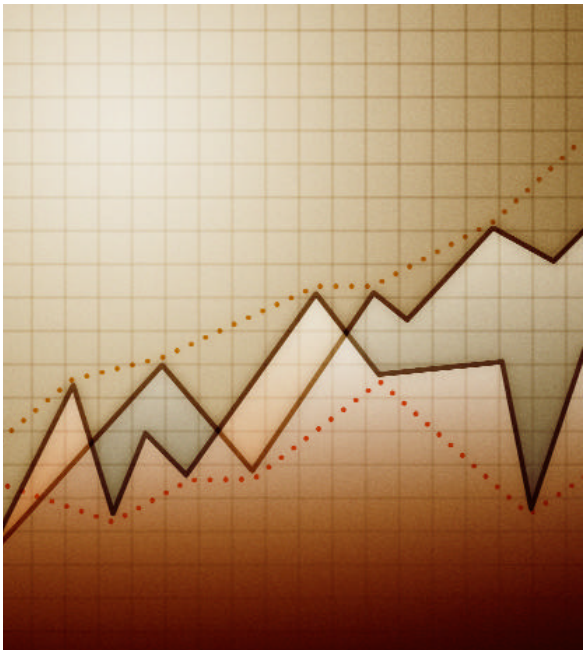
Final Report

U.S. Recycling Economic Information Study

Prepared for The National Recycling Coalition
by R. W. Beck, Inc.



NATIONAL RECYCLING COALITION INC.

July 2001

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Acknowledgement must also be given to the following agencies that contributed data from contemporaneous state and regional studies to this project:

- California Integrated Waste Management Board;
- Florida Department of Environmental Protection;
- Illinois Department of Commerce and Community Affairs;
- Indiana Department of Commerce;
- Missouri Department of Natural Resources;
- Nebraska Department of Economic Development;
- Northeast Recycling Council, with support provided by Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont;
- Ohio Department of Natural Resources; and
- Recycle Iowa (an initiative of the Iowa Department of Economic Development).

OVERVIEW

This Executive Summary presents the results of the United States Recycling Economic Information (US REI) Study. The main report provides an additional level of detail beyond that found in this Executive Summary, and thoroughly and completely documents the methodology used in producing the study results.

The goal of the study was to document the size of the recycling and reuse industry by first 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 recycling categories).

Next, similar information was estimated for four categories of supporting establishments intimately involved in the recycling and reuse industry. Finally, the broader effect of recycling and reuse businesses and their employees on the economy was derived 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);
- 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.

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; and
- Baseline of economic information to document future growth and development of the industry.

SUMMARY OF DIRECT RESULTS

The Study demonstrated that the nation's recycling and reuse industry is highly diverse in terms of which recovered materials are utilized, average establishment size, and which technologies are employed. Twenty-six recycling and reuse industry categories are used in this study and can be grouped into the following sectors based on the general types of activities undertaken:

- Recycling:
  - Collection;
  - Processing;
  - Manufacturing; and
- Reuse and Remanufacturing.

The recycling sector includes long-established sectors like paper and steel making, as well as new entrepreneurial ventures such as composting and plastic and rubber product manufacturers. The reuse and remanufacturing sector encompasses a diverse mix of establishments including wood reuse (e.g. pallet rebuilders, etc.), tire retreaders and electronic appliance demanufacturers.

COMPARISON OF INDUSTRY SECTOR SIZES

Table ES-1 presents estimates of direct economic activity for the recycling and reuse industry by sector. Detailed results for each of the twenty-six categories can be found in the main body of the report.

TABLE ES-1
SUMMARY OF ESTIMATES OF DIRECT ECONOMIC ACTIVITY
ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN $1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Data Type	Industry Sector				Industry Total
	Recycling Collection	Recycling Processing	Recycling Manufacturing	Reuse and Remanufacturing	
Establishments	9,247	12,051	8,047	26,716	56,061
Employment	32,010	160,865	759,746	169,183	1,121,804
Annual Payroll	956,875	3,826,360	29,181,749	2,747,498	36,712,482
Estimated Receipts	1,974,516	41,753,902	178,390,423	14,182,531	236,301,371
Estimated Throughput [1]	191,082	191,082	157,545	N/A	N/A

As Table ES-1 shows, the United States hosts 56,061 recycling and reuse establishments that employ approximately 1.1 million people, generate an annual payroll of $37 billion, and gross $236 billion in annual revenues.

Insight into the nation's recycling and reuse industry can be obtained by comparing the relative sizes of groups of business categories that are related in terms of materials recycled or sector of the industry that they are in.

Figures ES-1 and ES-2 graphically portray the information found in Table ES-1. As Figures ES-1 and ES-2 show, the economic size of the recycling manufacturing sector far exceeds the recycling collection, recycling processing, and reuse sectors.

[1] Throughput is amount of recovered material recycled and includes manufacturing scrap sent for recycling. It excludes materials prepared for fuel use and in-house process scrap returned to the manufacturing process. Throughput estimates are not summed to avoid triple counting at collection, processing, and manufacturing stages.

FIGURE ES-1
EMPLOYMENT BY INDUSTRY SECTOR

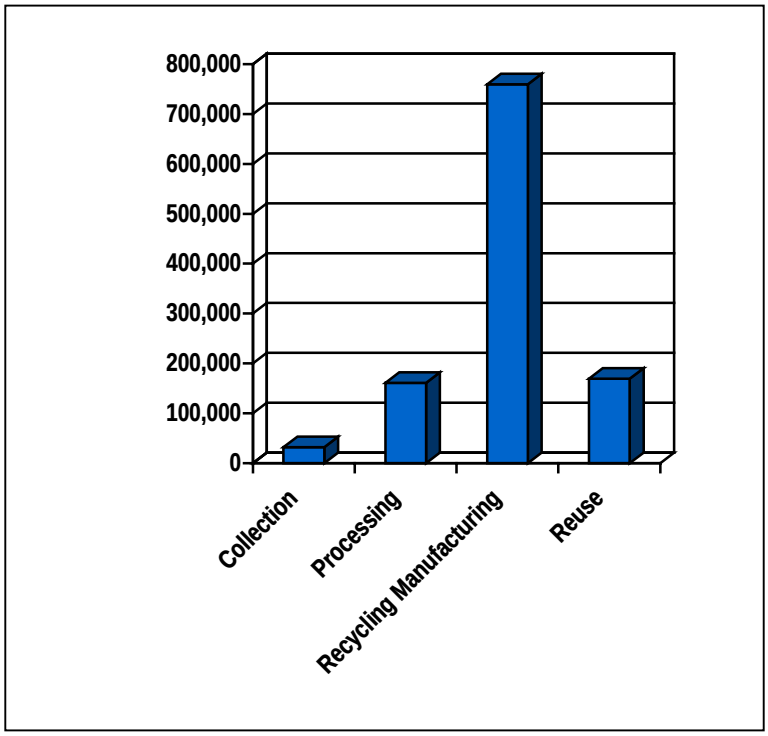
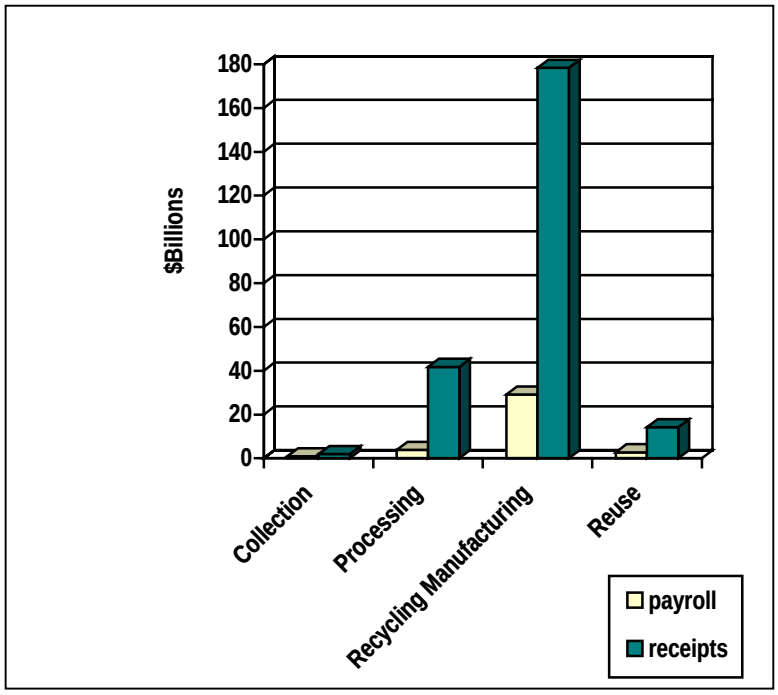


FIGURE ES-2
PAYROLL AND RECEIPTS BY INDUSTRY SECTOR



The ultimate value of a good or service is represented by the sale price of that good or service. Sales revenues, in turn, are used to employ persons and pay their wages, make

payments on equipment, provide a return to owners and investors, and pay upstream supplier establishments for the value of their goods or services. The cost in terms of labor, equipment, etc. of performing a particular process is a measure of the value that is added by that particular process.

The progression in size from recycling collection to recycling processing to recycling manufacturing follows from the fact that those sectors are part of a chain where increasingly more value is added to the recovered material as it moves through the recycling chain. Initially, a relatively small amount of value is added by consolidation (collection). Processors invest significantly more expense (value) in the recovered material by sorting and densification. However, no transformation of the recovered material has yet occurred – the material has simply been concentrated. The greatest value is added in manufacturing where relatively useless raw materials of little value are made into useful products of considerable value.

Reuse and remanufacturing differ slightly in that they focus on consolidation and refurbishing of products (not raw materials) that still have significant value; however, the value reuse adds cannot exceed the value inherent in a new product made from raw materials – otherwise people would buy the new product. This limits the amount of value that can be added, and thus the size of the reuse sector compared to the manufacturing sector.

COMPARISON OF THE RECYCLING SECTORS TO THE REUSE SECTOR

A noticeable distinction exists between the recycling sectors as a group (collection, processing, and manufacturing) and the reuse sector in terms of the size of establishments and average annual payroll. The recycling establishments have an average of 33 employees each, with an average annual payroll per employee of $36,000. Alternatively, the reuse sector is made up of smaller establishments – an average of 6 employees per establishment – with an average annual payroll of $16,000 per employee. Although the reuse and remanufacturing sector comprises 48 percent of total establishments, it makes up only 15 percent of total employees, 8 percent of payroll, and 6 percent of receipts.[2]

It is assumed that differences in employee pay between recycling sector and reuse sector establishments closely follow the level of skill and training required of employees. Recycling manufacturing, which contributes heavily to the overall recycling statistics, generally requires employees of higher skill and training than is normally required of employees of reuse establishments. Employees of higher skill and training are paid more than employees of lesser skill and training. It should be noted that remanufacturing jobs, which were not well-characterized by this study, are more likely to have similar skill and training requirements to recycling manufacturing jobs and would pay higher wages than the average reuse sector job.

The difference in average employees per establishment between the recycling and reuse sectors can come from several sources, although two are most likely: (1) whether continuous production processes are employed; and (2) whether economies of scale produce improved production efficiency. Continuous production processes are normally employed to save energy, avoid production startup/shutdown inefficiencies, or cover high monthly fixed costs (such as capital equipment finance costs) by increasing daily production and revenues. Establishments that operate three shifts per day employ more persons than establishments of similar hourly production capacity that operate one shift per day. Processes where economies

[2] These reuse and remanufacturing figures are thought to represent the minimum amount of economic activity captured by the methodology because remanufacturing activities are often included with traditional manufacturing industries that were not included in this study. Several years ago Boston University estimated remanufacturing activities on the national level (Professor Robert T. Lund, *The Remanufacturing Industry: Hidden Giant,* 1996). That study suggested that reuse and remanufacturing categories may be as much as three times larger than that characterized by this study's methodology.

of scale reduce unit costs apply to those instances where overhead costs are significantly streamlined or where larger-sized capital equipment is more efficient than smaller-sized equipment. Because the capital equipment and processes employed in recycling manufacturing favor continuous production and economies of scale, it is not unexpected that recycling establishments are on average larger than reuse sector establishments (which rely more heavily on manual labor).

COMPARISON OF RECYCLING COLLECTION AND PROCESSING TO RECYCLING MANUFACTURING

Recycling categories that are focused locally on recovering materials from commercial, industrial, and residential waste streams include establishments that collect and process recyclables for shipment to the recycling manufacturing industry. These local collection and processing establishments include:

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

Alternatively, establishments in the recycling manufacturing sector are considered to be downstream consumers of recovered materials who rely on local collectors and processors for their supply of materials. When the two groups are compared, local collection and processing make up approximately 20 percent of total recycling employment and receipts, whereas downstream manufacturing makes up the remaining 80 percent of employment and receipts. This suggests that public policy to encourage recycling and discourage disposal, and public and private investment in local recyclables collection and processing infrastructure pays great dividends in supporting significant downstream private recycling economic activity.

LARGEST CONTRIBUTORS

As has been noted, the economic size of the recycling manufacturing sector greatly exceeds that of the other recycling and reuse sectors. Upon closer examination, over half of the economic activity for the entire recycling and reuse industry is accounted for by the following four recycling manufacturing sector categories:

- Paper, paperboard, and deinked market pulp mills, which employ 139,375 people and gross nearly $49 billion in estimated annual receipts;
- Steel mills, which employ 118,544 people and gross $46 billion in estimated annual receipts;
- Plastics converters, which employ 178,700 people and gross nearly $28 billion in estimated annual receipts; and
- Iron and steel foundries, which employ 126,313 people and gross over $16 billion in annual estimated receipts.

These four categories alone account for 50 percent of all employees, 62 percent of wages, and 59 percent of total receipts. Figures ES-3 and ES-4 place this information into further perspective by showing how the size of the nation's major recyclable materials manufacturing industries compare to each other. As the Figures show, ferrous metals recycling manufacturing leads the other material groups.

FIGURE ES-3
RECYCLING MANUFACTURING INDUSTRY EMPLOYMENT BY MAJOR MATERIAL GROUP

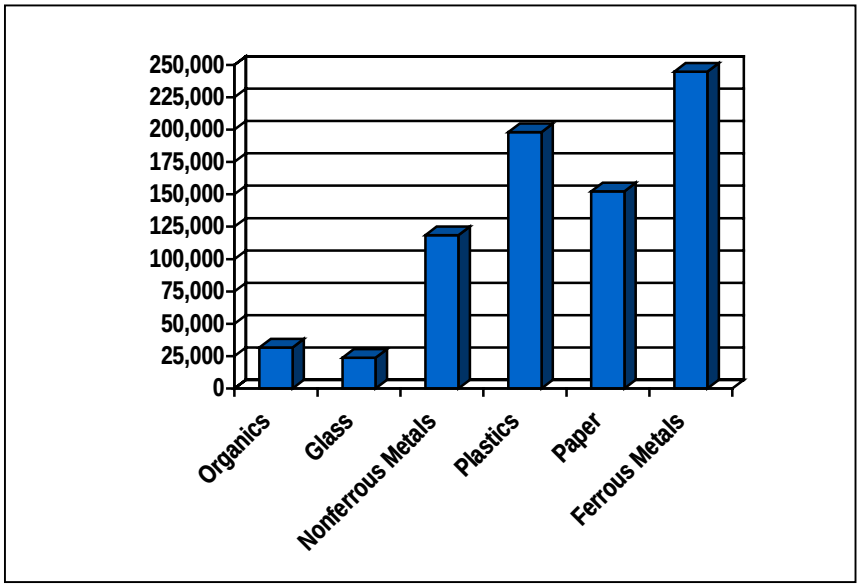
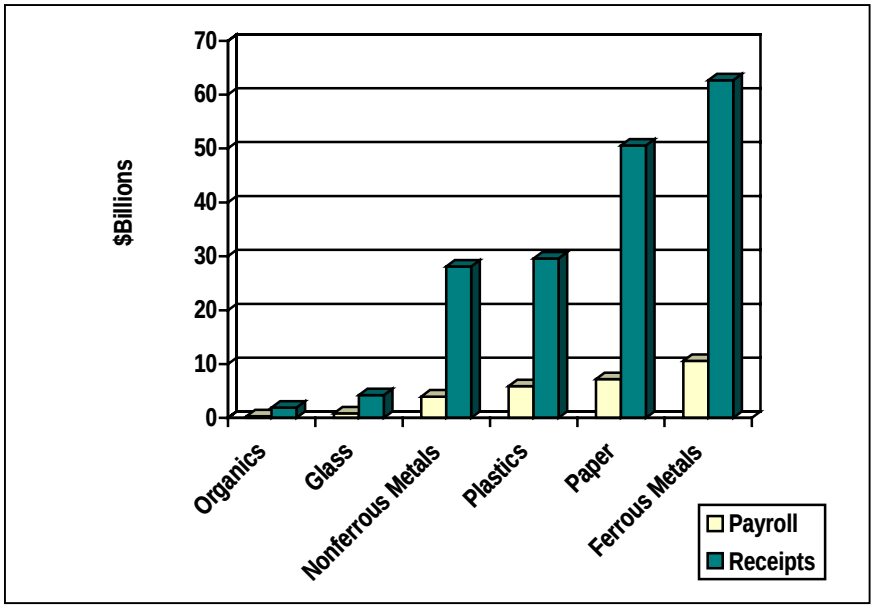


FIGURE ES-4
RECYCLING MANUFACTURING INDUSTRY PAYROLL AND RECEIPTS BY MAJOR MATERIAL GROUP



The amount of materials recycled, in combination with the underlying value of each raw material, help explain why some major material groups shown in Figures ES-3 and ES-4 rank higher than others. When large quantities of a high-value commodity are returned to the stream of commerce, the large amount of intrinsic value returned to the economy can support more jobs and economic activity than if a lesser amount or lower value commodity is returned to the stream of commerce. Plastics and non-ferrous metals are at the top end of the value scale, ferrous metals and paper are in the middle, and glass and compost are at the low end of the value scale. Major material group recycling amounts as estimated by this study are:

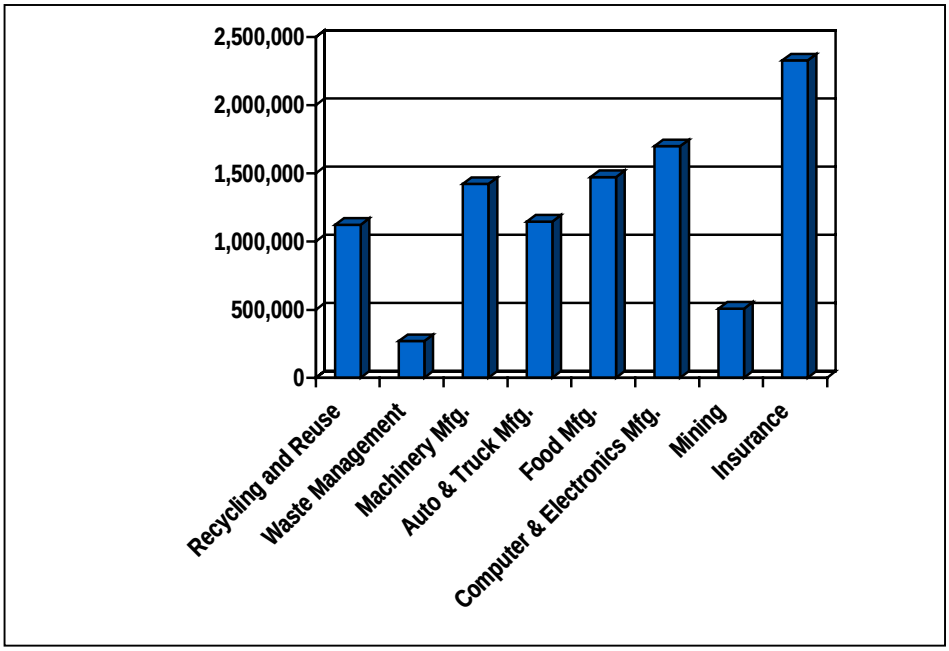
- Yard waste – 65 million tons (recycling of other organic materials is negligable);
- Glass – 3 million tons;
- Nonferrous metals – 7 million tons;
- Plastics – 3 million tons;
- Paper – 37 million tons; and
- Ferrous metals – 59 million tons.

When both amount recycled and value are considered together, the relative sizes of the various material groups can be explained. Similarly, estimates can be made of the economic impact that results from increased diversion of various materials.

THE RECYCLING AND REUSE INDUSTRY IN PERSPECTIVE

Figures ES-5, ES-6, and ES-7 show how the nation's recycling and reuse industry compares to other select national industries.[3] These industries were chosen because they present alternatives to recycling and reuse (i.e., waste management and mining) or because they are considered to be important or preferred industries that are often targeted for support by economic developers.

FIGURE ES-5
COMPARISON OF INDUSTRY EMPLOYMENT



[3] Comparative industry information comes from the 1997 Economic Census (U.S. Census Bureau) for the following industries: waste management – NAICS 562 waste management and remediation services minus 56292 materials recovery facilities; auto and truck manufacturing – NAICS 336 transportation equipment manufacturing; insurance – NAICS 524 insurance carriers and related activities; mining – NAICS 21; food manufacturing – NAICS 311; machinery manufacturing – NAICS 333.

FIGURE ES-6
COMPARISON OF ANNUAL WAGES PER JOB

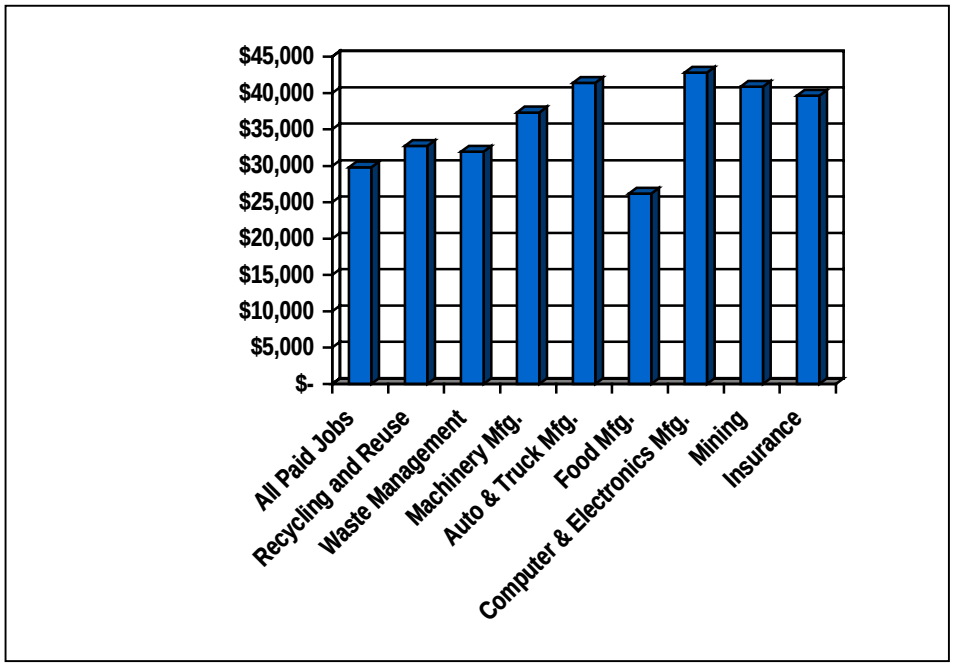
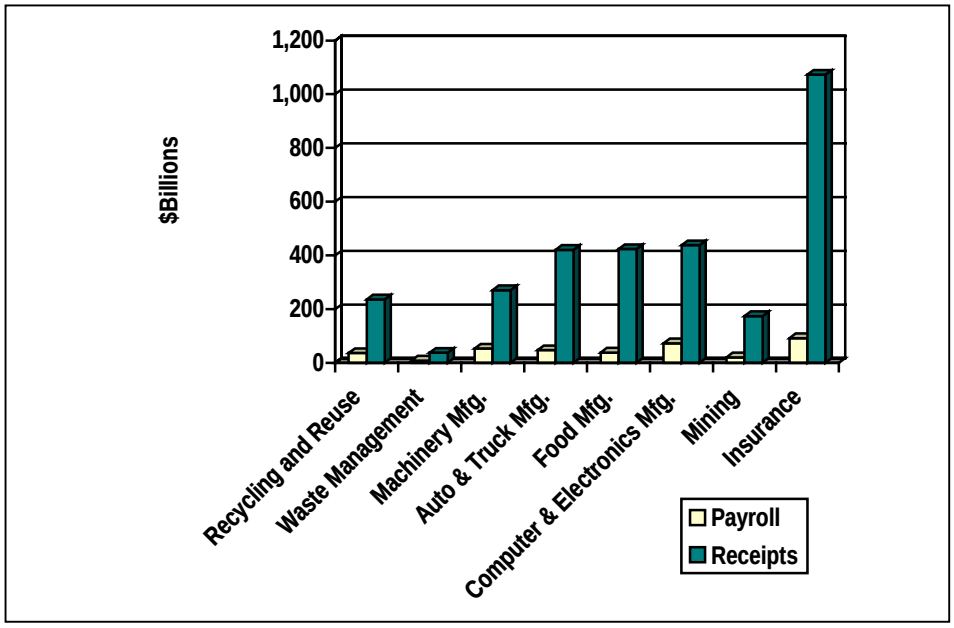


FIGURE ES-7
COMPARISON OF TOTAL WAGES AND SALES



As the figures show, the recycling and reuse industry is a significant industry as compared to other major industries. It provides large numbers of jobs that, on average, pay above the average national wage.

Despite the fact that more discards are disposed than recycled, it is not surprising that the recycling and reuse industry is larger than the waste management industry. This is because recycling and reuse are inherently value-adding, whereas disposal is not, and value-adding processes support jobs and economic activity.

SUMMARY OF OTHER ECONOMIC ACTIVITY PRODUCED

The study also estimated other economic activity produced in the United States economy that, while not directly part of the recycling and reuse industry, is attributable to the industry. Economic modeling was used to help estimate the level of this additional economic activity.

ECONOMIC ACTIVITY SUPPORTED BY INDUSTRY ESTABLISHMENTS

In addition to the economic activity of the recycling and reuse industry itself, other economic activity is supported because the industry purchases goods and services from other types of establishments (such as office supply companies, accounting firms, legal firms, building and landscape maintenance firms, etc.).

Economic modeling estimated that nearly 1.4 million jobs are maintained in support businesses because of the recycling and reuse industry. These jobs have a payroll of $52 billion and produce $173 billion in receipts.

ECONOMIC ACTIVITY SUPPORTED BY EMPLOYEES

Employees of the recycling and reuse industry (and employees in other businesses that support the industry) also support another round of economic activity when they spend their wages in the economy. Economic modeling estimated that employee personal spending supports 1.5 million jobs with a payroll of $41 billion, and produces receipts of $146 billion.

GOVERNMENT TAX REVENUES

This study estimated government tax revenues arising from the recycling and reuse industry based on income levels and tax rates. Table ES-2 shows the taxes paid directly by recycling and reuse industry establishments and their employees to various levels of government (direct revenues) and total revenues, which includes taxes from additional economic activity as estimated by economic modeling.

TABLE ES-2
SUMMARY OF RECYCLING & REUSE INDUSTRY CONTRIBUTION TO GOVERNMENT REVENUES
(IN $ MILLIONS)

Industry Sector	Direct Revenues				Total Revenues			
	Federal	State	Local	Total	Federal	State	Local	Total
Recycling Collection	200	100	100	400	300	200	100	600
Recycling Processing	700	400	300	1,400	1,700	800	600	3,200
Recycling Manufacturing	5,400	2,600	2,100	10,000	20,500	9,900	7,800	38,200
Reuse/Remanufacturing	600	300	200	1,200	2,100	1,000	800	3,900
Total	6,900	3,400	2,600	12,900	24,600	11,900	9,400	45,800

Note: figures may not add due to rounding.

Table ES-2 shows that U.S. government revenues exceed the combined revenues collected by state and local governments as a result of the recycling and reuse industry's economic activity. Individual federal income tax payments by employees in this industry make up over 70 percent of federal tax revenues, with corporate income taxes making up about half of the remainder. State taxes primarily come from sales and individual income taxes. Local taxes come primarily from property taxes and miscellaneous fees.

A conclusion that can be drawn by comparing the local government revenues in Table ES-2 to local government expenditures on recyclables collection and processing services

(estimated at over $3 billion per year) is that state and federal governments experience significant revenue benefits from local government spending on recycling programs.

INFLATION IN MODELING AND TAX REVENUE TOTALS

It is important to note that some of the results shown in the Other Economic Activity and Tax Revenue sections may be upwardly inflated by as much as 15 percent due to limitations inherent in the modeling process. These limitations cause problems when establishments in an industry are linked as part of a chain, as is the recycling industry. Similar problems would be seen in modeling results for any other industry that is linked in a chain. This inflation is unavoidable if modeling detail is desired for each component of an industry, as was the case for this study.

Economic models estimate and attribute other economic activity to an industry based on the level of purchases that establishments and employees in that industry make. When recycling manufacturers purchase materials from suppliers, modeling estimates the economic activity of those suppliers (e.g., recyclables collectors, recyclables processors, and material reclaimers) and counts it as additional economic activity that is supported. Because the economic activity of collectors, processors, and material reclaimers has already been counted as part of the recycling and reuse industry itself, modeling in effect double-counts their economic activity.

It is important to note that this bias is only found in modeling results for recycling and reuse industry sector subtotals or industry-wide totals. Also, government tax revenue subtotals and totals that are derived from modeling results show the same bias. Alternatively, **economic activity and government tax revenue totals derived only from the recycling and reuse industry itself do not include bias** .

SUMMARY

The recycling and reuse industry is an integrated network where the public and private sectors work together to recover and transform relatively useless discards into useful products of considerable value. Returning commodities to the stream of commerce is a value-adding, job-providing, and economy-spurring activity. The recycling and reuse industry is a significant contributor to the United States economy, providing large numbers of good jobs that pay well as shown by the following statistics:

- The average wage paid by the recycling and reuse industry is $32,700 – approximately $3,000 per year more than the national average wage. [4]
- The recycling and reuse industry supports 3.1 percent of the paid jobs in the United States – 0.9 percent through direct employment, and 2.2 percent (contributed equally) by industry and employee spending in the economy. [4]
- Some 2.7 percent of the US gross domestic product is attributable to the recycling and reuse industry, with 0.7 percent provided directly by the industry. [5]

Investments at the local level in collection and processing of recyclables and public policies that favor recycling and reuse support large private sector investments in downstream processing and manufacturing.

[4] Average wage data and total jobs data come from the U.S. Bureau of Economic Analysis, regional accounts data, regional economic profile for the U.S. for 1997 wage and salary jobs.

[5] Percentages come from dividing value added as estimated by economic modeling by gross domestic product data (national value added totals) as reported by the U.S. Bureau of Economic Analysis, "Gross State Product in Current Dollars, 1992-1998" table using data for 1997.

1.1 OVERVIEW

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- Induced economic values (personal spending by employees of direct and indirect establishments);
- 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.

1.2 COMPARISON TO SIMILAR STUDIES

The US REI study conforms to the methodology for gathering economic data on the recycling and reuse industry that was developed by the Northeast Recycling Council (NERC) and that has been used in many other state studies. As a result, the information contained in this report is generally comparable to that of REI studies conducted for:

- The Northeast Recycling Council,[6] including the ten-state region as a whole and state-level data for Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont;
- States that commissioned state-level studies as part of this study, including California, Florida, Indiana, Nebraska, and Ohio[7]; and
- Other states that conform to the specified REI methodology.[8]

[6] "Recycling Economic Information Study," Northeast Recycling Council, June 2000.

[7] "California Recycling Economic Information Study," California Integrated Waste Management Board, June 2001; "Florida Recycling Economic Information Study," Florida Department of Environmental Protection, June 2000; "Indiana Recycling Economic Information Study," Indiana Department of Commerce, May 2001; "Ohio Recycling Economic Information Study," Ohio Department of Natural Resources, January 2001; "Nebraska Recycling Economic Information Study," Nebraska Department of Economic Development, March 2001.

At least seven other recycling economic information studies had been performed before NERC developed a standard REI study methodology. 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. Therefore, care should be taken if attempting to compare the results of this study to previous studies. Table 1-1 lists the types of data collected in this study compared to three previous economic information studies.

TABLE 1-1
COMPARISON OF DATA PRESENTED IN OTHER RECYCLING ECONOMIC INFORMATION STUDIES

Name of Study	Types of Data Presented						
	Recycling Collection	Recycling Processing	Recycling End Use	Reuse	Support Businesses	Multipliers	Tax Revenues
US REI Study (2001)	●	●	●	●	●	●	●
Selected Previous Studies							
Assessment of Economic Impacts of Recycling in Iowa; Recycle Iowa Program (1996, 2001 Update)		●	●				●
Arizona Recycling Market Development Study; Arizona Department of Commerce (1996)	●	●	●			●	
Value Added to Recyclable Materials in the Northeast; NERC (1994)	●	●	●				

1.3 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; and
- Baseline of economic information to document future growth and development of the industry.

1.4 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;

[8] Illinois, Iowa, Minnesota, Missouri, and Wisconsin all conducted studies in 2000/2001 that made use of at least some of the tools and methodology found in "Recycling Economic Information Study", Northeast Recycling Council, June 2000.

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; 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. Evaluation of Data Sources
C. Sample of Raw Data from U.S. Census Bureau's *Economic Census*
D. Survey Materials
E. Statistical Analysis of Survey Results
F. State Data Tables
G. Glossary of Terms

2.1 STUDY 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 that recycling economic information studies face is 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.

Consistent with the methodology developed by NERC, this study includes those activities that are most essential to the continued recycling of materials and reuse of used products.[9] The study 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.

"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 recycled 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.

[9] NERC developed its methodology with grant funding from US EPA. US EPA also reviewed and commented on the methodology as it was under development.

The end-point of recycling is considered to be 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 study attempted to exclude economic activity associated with further conversion within the same facility as these are essentially manufacturing rather than recycling activities.

2.2 BUSINESS CATEGORIES

This report presents recycling and reuse industry data for twenty-six separate business categories. Data is also presented for four categories of support businesses. The business categories are 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. For more detailed definitions, please see Appendix A.

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 and brokers of 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

Business Category		Definition
10.	Nonferrous Foundries	Produce castings from nonferrous metals
11.	Paper, Paperboard, and Deinked Market Pulp Mills	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
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 recovered 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.	Transporters	Transport recovered materials or reusable goods by air, rail, water, or truck
30.	Other Support Businesses	Other support businesses such as accounting firms, janitorial firms, etc.

2.3 TYPES OF INFORMATION DEVELOPED

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

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

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

- **Number of Establishments:** An establishment is a single physical location where business is conducted or where services or industrial operations are performed;
- **Employment:** Consists of full and part-time employees, including salaried officers and executives of corporations;
- **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;
- **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
- **Total Throughput:** Total tons of recovered 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:

- **Indirect Economic Values:** Economic activity accrued by other establishments (suppliers and customers) as a result of the activities of the recycling and reuse businesses;
- **Induced Economic Values:** Economic activity accrued by retail and other establishments because of personal purchases by recycling and reuse industry and indirect establishment employees;
- **Multipliers:** The ratio of total values (direct, indirect, and induced) to direct values; and
- **Tax Revenues:** State revenues derived from taxes, charges and fees, and miscellaneous revenues.

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 reported in Section 4, 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.

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. Table 3-1 lists the business categories and the approach used for each category.

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 Data
6.	Glass Container Manufacturing Plants	Existing Data
7.	Glass Product Producers (other recycled uses)	Survey
8.	Nonferrous Secondary Smelting and Refining Mills	Existing Data
9.	Nonferrous Product Producers	Existing Data
10.	Nonferrous Foundries	Existing Data
11.	Paper, Paperboard, and Deinked Market Pulp Mills	Existing Data
12.	Paper-Based Product Manufacturers	Survey
13.	Pavement Mix Producers (asphalt and aggregate)	Survey
14.	Plastics Reclaimers	Existing Data
15.	Plastics Converters	Existing Data
16.	Rubber Product Manufacturers	Survey
17.	Steel Mills	Existing Data
18.	Iron and Steel Foundries	Existing Data
19.	Other Recycling Processors/Manufacturers	Survey
	Reuse and Remanufacturing Industry	
20.	Computer and Electronic Appliance Demanufacturers	Survey
21.	Motor Vehicle Parts (used)	Existing Data
22.	Retail Used Merchandise Sales	Existing Data
23.	Tire Retreaders	Existing Data
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.	Transporters	Modeling
30.	Other Support Businesses	Modeling

The breakdown of the number of categories served by each approach is:

- Existing Data – 13;
- Survey Data – 12;
- Derivation Data – 2; and
- Modeling – 3.

Each of the three approaches is described in greater detail in the following subsections. Furthermore, Appendix B summarizes data sources used for compiling the survey database or otherwise used for producing direct data for this study.

After the direct economic values were developed, total economic values were estimated through economic modeling' 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:

- Survey for Intermediate Inputs – A 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 for 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.

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 aligned well with a distinct census category. Reports from the U.S. Census included the 1997 Economic Census, which provides number of establishments, number of employees, payroll, and receipts for each category of establishment. Recovered material consumption by each category is also reported on the national level in those reports. 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. Up until 1997, the Census Bureau categorized businesses according to the Standard Industrial Classification (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 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 codes also include 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 the 1997 Economic Census for relevant NAICS codes, which was the most recent data available from the U.S. Census when this study was conducted. Although the Economic Census is only updated every five years, the U.S. Census updates its Standard Statistical Establishments List (SSEL) yearly, which could provide more current data than the Economic Census for future studies.

It should be noted that certain data are not disclosed by U.S. Census when a NAICS code has a small number of associated businesses and showing exact numbers would reveal sensitive information for a particular organization. This problem generally occurs when state or municipal level data is presented. See Appendix C for a sample of data provided by U.S. Census.

3.2.1.3 ADDITIONAL SOURCES OF EXISTING DATA

Although the most commonly used existing data was the U.S. Census 1997 Economic Census, other sources provided throughput data or partial data for use in derivations or adjustments to original data. These sources of existing information and their contributions include:

- American Forest & Paper Association – State and national 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, but lists of establishments in those categories were available, 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 National Recycling Coalition as part of the US REI study developed a national database of establishments as a tool for surveying businesses in categories with little or no sources of existing data. The database was compiled from various electronic databases, state directories, periodicals, and other sources. 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. Over 20,000 establishments were listed in the database at the conclusion of the study.

3.2.2.2 SURVEY DESIGN

The survey was designed to obtain economic information from businesses in categories with little or no existing information. Appendix D contains a copy of the survey forms that were used for this study.

The survey cover page confirmed the database records for establishment name, mailing information, physical location, and contact person. For organizations with more than one physical location (establishment), one cover page and survey for each physical location were completed.

The survey solicited responses to the following questions:

1. Classify the establishment according to the categories defined for the study (respondents could check more than one category);
2. Identify the single category that is most representative of the recycling or reuse-related operations for the establishment;
3. Give estimations of establishment size including number of employees, total annual payroll, and total annual receipts;

4. Estimate the percentages of labor and receipts considered 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.

3.2.2.3 SURVEY APPROACH

Prior to beginning the random sample of establishments in states that did not commission state-level studies, it was estimated and budgeted that up to 600 establishments would need to be targeted for survey phone calls. Once the survey database was finalized, 6,574 establishments were listed as being in survey categories or as "unknown." It was determined that 627 establishments would need to be surveyed in order to acquire statistically significant data. A random sample from the 6,574 establishments listed as being in survey categories or as "unknown" was taken, and those 627 establishments were mailed a survey. Furthermore, at least three follow-up telephone attempts were made to establishments that failed to respond to the mailed survey in order to obtain survey information.

A statistical formula was used to ensure the correct number of completions was targeted and distributed appropriately by category. The number chosen for follow-up phone calls depended on the number of completed surveys needed in each category in order to obtain statistics accurate to +/- 10 percent at a 95 percent level of confidence.

This entailed randomly numbering all establishments to be surveyed. Phone calls were placed beginning with the first randomly selected business for each category and continued until all businesses in the category were called or an appropriate number of completions needed for statistical confidence was reached.

Once surveys were completed, 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

A statistical analysis of the survey data provided by establishments that completed surveys was used to identify the recycling characteristics of the average establishment in each of the twelve survey business categories. These averages were then applied to all establishments in each survey category to estimate the number of employees[10] involved in recycling activities, as well as the dollar value of recycling and reuse payroll and receipts. However, before making this extrapolation the list of non-responding establishments was examined to identify any establishments that were known to be very large, and whose economic activity would need to be estimated by some other means.

The US REI Study used totals from survey categories from individual state studies and the NERC study, in combination with survey results from the random sampling of the remaining 34 states to arrive at totals for survey categories.

Survey information obtained from 212 firms formed the basis of the statistical analysis for the 34 states surveyed as part of the national survey. Because many of the establishments initially included in the database were found to have been misclassified or gone out of business, it was

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

necessary to re-estimate the number of establishments in each survey category before extrapolating average statistical data. In the 34 surveyed states, 2,370 establishments are believed to be involved in recycling activities in the twelve survey categories. The same statistical analysis was conducted in each of the state/regional studies as part of this national study. For a detailed explanation of the statistical analysis of surveys, please refer to Appendix E.

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 Section 4.1, note 6 of Table 4-2. Additionally, direct data for three of the four support business categories was derived as a result of economic modeling.

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 using the IMPLAN[11] economic model.

Economic modeling started with the purchase of data files that provided a standard inter-industrial accounting of the United States economy. These data files 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 that would isolate the 26 categories of recycling and reuse establishments from other establishments in the U.S. so that their economic values could be separately analyzed and reported.

The eight-step process is described below:

[11] 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.

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 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 model. 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 industry. This ensured the model's total amount of industrial activity summed to precisely the same value as it 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 category.

6. There are several other components to input-output modeling that were investigated on the individual state levels. One modification involved changing regional purchase coefficients (RPCs) in the different state models. Adjustments were made to each state model to account for the differences and likelihood of purchasing materials in state or out of state. When looking at the U.S. as a whole, this issue has insignificant leakage effects to the results, and therefore adjustments were not necessary. In other words, it is much more likely that a state will have materials being purchased out of state, than the U.S. will have materials being purchased from another country.

   There were other account categories that were assessed also in the INPUT-OUTPUT model. 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 model was then re-checked for errors, omissions, and reasonableness and re-estimated in final form. This step included rebalancing the model so that the gross total equaled the original starting values.

8. Once the final model was constructed, multipliers were generated for each recycling and reuse industry 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 contribution.

In order to estimate tax revenues associated with the recycling and reuse industry's economic data (direct as well as indirect and induced), total state and local[12] government revenue data were gathered from the U.S. Census Bureau's 1997 Census of Governments publications. This data included general revenue from own sources (meaning that revenues were counted only for the collecting government to avoid duplication when revenues are transferred from one level of government to another) for the fiscal year from July 1, 1996 to June 30, 1997. General revenues include:

- Taxes (e.g., property, sales, personal income, corporate income, fuel);
- Charges (e.g., higher educational tuition, hospital fees, solid waste and sewerage fees); and
- Other miscellaneous general revenue (e.g., interest earnings, special revenues, etc.).

Social Security and retirement taxes, as well as utility system revenues (i.e., water, electric) are not general revenues and were not included in the revenue figures.

Next, data on total incomes were obtained from the U.S. Bureau of Economic Analysis Regional Economic Information System. Total tax revenues received by each level of government were divided by total income to yield effective tax rates for each level of government. These tax rates were then applied to the direct and total values of personal income for each business category to yield total recycling and reuse industry tax revenue estimates received by each level of government. Implicit in this method of estimating taxes is the assumption that recycling and reuse establishments are taxed at the same rates as other types of establishments.

3.5 VALIDATION OF STUDY RESULTS

Upon completion of the REI study results, they were reviewed to ensure that both direct and indirect study data were valid and meaningful. The methods of review included:

- Review of completed surveys by senior staff; and
- Comparisons of per-establishment and per-employee figures from the nation to similar figures from comparable state and regional studies.

Furthermore, previous reviews by state government staff and industry trade associations of the Northeast data produced by the NERC REI Study and the other state studies validated that the study methodology fairly and conservatively characterized the level of economic activity for their state or industry.[13]

[12] "Local government" includes counties, municipalities, townships, special districts and school districts. Similar federal government revenue data was gathered for the fiscal year beginning October 1, 1996.

[13] Trade associations that reviewed the NERC study included the American Forest & Paper Association, the American Plastics Council, the Institute of Scrap Recycling Industries, and the Steel Recycling Institute.

SECTION 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 U.S. Recycling and Reuse Industry data table;
- The U.S. Recycling and Reuse Industry data table of results, including numbered notes that correspond to specific data points in the table and explain how the data was derived;
- An analysis of the results; and
- A discussion of the accuracy and completeness of the results.

4.1 GENERAL NOTES ON DATA TABLES

This section provides general information regarding the format of the U.S. Recycling and Reuse Industry data table presented in this section. 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:

- 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;
- Some establishments involved in recycling or reuse are also involved in non-recycling activities not intended to be covered in this study; and
- 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 US 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

NAICS code. For example, data for all paper mills 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."[14] 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 the table notes for Table 4-2.

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 generally 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. 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 Table 4-2, 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 Table 4-2 are:

- Establishments – an establishment is a single physical location of an organization or government. A single organization 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.

[14] For a complete definition of covered activities, refer to Section 2.1 and note 2 on page 4-7.

- 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.[15]

C. Total Statistics on all Industry Establishments – the combined statistics for all establishments in categories without regard to recycling activity.[16]

D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities – a subset of Column C and reports statistics on only those establishments with some portion of operations in covered recycling activities. 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. Statistics on Establishments Undertaking Recycling or Reuse Activities – a subset of Column 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.

F. Statistics on Establishments 100% Recycling or Reuse-Dependent – estimates for establishments with 100 percent of operations dependent on recycling or reuse, which in most cases establishments consume no virgin material.[17] This column presents data that is discounted for non-covered activities.

G. Estimates of Total Recycling-Related Economic Activity – 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 table.

TABLE 4-1
ABBREVIATIONS USED IN TABLE OF RESULTS

Abbreviation	Definition
AF&PA	American Forest & 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
USGS	U.S. Geological Survey

[15] 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.

[16] 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.

[17] 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.

TABLE 4-2

UNITED STATES 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 AT THE END OF THE DATA TABLE.

		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 Establishments 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 Collection	Establishments							3,052	Derivation; multiple sources [6]	3,052
	Employment							10,560		10,560
	Annual Payroll							315,670		315,670
	Estimated Receipts							651,590		651,590
	Estimated Throughput							12,408	Derivation; multiple sources [7]	12,408
2. Private Staffed Collection	Establishments							6,195	Derivation: multiple sources [8]	6,195
	Employment							21,450		21,450
	Annual Payroll							641,205		641,205
	Estimated Receipts							1,322,925		1,322,925
	Estimated Throughput							178,674	Derivation; multiple sources [9]	178,674
3. Compost and Miscellaneous Organics Producers	Establishments							2,295	REI Study Database [10]	2,295
	Employment							31,718	Sum of results (survey data	31,718
	Annual Payroll							330,679	extrapolations) from several state	330,679
	Estimated Receipts							1,905,971	or regional surveys (n=538) [11],	1,905,971
	Estimated Throughput							65,251	[12]	65,251
4. Materials Recovery Facilities (MRFs)	Establishments							668	REI Study Database [10]	668
	Employment							14,155	Sum of results (survey data	14,155
	Annual Payroll							266,590	extrapolations) from several state	266,590
	Estimated Receipts							1,099,272	or regional surveys (n=201) [11]	1,099,272
	Estimated Throughput							18,727		18,727
5. Recyclable Material Wholesalers	Establishments							9,088	U.S. Census. 1997 Econ. Census	9,088
	Employment							114,992	NAICS code 421930 [13], [14]	114,992
	Annual Payroll							3,229,092		3,229,092
	Estimated Receipts							38,748,659		38,748,659
	Estimated Throughput							107,104	Derivation [15]	107,104
6. Glass Container Manufacturing Plants	Establishments			61	U.S. Census. 1997 Econ. Census	61	From Column D [16]			61
	Employment			21,184	NAICS code 327213 [13]	19,066	Column D adjusted for			19,066
	Annual Payroll			840,703		756,633	non-covered activities [16]			756,633
	Estimated Receipts			4,198,122		3,778,310				3,778,310
	Estimated Throughput			2,416		2,416	From Column D [16]			2,416
7. Glass Product Producers (other recycled uses)	Establishments					89	REI Study Database [10]			89
	Employment					4,723	Sum of results (survey data			4,723
	Annual Payroll					92,831	extrapolations) from several state			92,831
	Estimated Receipts					452,425	or regional surveys (n=21) [11]			452,425
	Estimated Throughput					614	Glass Packaging Institute [17]			614
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	395	U.S. Census. 1997 Econ. Census	253	Column C adjusted to remove			253	From Column D [19]	253
	Employment	20,641	NAICS codes 331314, 331423,	13,463	establishments that alloy rather			12,790	Column D adjusted for	12,790
	Annual Payroll	744,910	and 331492 [13]	467,314	than smelt/refine (remove portion			443,948	non-covered activities [19]	443,948
	Estimated Receipts	8,651,629		6,958,142	Corresponding to SIC 3399)			6,610,235		6,610,235
	Estimated Throughput	3,418	'97 Economic Census/USGS [18]	3,418	From Column C			3,418	From Column D [19]	3,418
9. Nonferrous Product Producers	Establishments	392	U.S. Census. 1997 Econ. Census	196	Column C adjusted to remove	196	From Column D [16]			196
	Employment	80,807	NAICS codes 331315, 331316,	40,404	Establishments that don't recycle	36,363	Column D adjusted for			36,363
	Annual Payroll	3,071,475	331319, and 331421 [13]	1,535,738	[20]	1,382,164	non-covered activities [16]			1,382,164
	Estimated Receipts	28,768,219		14,384,110		12,945,699				12,945,699
	Estimated Throughput	2,910		2,910	From Column C	2,910	From Column D [16]			2,910

		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 Establishments 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	
10. Nonferrous Foundries	Establishments			1,395	U.S. Census. 1997 Econ. Census	1,395	From Column D [16]			1,395
	Employment			77,019	NAICS codes 331521, 331524,	69,317	Column D adjusted for			69,317
	Annual Payroll			2,386,131	331525, 331528 [13]	2,147,518	non-covered activities [16]			2,147,518
	Estimated Receipts			9,516,660		8,564,994				8,564,994
	Estimated Throughput			393	1997 Economic Census [21]	393	From Column D [16]			393
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	549	U.S. Census. 1997 Econ. Census	474	Derived from Column C with data	261	Derived from Column D with data	213	Derived from Column D with data	474
	Employment	198,681	NAICS code 3221. [13]	171,539	From AF&PA to remove	66,042	from AF&PA and further adjusted	73,333	from AF&PA and further adjusted	139,375
	Annual Payroll	9,822,942		8,481,010	Establishments that don't	3,265,189	to exclude non-covered activities	3,625,632	to exclude non-covered activities	6,890,821
	Estimated Receipts	69,597,892		60,089,983	Consume recovered fiber [22]	23,134,644	[23]	25,688,468	[23]	48,823,111
	Estimated Throughput			34,108		18,759		15,349		34,108
12. Paper-Based Product Manufacturers	Establishments							215	REI Study Database[10]	215
	Employment							12,867	Sum of results (survey data	12,867
	Annual Payroll							312,714	extrapolations) from several state	312,714
	Estimated Receipts							1,715,935	or regional surveys (n=39). [11]	1,715,935
	Estimated Throughput							2,450	AF&PA [24]	2,450
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					120	REI Study Database[10]			120
	Employment					3,460	Sum of results (survey data			3,460
	Annual Payroll					135,936	extrapolations) from several state			135,936
	Estimated Receipts					831,912	or regional surveys (n=59). [11]			831,912
	Estimated Throughput					42,881				42,881
14. Plastics Reclaimers	Establishments							780	APC Database [25]	780
	Employment							19,411		19,411
	Annual Payroll							557,989	Derivation -'97 Econ. Census [25]	557,989
	Estimated Receipts							1,635,183	Derivation - Plastics News [25]	1,635,183
	Estimated Throughput							2,581	APC Database [25]	2,581
15. Plastics Converters	Establishments	15,414	SPI Economic Report 2000 for	2,510	Derivation; from SPI data [27]	2,510	From Column D [29]			2,510
	Employment	1,371,600	NAICS codes 325991 and 3261	223,375	Derivation; from SPI data [27]	178,700	Column D adjusted for			178,700
	Annual Payroll	41,098,500	plus captive plastics converting	6,693,184	Derivation; from SPI data [27]	5,354,547	non-covered activities [29]			5,354,547
	Estimated Receipts	214,537,300	[26]	34,938,932	Derivation; from SPI data [27]	27,951,145				27,951,145
	Estimated Throughput			2,581	APC Database [28]	2,581	From Column D [29]			2,581
16. Rubber Product Manufacturers	Establishments					158	REI Study Database[10]			158
	Employment					3,917	Sum of results (survey data			3,917
	Annual Payroll					91,456	extrapolations) from several state			91,456
	Estimated Receipts					377,434	or regional surveys (n=39). [11]			377,434
	Estimated Throughput					424	Scrap Tire Mgmt. Council [30]			424
17. Steel Mills	Establishments	279	U.S. Census. 1997 Econ. Census	101	Column C minus non-integrated			101	From Column D [32]	101
	Employment	146,532	NAICS code 331111 [13]	124,783	Mills (NAICS code 3311114) [31]			118,544	Column D adjusted for	118,544
	Annual Payroll	7,469,223		6,498,403				6,173,483	non-covered activities [32]	6,173,483
	Estimated Receipts	57,068,867		48,425,672				46,004,388		46,004,388
	Estimated Throughput	48,134		48,134	From Column C [31]			48,134	From Column D [32]	48,134
18. Iron and Steel Foundries	Establishments			1,143	U.S. Census. 1997 Econ. Census	1,143	From Column D [19]			1,143
	Employment			132,961	NAICS code 33151. [13], [33]	126,313	Column D adjusted for non-			126,313
	Annual Payroll			4,663,396		4,430,226	covered activities D [19]			4,430,226
	Estimated Receipts			17,565,350		16,687,083				16,687,083
	Estimated Throughput			11,249		11,249	From Column D [19]			11,249
19. Other Recycling Processors/Manufacturers	Establishments					552	REI Study Database[10]			552
	Employment					14,901	Sum of results (survey data			14,901
	Annual Payroll					411,483	extrapolations) from several state			411,483
	Estimated Receipts					2,012,571	or regional surveys (n=98). [11]			2,012,571
	Estimated Throughput					5,966				5,966
Recycling Industry Subtotals	**Establishments**					6,485		22,860		29,345
	Employment					522,802		429,820		952,621
	Annual Payroll					18,067,983		15,897,001		33,964,984
	Estimated Receipts					96,736,215		125,382,626		222,118,841

SECTION 4

		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 Establishments 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 & Electronic Appliance Demanufacturers	Establishments					187	REI Study Database [10]			187
	Employment					3,837	Sum of results (survey data			3,837
	Annual Payroll					93,312	extrapolations) from several state			93,312
	Estimated Receipts					435,509	or regional surveys (n=57) [11]			435,509
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							7,105	U.S. Census. 1997 Econ. Census	7,105
	Employment							45,807	NAICS code 421140 [13]	45,807
	Annual Payroll							971,776		971,776
	Estimated Receipts							5,272,107		5,272,107
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							17,990	U.S. Census, 1997 Econ. Census	17,990
	Employment							97,965	NAICS code 453310 [13]	97,965
	Annual Payroll							1,203,591		1,203,591
	Estimated Receipts							6,043,642		6,043,642
	Estimated Throughput							N/A		N/A
23. Tire Retreaders	Establishments							754	U.S. Census. 1997 Econ. Census	754
	Employment							7,939	NAICS code 326212 [13]	7,939
	Annual Payroll							192,387		192,387
	Estimated Receipts							982,607		982,607
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					490	REI Study Database [10]			490
	Employment					9,109	Sum of results (survey data			9,109
	Annual Payroll					188,097	extrapolations) from several state			188,097
	Estimated Receipts					906,878	or regional surveys (n=111) [11]			906,878
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							54	REI Study Database [10]	54
	Employment							186	Sum of results (survey data	186
	Annual Payroll							4,415	extrapolations) from several state	4,415
	Estimated Receipts							16,976	or regional surveys (n=21) [11]	16,976
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					136	REI Study Database [10]			136
	Employment					4,340	Sum of results (survey data			4,340
	Annual Payroll					93,920	extrapolations) from several state			93,920
	Estimated Receipts					524,811	or regional surveys (n=43) [11]			524,811
	Estimated Throughput					N/A				N/A
Reuse Industry Subtotals	**Establishments**					813		25,903		26,716
	Employment					17,286		151,897		169,183
	Annual Payroll					375,329		2,372,169		2,747,498
	Estimated Receipts					1,867,198		12,315,332		14,182,531

GRAND TOTALS	**Establishments**	7,298		48,763		56,061
Recycling and Reuse/Remanufacturing	**Employment**	540,087		581,717		1,121,804
	Annual Payroll	18,443,311		18,269,170		36,712,482
	Estimated Receipts	98,603,413		137,697,958		236,301,371

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.

Summary of Calculations

Data Type	Calculation[1]
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+N*P)*12 months/year

1Variables are defined in the following table.

Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	133,165,000	BioCycle (11/2000)
B	Persons per household	2.61	U. S. Census Bureau
C	Homes collected per truck per day	900	R. W. Beck Estimate
D	Percent of homes collected by government staffed collection	33%	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, etc.	5%	R. W. Beck Estimate
I	Average payroll per employee	$29,893	1997 U. S. Economic Census
J	Recycling collection cost per household per month	$2.00	R. W. Beck Estimate
K	Number of curbside programs	9,247	BioCycle (11/2000)
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	70%	Estimated from BioCycle (11/2000)
O	Percent of year collection takes place	75%	R. W. Beck Estimate
P	Yard Waste Collection Cost per Household per Month	$1.75	R. W. Beck Estimate

7 Throughput is estimated based on per-employee collection averages from the Northeast, Florida, and Ohio.
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.”
9 Throughput is derived by subtracting the Government Staffed Curbside Collection tonnage estimate from the sum of processing estimates for Compost and Organics Producers, Materials Recovery Facilities, and Recyclable Material Wholesalers.
10 Number of establishments for all survey categories is based on the REI study database.
11 Unless otherwise noted, number of employees, payroll, and receipts for all survey categories is based on summing the results of separate statistical analyses of survey results conducted for the ten Northeast states, California, Florida, Illinois, Indiana, Nebraska, Ohio, and the remaining 36 states as a group. Throughput is based on multiplying a national per-establishment average for all surveyed establishments times total establishments in the category. 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.”

12 Surveys focused on active processing of organic materials for beneficial use. As a result, number of establishments, potential economic activity, and throughput associated with inactive composting techniques (i.e., allowing materials to slowly and independently decompose over time) may not be fully reflected in totals. Throughput for this category is based on summing throughput amounts from each of the individual state and regional studies listed in Note 11.
13 Data obtained from the U.S. Census, 1997 Economic Census. Unless otherwise noted, throughput comes from scrap materials consumption as reported by Census. See Section 3.2.1.2 for a detailed description of the use of Census Bureau statistics.
14 Data are taken from U.S. Census, 1997 Economic Census for NAICS code 421930 – Recyclable Material Wholesalers. This category is defined as 100 percent recycling-related and includes a number of different types of businesses including scrap metal dealers, paper stock dealers, C&D processors, beneficiation facilities, crumb rubber producers, textile processors, and brokers. Brokerage economic activity was subtracted from the Census figures and is accounted for under indirect support to the recycling and reuse industry.
15 Throughput for Recyclable Material Wholesalers is derived by summing national recycling data as provided by several national trade associations, USGS, and U.S. Census and subtracting MRF throughput.
16 Number of establishments and throughput are taken from Column D with no adjustments. Employment, annual payroll, and estimated receipts are derived from Column D with an adjustment for the percent of covered activities (90 percent).
17 Throughput is from the Glass Packaging Institute for 1997.
18 Throughput for Nonferrous Smelting and Refining is estimated based on national scrap consumption for smelting and refining mills from the 1997 Economic Census supplemented by information from the USGS' publication *Minerals Information – 1997, Recycling – Metals*.
19 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.
20 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 USGS nonferrous metals specialists.
21 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 NAICS code) / ($0.45/lb for aluminum or $0.72/lb. for copper) / (2,000 lbs/ton).
22 Estimate of establishments is based on information on mills that consume recovered paper from AF&PA's *Paper Matcher*. Estimates of employees, payroll, receipts are derived from Column C using the ratio of mills that consume recovered paper to all mills. Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999). Throughput numbers used are for 1997 to coincide with the data from the 1997 Economic Census.
23 Estimates of employees, payroll, and receipts are derived from Column D with an adjustment for the percent of covered activities (70 percent for Column E, 95 percent for Column F). The split between Columns E and F comes from an AF&PA estimate that 45 percent of mills are dependent on recovered paper.
24 Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999) for 1997.
25 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 ($28,746). Estimated receipts is calculated by multiplying throughput of recycled resins produced times an average of recycled resin prices from Plastics News. Throughput is from the American Plastics Council's Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled.
26 Establishments, employees, payroll, and receipts in Column C for Plastics Converters are obtained from the Society of the Plastics Industry's *Economic Report 2000* for plastics converters (NAICS codes 325991 and 3261) plus additional estimates for captive plastics converting operations by establishments classified in other non-plastics industries.
27 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).
28 Throughput is from the American Plastics Council's Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled.

29 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).
30 Throughput is taken from 2000 data provided by the Scrap Tire Management Council on the number of tires recycled into crumb and punched/stamped products times an average tire weight.
31 Establishments, employees, payroll, and receipts are derived from Column C by subtracting the economic activity of non-integrated mills (NAICS 3311114), which do not make steel. Throughput is taken directly from Column C with no adjustments.
32 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 the Steel Recycling Institute, 100 percent of steel mills are dependent on recovered steel to make new steel, utilizing anywhere from 15 percent-100 percent recovered steel. Therefore, the only deduction taken is to account for non-covered activities. Establishments and throughput are from Column D with no adjustment.
33 For Iron and Steel Foundries, estimates for Column D are taken directly from U.S. Census with no adjustments. The Steel Recycling Institute states that all foundries as a matter of practice utilize a significant percentage of scrap in the making of new iron products.

4.2 ANALYSIS OF RESULTS

Table 4-3 presents an analysis of three data types related to the results presented in Table 4-2. The three analyses performed for each category and sector (recycling, reuse, or support 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.

TABLE 4-3
ANALYSIS OF ECONOMIC ACTIVITY FOR THE RECYCLING AND REUSE INDUSTRY
ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN $1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Business Category	Data Type	Estimates of Economic Activity	Percent of Total for All Categories	Per Establishment Averages		Per Employee Averages	
				Employees	Estimated Receipts	Annual Payroll	Estimated Receipts
Recycling Industry Economic Activity							
1. Government Staffed Residential Curbside Collection	Establishments	3,052	5.5%				
	Employment	10,560	0.9%	3			
	Annual Payroll	315,670	0.9%			30	
	Estimated Receipts	651,590	0.3%		214		62
2. Private Staffed Residential Curbside Collection	Establishments	6,195	11.1%				
	Employment	21,450	1.9%	3			
	Annual Payroll	641,205	1.7%			30	
	Estimated Receipts	1,322,925	0.6%		214		62
3. Compost and Miscellaneous Organics Producers	Establishments	2,295	4.1%				
	Employment	31,718	2.8%	14			
	Annual Payroll	330,679	0.9%			10	
	Estimated Receipts	1,905,971	0.8%		830		60
4. Materials Recovery Facilities (MRFs)	Establishments	668	1.2%				
	Employment	14,155	1.3%	21			
	Annual Payroll	266,590	0.7%			19	
	Estimated Receipts	1,099,272	0.5%		1,646		78
5. Recyclable Material Wholesalers	Establishments	9,088	16.2%				
	Employment	114,992	10.3%	13			
	Annual Payroll	3,229,092	8.8%			28	
	Estimated Receipts	38,748,659	16.4%		4,264		337
6. Glass Container Manufacturing Plants	Establishments	61	0.1%				
	Employment	19,066	1.7%	313			
	Annual Payroll	756,633	2.1%			40	
	Estimated Receipts	3,778,310	1.6%		61,940		198
7. Glass Product Producers (other recycled uses)	Establishments	89	0.2%				
	Employment	4,723	0.4%	53			
	Annual Payroll	92,831	0.3%			20	
	Estimated Receipts	452,425	0.2%		5,083		96
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	253	0.5%				
	Employment	12,790	1.1%	51			
	Annual Payroll	443,948	1.2%			35	
	Estimated Receipts	6,610,235	2.8%		26,127		517
9. Nonferrous Product Producers	Establishments	196	0.4%				
	Employment	36,363	3.2%	186			
	Annual Payroll	1,382,164	3.8%			38	
	Estimated Receipts	12,945,699	5.5%		66,049		356
10. Nonferrous Foundries	Establishments	1,395	2.5%				
	Employment	69,317	6.2%	50			
	Annual Payroll	2,147,518	5.9%			31	
	Estimated Receipts	8,564,994	3.6%		6,140		124
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	474	0.8%				
	Employment	139,375	12.4%	294			
	Annual Payroll	6,890,821	18.8%			49	
	Estimated Receipts	48,823,111	20.8%		103,002		350
12. Paper-Based Product Manufacturers	Establishments	215	0.4%				
	Employment	12,867	1.1%	60			
	Annual Payroll	312,714	0.9%			24	
	Estimated Receipts	1,715,935	0.7%		7,981		133

Business Category	Data Type	Estimates of Economic Activity	Percent of Total for All Categories	Per Establishment Averages		Per Employee Averages	
				Employees	Estimated Receipts	Annual Payroll	Estimated Receipts
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	120	0.2%				
	Employment	3,460	0.3%	29			
	Annual Payroll	135,936	0.4%			39	
	Estimated Receipts	831,912	0.4%		6,933		240
14. Plastics Reclaimers	Establishments	780	1.4%				
	Employment	19,411	1.7%	25			
	Annual Payroll	557,989	1.5%			29	
	Estimated Receipts	1,635,183	0.7%		2,096		84
15. Plastics Converters	Establishments	2,510	4.5%				
	Employment	178,700	15.9%	71			
	Annual Payroll	5,354,547	14.6%			30	
	Estimated Receipts	27,951,145	11.9%		11,135		156
16. Rubber Product Manufacturers	Establishments	158	0.3%				
	Employment	3,917	0.3%	25			
	Annual Payroll	91,456	0.2%			23	
	Estimated Receipts	377,434	0.2%		2,389		96
17. Steel Mills	Establishments	101	0.2%				
	Employment	118,544	10.6%	1174			
	Annual Payroll	6,173,483	16.8%			52	
	Estimated Receipts	46,004,388	19.6%		455,489		388
18. Iron and Steel Foundries	Establishments	1,143	2.0%				
	Employment	126,313	11.3%	111			
	Annual Payroll	4,430,226	12.1%			35	
	Estimated Receipts	16,687,083	7.1%		14,599		132
19. Other Recycling Processors/Manufacturers	Establishments	552	1.0%				
	Employment	14,901	1.3%	27			
	Annual Payroll	411,483	1.1%			28	
	Estimated Receipts	2,012,571	0.9%		3,646		135
Recycling Subtotals	**Establishments**	29,345	52.3%				
	Employment	952,621	84.9%	33			
	Annual Payroll ($1,000)	33,964,984	92.5%			36	
	Estimated Receipts ($1,000)	222,118,841	94.0%		7,569		233
Reuse and Remanufacturing Industry Economic Activity							
20. Computer and Electronic Appliance Demanufacturers	Establishments	187	0.3%				
	Employment	3,837	0.3%	21			
	Annual Payroll	93,312	0.3%			24	
	Estimated Receipts	435,509	0.2%		2,329		114
21. Motor Vehicle Parts (used)	Establishments	7,105	12.7%				
	Employment	45,807	4.1%	6			
	Annual Payroll	971,776	2.6%			21	
	Estimated Receipts	5,272,107	2.2%		742		115
22. Retail Used Merchandise Sales	Establishments	17,990	32.2%				
	Employment	97,965	8.7%	5			
	Annual Payroll	1,203,591	3.3%			12	
	Estimated Receipts	6,043,642	2.6%		336		62
23. Tire Retreaders	Establishments	754	1.4%				
	Employment	7,939	0.7%	11			
	Annual Payroll	192,387	0.5%			24	
	Estimated Receipts	982,607	0.4%		1,303		124
24. Wood Reuse	Establishments	490	0.9%				
	Employment	9,109	0.8%	19			
	Annual Payroll	188,097	0.5%			21	
	Estimated Receipts	906,878	0.4%		1,851		100
25. Materials Exchange Services	Establishments	54	0.1%				
	Employment	186	0.0%	3			
	Annual Payroll	4,415	0.0%			24	
	Estimated Receipts	16,976	0.0%		314		91
26. Other Reuse	Establishments	136	0.2%				
	Employment	4,340	0.4%	32			
	Annual Payroll	93,920	0.3%			22	
	Estimated Receipts	524,811	0.2%		3,859		121
Reuse and Remanufacturing Subtotals	Establishments	26,716	47.9%				
	Employment	169,183	15.1%	6			
	Annual Payroll ($1,000)	2,747,498	7.5%			16	
	Estimated Receipts ($1,000)	14,182,531	6.0%		531		84
GRAND TOTAL Recycling, Reuse and Remanufacturing	Establishments	56,061	100.0%				
	Employment	1,121,804	100.0%	20			
	Annual Payroll ($1,000)	36,712,482	100.0%			33	
	Estimated Receipts ($1,000)	236,301,371	100.0%		4,215		211

Insight into the nation's recycling and reuse industry can be obtained by comparing the relative sizes of groups of business categories that are related in terms of materials recycled or sector of the industry that they are in.

Figures 4-1 and 4-2 graphically portray the recycling and reuse industry by industry sector. As Figures 4-1 and 4-2 show, the economic size of the recycling manufacturing sector far exceeds the recycling collection, recycling processing, and reuse sectors.

FIGURE 4-1
EMPLOYMENT BY INDUSTRY SECTOR

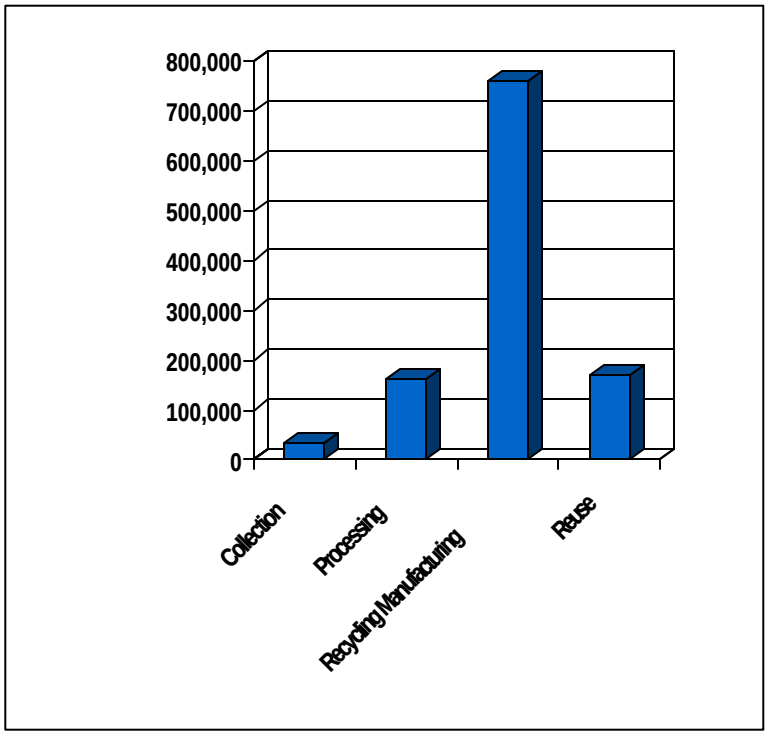
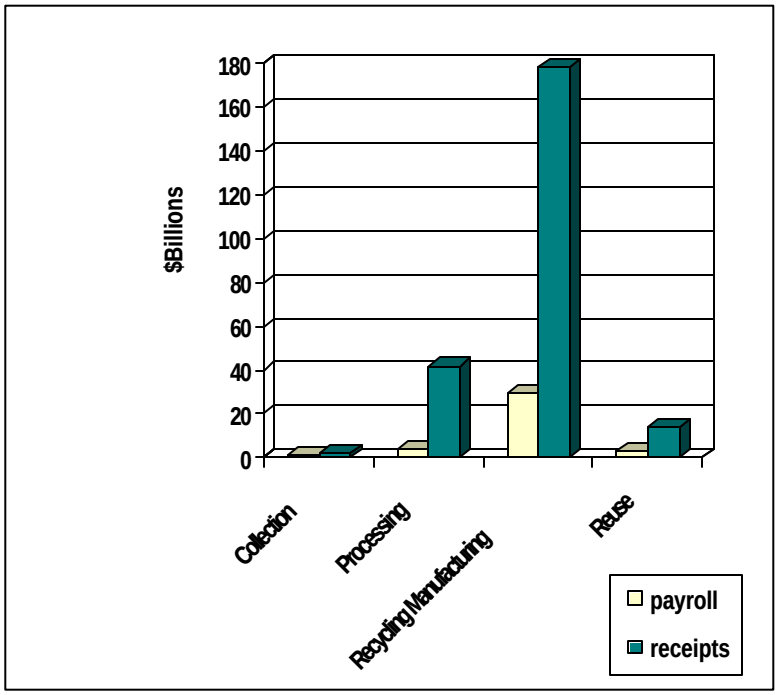


FIGURE 4-2
PAYROLL AND RECEIPTS BY INDUSTRY SECTOR



The ultimate value of a good or service is represented by the sale price of that good or service. Sales revenues, in turn, are used to employ persons and pay their wages, make payments on equipment, provide a return to owners and investors, and pay upstream supplier establishments for the value of their goods or services. The cost in terms of labor, equipment, etc. of performing a particular process is a measure of the value that is added by that particular process.

The progression in size from recycling collection to recycling processing to recycling manufacturing follows from the fact that those sectors are part of a chain where increasingly more value is added to the recovered material as it moves through the recycling chain. Initially, a relatively small amount of value is added by consolidation (collection). Processors invest significantly more expense (value) in the recovered material by sorting and densification. However, no transformation of the recovered material has yet occurred – the material has simply been concentrated. The greatest value is added in manufacturing where relatively useless raw materials of little value are made into useful products of high value.

Reuse and remanufacturing differ slightly in that they focus on consolidation and refurbishing of products (not raw materials) that still have significant value; however, the value reuse adds cannot exceed the value inherent in a new product made from raw materials – otherwise people would buy the new product. This limits the amount of value that can be added, and thus the size of the reuse sector compared to the manufacturing sector.

4.2.1 COMPARISON OF THE RECYCLING SECTORS TO THE REUSE SECTOR

Table 4-3 shows a noticeable distinction exists between the recycling sectors as a group (collection, processing, and manufacturing) and the reuse sector in terms of the size of establishments and average annual payroll. The recycling establishments have an average of 33 employees each, with an average annual payroll per employee of $36,000. Alternatively, the reuse sector is made up of smaller establishments – an average of 6 employees per establishment – with an average annual payroll of $16,000 per employee. Although the reuse

and remanufacturing sector comprises 48 percent of total establishments, it makes up only 15 percent of total employees, 8 percent of payroll, and 6 percent of receipts.[18]

It is assumed that differences in employee pay between recycling sector and reuse sector establishments closely follow the level of skill and training required of employees. Recycling manufacturing, which contributes heavily to the overall recycling statistics, generally requires employees of higher skill and training than is normally required of employees of reuse establishments. Employees of higher skill and training are paid more than employees of lesser skill and training. It should be noted that remanufacturing jobs, which were not well-characterized by this study, are more likely to have similar skill and training requirements to recycling manufacturing jobs and would pay higher wages than the average reuse sector job.

The difference in average employees per establishment between the recycling and reuse sectors can come from several sources, although two are most likely: (1) whether continuous production processes are employed; and (2) whether economies of scale produce improved production efficiency. Continuous production processes are normally employed to save energy, avoid production startup/shutdown inefficiencies, or cover high monthly fixed costs (such as capital equipment finance costs) by increasing daily production and revenues. Establishments that operate three shifts per day employ more persons than establishments of similar hourly production capacity that operate one shift per day. Processes where economies of scale reduce unit costs apply to those instances where overhead costs are significantly streamlined or where larger-sized capital equipment is more efficient than smaller-sized equipment. Because the capital equipment and processes employed in recycling manufacturing favor continuous production and economies of scale, it is not unexpected that recycling establishments are on average larger than reuse sector establishments (which rely more heavily on manual labor).

4.2.2 COMPARISON OF RECYCLING COLLECTION AND PROCESSING TO RECYCLING MANUFACTURING

Recycling categories that are focused locally on recovering materials from commercial, industrial, and residential waste streams include establishments that collect and process recyclables for shipment to the recycling manufacturing industry. These local collection and processing establishments include:

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

Alternatively, establishments in the recycling manufacturing sector are considered to be downstream consumers of recovered materials who rely on local collectors and processors for their supply of materials. When the two groups are compared, local collection and processing make up approximately 20 percent of total recycling employment and receipts, whereas downstream manufacturing makes up the remaining 80 percent of employment and receipts. This suggests that public policy to encourage recycling and discourage disposal, and public

[18] These reuse and remanufacturing figures are thought to represent the minimum amount of economic activity captured by the methodology because remanufacturing activities are often included with traditional manufacturing industries that were not included in this study. Several years ago Boston University estimated remanufacturing activities on the national level (Professor Robert T. Lund, *The Remanufacturing Industry: Hidden Giant*, 1996). That study suggested that reuse and remanufacturing categories may be as much as three times larger than that characterized by this study's methodology.

and private investment in local recyclables collection and processing infrastructure pays great dividends in supporting significant downstream private recycling economic activity.

4.2.3 LARGEST CONTRIBUTORS

As has been noted, the economic size of the recycling manufacturing sector greatly exceeds that of the other recycling and reuse sectors. Upon closer examination, over half of the economic activity for the entire recycling and reuse industry is accounted for by the following four recycling manufacturing sector categories:

- Paper, paperboard, and deinked market pulp mills, which employ 139,375 people and gross nearly $49 billion in estimated annual receipts;
- Steel mills, which employ 118,544 people and gross $46 billion in estimated annual receipts;
- Plastics converters, which employ 178,700 people and gross nearly $28 billion in estimated annual receipts; and
- Iron and steel foundries, which employ 126,313 people and gross over $16 billion in annual estimated receipts.

These four categories alone account for 50 percent of all employees, 62 percent of wages, and 59 percent of total receipts. Figures 4-3 and 4-4 place this information into further perspective by showing how the size of the nation's major recyclable materials manufacturing industries compare to each other. As the Figures show, ferrous metals recycling manufacturing leads the other material groups.

FIGURE 4-3
RECYCLING MANUFACTURING INDUSTRY EMPLOYMENT BY MAJOR MATERIAL GROUP

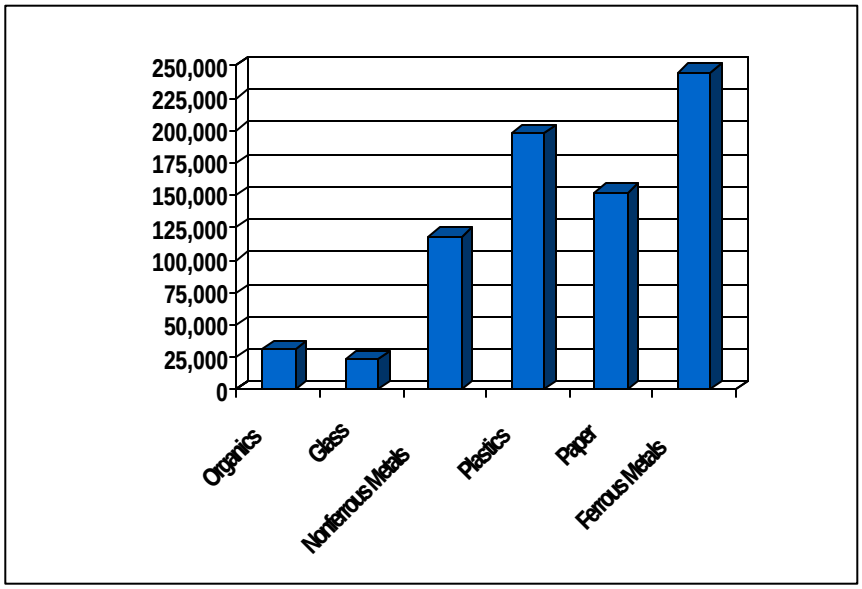
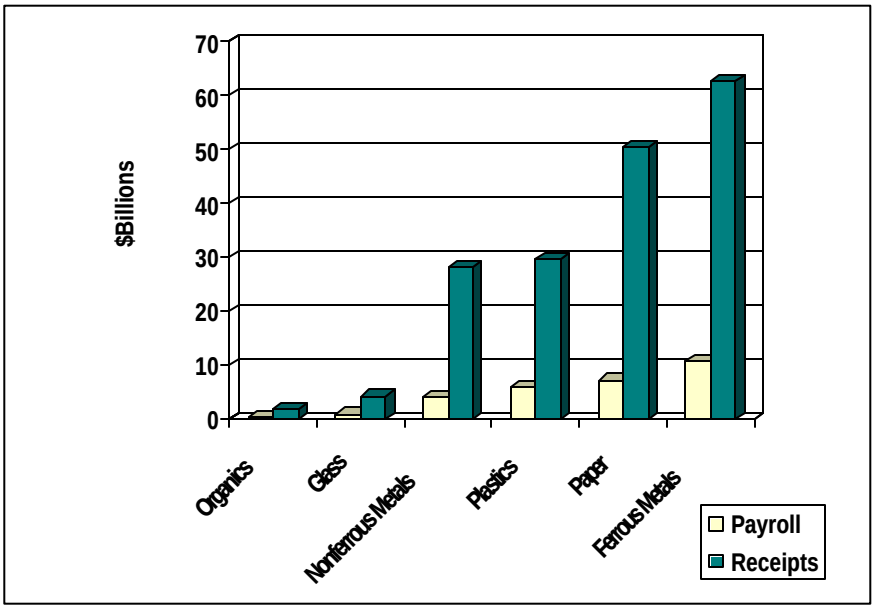


FIGURE 4-4
RECYCLING MANUFACTURING INDUSTRY PAYROLL AND RECEIPTS BY MAJOR MATERIAL GROUP



The amount of materials recycled, in combination with the underlying value of each raw material, help explain why some major material groups shown in Figures 4-3 and 4-4 rank higher than others. When large quantities of a high-value commodity are returned to the stream of commerce, the large amount of intrinsic value returned to the economy can support more jobs and economic activity than if a lesser amount or lower value commodity is returned to the economy. Plastics and non-ferrous metals are at the top end of the value scale, ferrous metals and paper are in the middle, and glass and compost are at the low end of the value scale. Major material group recycling amounts as estimated by this study are:

- Yard waste – 65 million tons (recycling of other organic materials is negligable);
- Glass – 3 million tons;
- Nonferrous metals – 7 million tons;
- Plastics – 3 million tons;
- Paper – 37 million tons; and
- Ferrous metals – 59 million tons.

When both amount recycled and value are considered together, the relative sizes of the various material groups can be explained. Similarly, estimates can be made of the economic impact that results from increased diversion of various materials.

4.2.4 THE RECYCLING AND REUSE INDUSTRY IN PERSPECTIVE

Figures 4-5, 4-6, and 4-7 show how the nation's recycling and reuse industry compares to other select national industries.[19] These industries were chosen because they present alternatives to recycling and reuse (i.e., waste management and mining) or because they are

[19] Comparative industry information comes from the 1997 Economic Census (U.S. Census Bureau) for the following industries: waste management – NAICS 562 waste management and remediation services minus 56292 materials recovery facilities; auto and truck manufacturing – NAICS 336 transportation equipment manufacturing; insurance – NAICS 524 insurance carriers and related activities; mining – NAICS 21; food manufacturing – NAICS 311; machinery manufacturing – NAICS 333.

considered to be important or preferred industries that are often targeted for support by economic developers.

FIGURE 4-5
COMPARISON OF INDUSTRY EMPLOYMENT

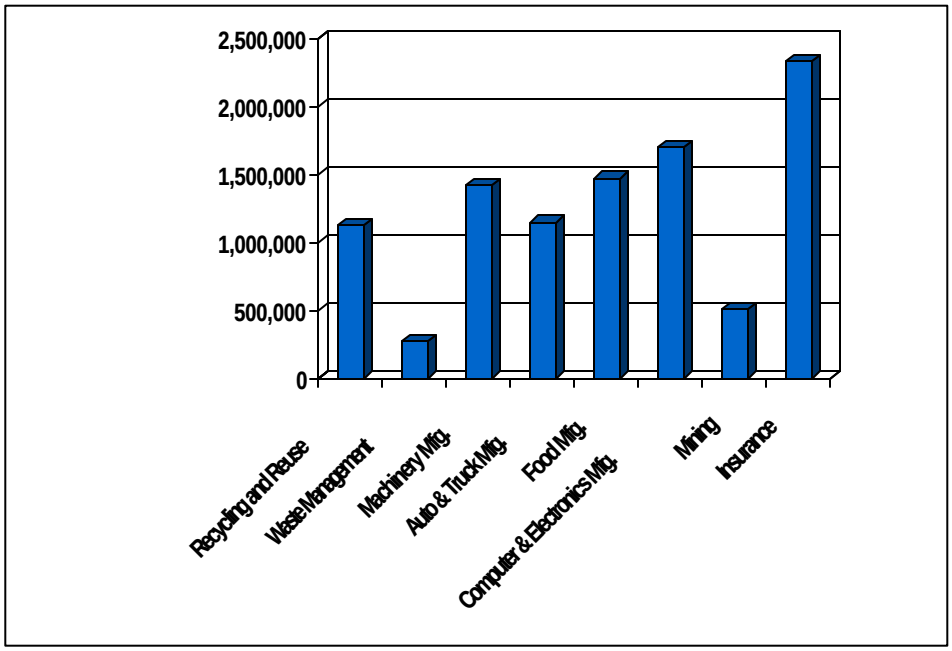


FIGURE 4-6
COMPARISON OF ANNUAL WAGES PER JOB

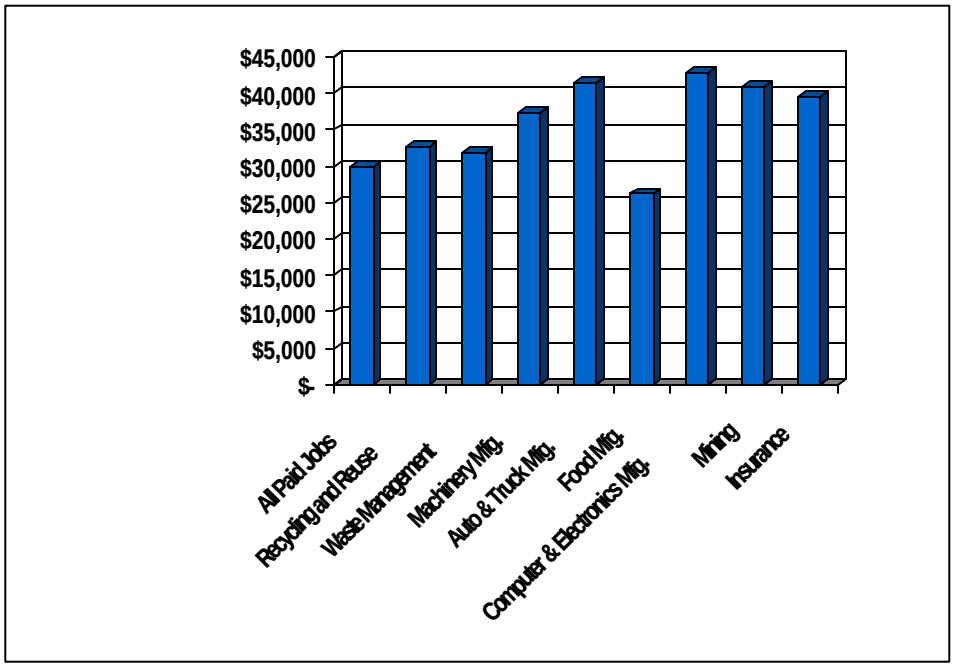
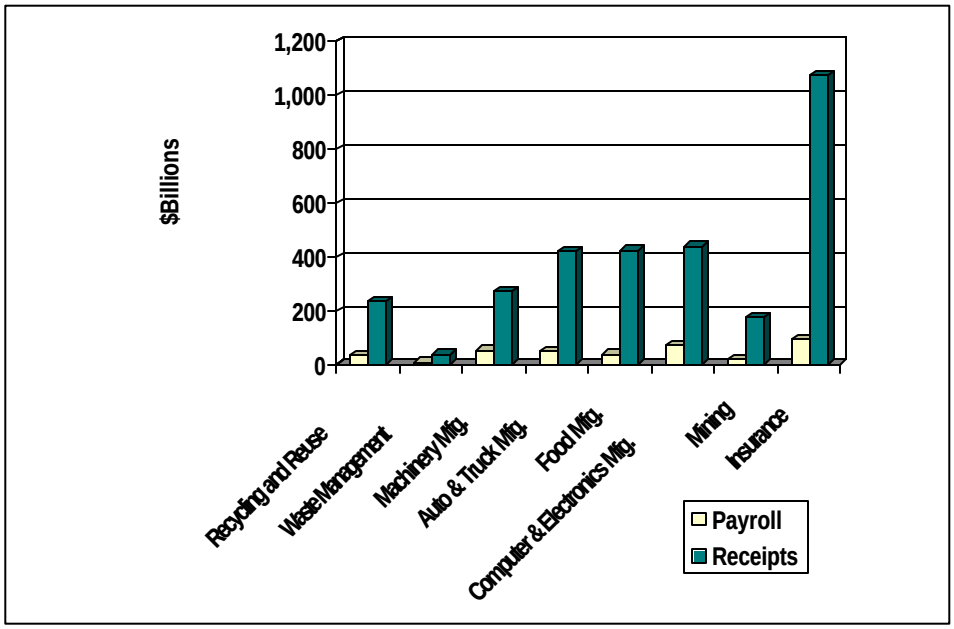


FIGURE 4-7
COMPARISON OF TOTAL WAGES AND SALES



As the figures show, the recycling and reuse industry is a significant industry as compared to other major industries. It provides large numbers of jobs that, on average, pay above the average national wage.

Despite the fact that more discards are disposed than recycled, it is not surprising that the recycling and reuse industry is larger than the waste management industry. This is because recycling and reuse are inherently value-adding, whereas disposal is not, and value-adding processes support jobs and economic activity.

4.3 ACCURACY AND COMPLETENESS OF RESULTS

The results of this study for the categories identified are thought to be realistic and generally 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; however, confidence intervals for total employment, payroll, and receipts for certain categories are quite large because of the small number of establishments in those categories.

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;
- Certain business categories that could be considered part of the recycling and reuse industry were excluded because data were not available. Most notable is equipment remanufacturers, for which only a one-time national-level study was conducted, and for which lists of contact information are not maintained. In other cases, such as repair shops, there is significant debate on the types of repair activities that should be counted (e.g., automobile repair establishments).
- Many establishments in rapidly growing recycling and reuse sectors, or those that were recycling non-traditional materials (such as fluorescent lamps and carpets) may not have

been fully listed in recycling directories, and thus their activity may be underrepresented in the overall results.

- 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.

4.4 INDIVIDUAL STATE RESULTS

Several states conducted REI studies in conjunction with this national study or the Northeast Recycling Council Study, or independently using the same standardized REI methodology used for those studies. Therefore, the results for those states are generally comparable to each other and the national totals found in this report.

The overall results for California, Delaware, Florida, Illinois, Indiana, Massachusetts, Nebraska, New Jersey, New York, Ohio, Pennsylvania, and Vermont are compared in this section. Detailed business category by business category figures and notes for each state can be found in Appendix F. Before comparing the state data, however, differences between those studies (such as year for which data were obtained) should be noted.

4.4.1 DIFFERENCES IN REI STUDIES

Differences in REI studies can generally be traced to two areas:

- Existing data source changes;
- Methodological changes between studies.

4.4.1.1 EXISTING DATA SOURCE CHANGES

As was discussed in Section 3.2, the SIC system is being eliminated and replaced with the NAICS system. NAICS data was not yet available for the NERC (Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont), Florida, Nebraska, Indiana or Ohio studies when their data was compiled, so 1996 Census SIC data was used. However, 1997 Census NAICS data became available in time to be used for the national, California, and Illinois studies. Apart from the one-year difference in the data and the effect of inflation on fiscal values, the change over between systems caused some differences in the way certain Census categories were defined, and thus the source data used for certain recycling and reuse business categories.

NAICS most notable advantage over the SIC system is that it breaks industries down into sub-components that SIC did not, thus showing more detail. To illustrate this point, take the iron and steel mill industry for example. NAICS subdivides iron and steel mills into four sub-components – fully integrated, partially integrated with a blast furnace, partially integrated without a blast furnace, and non-integrated. NAICS detail revealed that non-integrated mills, which do not recycle steel scrap but instead convert steel intermediates made by other steel mills into products, had been included by Census in SIC data. These establishments were outside the boundary of the definition for the recycling and reuse industry. The fact that these conversion mills were included under the original SIC code was not apparent from the original SIC definition and data for them were included in the original NERC study. Data from non-integrated mills were excluded from all other state studies and this US REI study.

It is important to note that non-integrated steel mills are much smaller than integrated steel mills that recycle steel. Although these non-integrated mills represent 64 percent of the number of "steel mill" establishments, they represent less than 15 percent of employment, payroll, and receipts reported by Census. It should be noted that employment, payroll and receipts are typically much better measures of economic contribution than number of establishments, and the bottom-line impact of including non-integrated mills affected the overall NERC study results by less than 4 percent for these measures. A similar problem was experienced for the tire retreaders category, which included more establishments in the SIC code than were included when reclassified under NAICS system. Because the tire retreader category is small compared to all the other categories (generally less than one percent of the total for the total recycling and reuse industry), this difference is not thought to significantly affect the overall bottom-line results.

4.4.1.2 METHODOLOGICAL CHANGES BETWEEN STUDIES

There were some minor changes in methodology among the various REI studies. Census NAICS data for glass container manufacturers were used for the California, Illinois, and national studies. Surveys of glass container manufacturers were conducted for all the other state studies because with few exceptions there are too few glass container manufacturers in a state for Census to be able to report that information without disclosing individual company data. Surveys therefore are necessary to obtain the data for nearly all state studies (in order to avoid disclosure of survey data, the glass container manufacturing survey data was added to other disclosure category data and reflected in bottom-line totals).

A second methodology change was the way in which economic activity for brokers of recyclable commodities was treated. At the state-level, data were not separately available for brokers, so estimates were made using the economic model and those estimates were recorded as a support business category. While completing the national study, it was found that data were available for recyclable commodities brokerages at the national level. Furthermore, it was found that the economic activity for brokers of recyclable commodities is already included under the recyclable material wholesaler category, although the definition for that category did not indicate so (this was not known while the state studies were completed). Therefore, the broker break-out in previously published state studies should be disregarded and considered to have been already accrued under the recyclable material wholesaler category. Because the broker estimates were subtracted from the other indirect establishments category to show their break-out, their economic activity was not double-counted. It is thought that the broker activity found in the model is related to mortgage, financial instrument, and securities brokerage activities.

4.4.2 COMPARISON OF REI STUDY RESULTS

One important conclusion to draw from the series of REI studies is that the recycling and reuse industry is not monolithic, but does display variations between states and regions, particularly in the size of establishments. The Compost and miscellaneous organics producer category exemplifies this point. Compost sites are distinctly larger, in terms of number of employees per establishment, payroll, and receipts in other parts of the country than in the Northeast. It is thought that climate and seasonal differences may play a role in the differences, as there is little yard waste to compost in northern states during the winter. Figures are much more consistent if comparisons are made on a per-employee basis, although differences are still evident between states and regions of the country.

Differences between specific companies in somewhat generally defined categories can also impact comparisons. The glass product producers category illustrated this when per-establishment data from the national study were compared to similar data for the NERC

study. Further investigation revealed that very few fiberglass establishments (which are very large compared to other establishments in the glass product producers category) are found in the Northeast compared to the rest of the country, contributing to the difference.

Considering the caveats discussed above, comparisons were made between states as shown in Figures 4-6 and 4-7. Figure 4-6 shows actual recycling/reuse employment numbers on the left, as well as normalized recycling/reuse employment (on a per 100,000 state population basis) on the right. As the figure shows, Ohio has the most recycling and reuse employees in actual numbers, followed closely by California, which has three times the population of Ohio. When employment data is normalized for population differences, Indiana has the most recycling and reuse employees per capita. The State of Iowa recently completed a statewide study to measure the economic impacts of Iowa's recycling industry (Economic Impacts of Recycling in Iowa, Recycle Iowa, August 2001). Iowa's estimated direct recycling employment was 11,478, or 383 per 100,000 population; however, it is important to note that Iowa's figures do not include employment estimates for the collection and reuse sectors.

FIGURE 4-6
COMPARISON OF TOTAL EMPLOYMENT TO NORMALIZED EMPLOYMENT

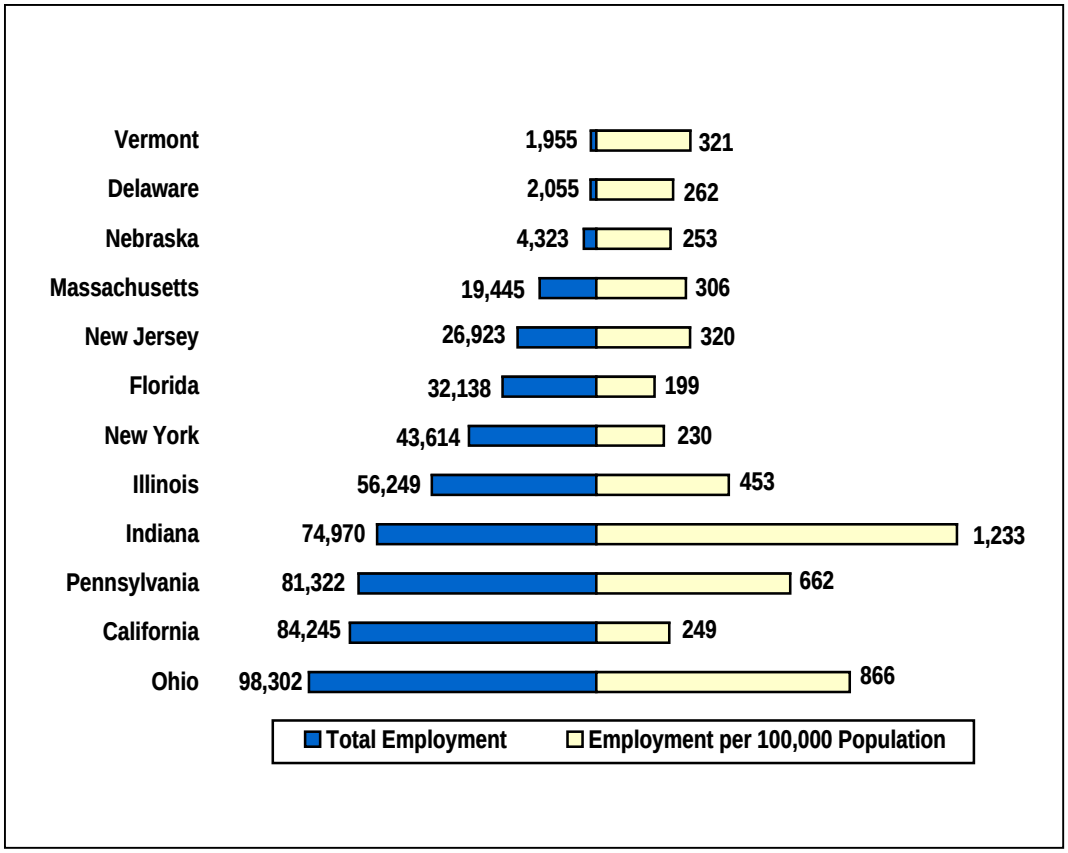


Figure 4-7 shows the components of the normalized data by industry sector. It is informative to note that normalized recycling collection, recycling processing, and reuse sectors are fairly close in each state – it is recycling manufacturing that sets states apart. This is particularly apparent in traditional industrial states such as Indiana, Ohio and Pennsylvania. These three states are the top three states in the nation in terms of the absolute size of their steel mill and nonferrous recycled metals industrial sectors. They also rank very high in terms of other material sectors, as shown in Table 4-4. The recycling manufacturing sector in Indiana, Ohio, and Pennsylvania has a demand for more recovered materials than those three states recover –

municipal solid waste recycling rates in those states are at or below the national average[20] – thus recovered materials must be imported from other states and countries.

FIGURE 4-7
EMPLOYMENT BY SECTOR PER 100,000 STATE POPULATION

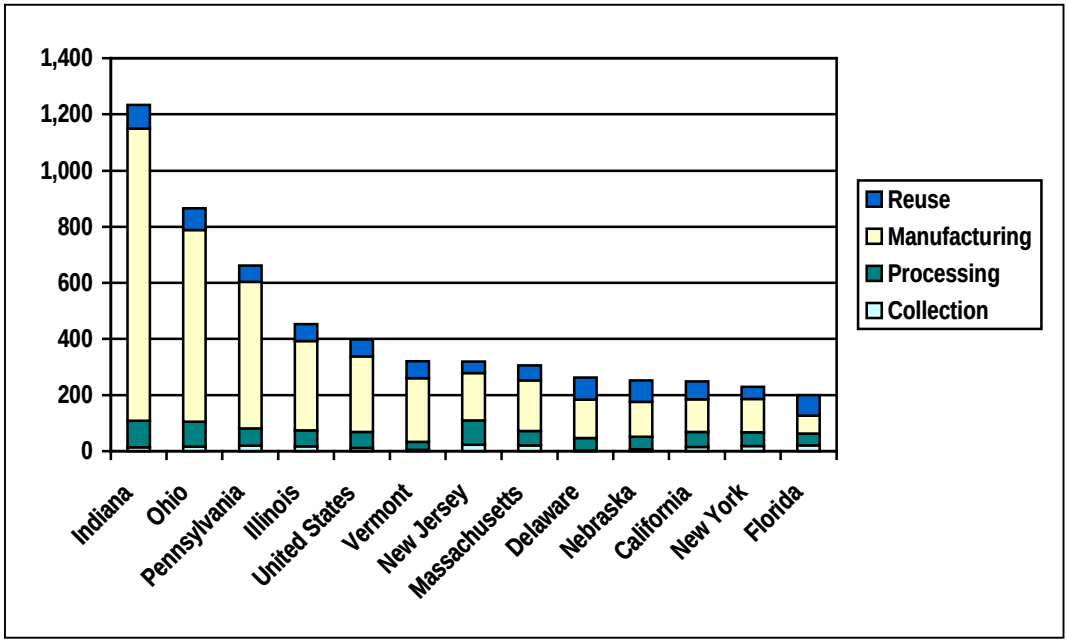


TABLE 4-4
STATE RANK IN TERMS OF BASIC MATERIALS INDUSTRY VALUE OF SHIPMENTS

Industrial Sector[1]	Indiana	Ohio	Pennsylvania
Steel Mills	1	2	3
Iron and Steel Foundries	4	1	7
Plastics Converters	7	2	6
Nonferrous Smelting & Refining, Product Producers, and Foundries	2	3	1

[1] Based on recycling industry size. Paper industry ranking data is not available.

[20] "State of Garbage in America," BioCycle Magazine, November 2000.

5.1 OVERVIEW

This study modeled the economic values of twenty-six recycling or reuse categories. Further calculations were made to estimate 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. Input-output modeling allows researchers to investigate the interdependencies that industries, institutions, and households have with each other in a defined 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 from within the region being modeled) is estimated in the I-O model. This probability is high when considering the United States as a region, and much smaller if the region is a particular state or county. 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.

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 provided a very good first pass at identifying 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. As was discussed previously in the Study Methodology section, this study performed limited surveys to obtain additional intermediate input data. This data, in combination with in-house data from previous county-level and state-level modeling projects, further improved the quality of the model that was produced.

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; and
- An implicit assumption that input commodity supply is infinite and perfectly elastic.

I-O models, therefore, are just that – models – that simulate industrial interdependencies in the 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. 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 (such as the recycling industry) has on the economy.

The generic term "economic impact" often suffers from misapplication. There are several kinds of economic transactions that may occur. For example:

- Firms may produce goods or provide services for export, attracting outside funds that support employment, industrial purchases, and household spending.
- Firms may substitute locally produced commodity inputs for those that previously were imported. In this case funds are retained in the region rather than exported.
- 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, 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 economy.

A much harder measure of potential economic impact falls into the category of import substitution. If a region is able to develop industries that produce a good that substitutes for a good that is imported, then that industry is *retaining* dollars 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 – 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 interrelationships that exist for the industries. These values are the intrinsic worth of a set of industrial activities to the nation. 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 full- and part-time positions in the economy, not the number of full-time-equivalents.[21] 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 part-time labor. Others 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 are associated with those establishments. 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. 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

[21] For example, a restaurant may employ 20 people on a half-time basis (20 jobs) to fill its labor requirement of 10 full-time-equivalents.

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 all 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	Value
Recycling and Reuse Equipment Manufacturers [1]	Employment	55,493
	Annual Payroll	1,302,461
	Estimated Receipts	8,543,306
Consulting/Engineering [2]	Employment	8,864
	Annual Payroll	361,589
	Estimated Receipts	813,177
Transporters [2]	Employment	27,622
	Annual Payroll	3,666,526
	Estimated Receipts	5,061,306
Other Indirect Establishments [2]	Employment	1,285,331
	Annual Payroll	46,944,729
	Estimated Receipts	157,771,006
Support Businesses Totals	Employment	1,377,310
	Annual Payroll ($1,000)	52,275,305
	Estimated Receipts ($1,000)	172,188,795

[1] Data for Recycling and Reuse Equipment Manufacturers are based on a statistical analysis of survey results and reflect economic activity associated with equipment sales.
[2] Data come from modeling output and reflect the indirect activity stimulated by the 26 direct categories of recycling and reuse establishments targeted by this study for direct data.

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 regardless of where they sell their equipment. Totals for the other categories represent indirect activity relating to only the 26 categories of recycling and reuse industry establishments that were 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	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
Table 5-4	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
Table 5-5	Summary Of Recycling & Reuse Industry Contribution To Government Revenues	Summarizes indirect and total general revenues (taxes, charges and fees, and miscellaneous revenues) received by federal, state, and local governments from each recycling and reuse industry sector
Table 5-6	Summary of Recycling & Reuse Industry Effects on Own-Source State Government Revenues	Shows individual and corporate income taxes and all other general revenues (charges and fees, miscellaneous revenues) received by U.S. governments (federal, state, and local) as a result of the direct and total economic activity for the 26 categories of recycling and reuse establishments

TABLE 5-3
RECYCLING AND REUSE INDUSTRY ECONOMIC VALUES AND MULTIPLIERS

	Jobs [1]				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	10,560	779	5,625	16,964	1.07	1.61	316	29	183	528	1.09	1.67	652	72	511	1,234	1.11	1.89	561	41	310	912	1.07	1.63
2. Private Staffed Residential Curbside Collection	21,450	3,441	14,799	39,690	1.16	1.85	779	128	482	1,388	1.16	1.78	1,323	349	1,343	3,015	1.26	2.28	835	206	815	1,856	1.25	2.22
Subtotal	32,010	4,219	20,424	56,654	1.13	1.77	1,094	157	665	1,916	1.14	1.75	1,975	421	1,854	4,249	1.21	2.15	1,396	247	1,125	2,768	1.18	1.98
Recycling Processing																								
3. Compost and Miscellaneous Organics Producers	31,718	12,771	14,561	59,049	1.40	1.86	428	463	474	1,364	2.08	3.19	1,906	1,355	1,320	4,581	1.71	2.40	592	807	802	2,200	2.36	3.72
4. Materials Recovery Facilities (MRFs)	14,155	7,889	11,810	33,854	1.56	2.39	346	238	310	894	1.69	2.58	1,099	528	777	2,404	1.48	2.19	636	347	525	1,508	1.55	2.37
5. Recyclable Material Wholesalers	114,097	63,581	124,043	301,721	1.56	2.64	3,310	1,414	2,507	7,231	1.43	2.18	37,358	15,627	30,472	83,458	1.42	2.23	5,843	2,139	4,226	12,208	1.37	2.09
Subtotal	159,970	84,241	150,413	394,624	1.53	2.47	4,084	2,115	3,291	9,489	1.52	2.32	40,363	17,510	32,570	90,443	1.43	2.24	7,071	3,293	5,553	15,917	1.47	2.25
Recycling Manufacturing																								
6. Glass Container Manufacturing Plants	19,066	19,295	25,691	64,052	2.01	3.36	811	758	834	2,402	1.93	2.96	3,778	2,268	2,325	8,371	1.60	2.22	1,286	1,235	1,412	3,932	1.96	3.06
7. Glass Product Producers (other recycled uses)	4,723	2,429	3,196	10,348	1.51	2.19	100	95	103	298	1.95	2.99	452	280	288	1,020	1.62	2.26	172	160	175	506	1.93	2.95
8. Nonferrous Secondary Smelting and Refining Mills	12,790	35,136	32,742	80,668	3.75	6.31	466	1,407	989	2,861	4.02	6.14	6,610	4,051	2,765	13,426	1.61	2.03	645	2,340	1,692	4,677	4.63	7.26
9. Nonferrous Product Producers	36,363	88,317	84,049	208,729	3.43	5.74	1,451	3,521	2,626	7,599	3.43	5.24	12,946	11,441	7,339	31,726	1.88	2.45	2,131	5,702	4,472	12,305	3.68	5.78
10. Nonferrous Foundries	69,317	31,018	57,005	157,340	1.45	2.27	2,255	1,234	1,853	5,341	1.55	2.37	8,565	4,049	5,167	17,781	1.47	2.08	5,390	1,975	3,137	10,501	1.37	1.95
11. Paper, Paperboard, and Deinked Market Pulp Mills	139,375	304,051	311,479	754,905	3.18	5.42	6,923	11,943	10,020	28,886	2.73	4.17	48,823	35,693	27,952	112,468	1.73	2.30	10,749	19,413	16,988	47,150	2.81	4.39
12. Paper-based Product Manufacturers	12,867	10,440	12,002	35,309	1.81	2.74	314	416	388	1,118	2.32	3.56	1,716	1,339	1,082	4,137	1.78	2.41	495	672	657	1,825	2.36	3.68
13. Pavement Mix Producers (asphalt and aggregate)	3,460	4,488	5,075	13,023	2.30	3.76	139	172	165	476	2.24	3.44	832	444	461	1,736	1.53	2.09	520	236	280	1,035	1.45	1.99
14. Plastics Reclaimers	19,411	18,016	20,830	58,257	1.93	3.00	564	663	652	1,879	2.18	3.33	1,635	1,135	1,065	3,836	1.69	2.35	774	1,062	1,104	2,939	2.37	3.80
15. Plastics Converters	178,700	165,860	191,760	536,321	1.93	3.00	5,410	6,364	6,258	18,033	2.18	3.33	27,951	19,408	18,203	65,563	1.69	2.35	7,424	10,189	10,594	28,207	2.37	3.80
16. Rubber Product Manufacturers	3,917	2,450	2,935	9,302	1.63	2.37	92	87	95	275	1.94	2.97	377	250	266	893	1.66	2.37	116	135	161	412	2.17	3.57
17. Steel Mills	118,544	333,761	335,676	787,981	3.82	6.65	6,481	13,663	10,667	30,811	3.11	4.75	46,004	42,155	29,781	117,940	1.92	2.56	8,468	22,848	18,117	49,433	3.70	5.84
18. Iron and Steel Foundries	126,313	101,387	142,311	370,011	1.80	2.93	4,651	3,909	4,536	13,096	1.84	2.82	16,687	11,081	12,662	40,430	1.66	2.42	5,587	6,271	7,701	19,560	2.12	3.50
19. Other Recycling Processors/Manufacturers	14,901	8,305	12,432	35,637	1.56	2.39	534	368	479	1,381	1.69	2.58	2,013	967	1,423	4,402	1.48	2.19	982	536	810	2,328	1.55	2.37
Subtotal	759,747	1,124,953	1,237,182	3,121,882	2.48	4.11	30,191	44,599	39,664	114,454	2.48	3.79	178,390	134,562	110,777	423,730	1.75	2.38	44,736	72,774	67,300	184,810	2.63	4.13
Reuse/Remanufacturing																								
20. Computer and Electronic Appliance Demanufacturers	3,837	2,806	3,385	10,028	1.73	2.61	97	111	110	317	2.15	3.29	436	350	307	1,092	1.80	2.51	135	174	186	496	2.29	3.66
21. Motor Vehicle Parts (used)	45,807	35,449	39,246	120,502	1.77	2.63	993	1,406	1,273	3,672	2.42	3.70	5,272	4,495	3,550	13,318	1.85	2.53	1,309	2,187	2,155	5,651	2.67	4.32
22. Retail Used Merchandise Sales	97,966	52,141	54,384	204,490	1.53	2.09	1,492	1,842	1,770	5,103	2.23	3.42	6,044	4,764	4,935	15,743	1.79	2.60	2,437	2,964	2,995	8,396	2.22	3.45
23. Tire Retreaders	7,939	6,728	8,118	22,785	1.85	2.87	242	254	264	760	2.05	3.14	983	736	735	2,453	1.75	2.50	402	419	446	1,267	2.04	3.15
24. Wood Reuse	9,109	6,824	7,694	23,628	1.75	2.59	214	258	250	722	2.20	3.37	907	766	698	2,371	1.84	2.61	265	370	424	1,059	2.40	3.99
25. Materials Exchange Services	7,117	4,175	7,378	18,671	1.59	2.62	300	153	240	693	1.51	2.31	1,391	452	670	2,512	1.32	1.81	1,019	281	406	1,707	1.28	1.67
26. Other Reuse	4,340	4,422	4,762	13,524	2.02	3.12	129	163	155	447	2.26	3.46	525	438	432	1,395	1.83	2.66	178	266	262	706	2.49	3.96
Subtotal	176,115	112,545	124,967	413,627	1.64	2.35	3,467	4,185	4,061	11,713	2.21	3.38	15,556	12,001	11,327	38,884	1.77	2.50	5,746	6,662	6,875	19,282	2.16	3.36
Total All Groups	1,127,842	1,325,959	1,532,986	3,986,787	2.18	3.53	38,836	51,056	47,681	137,573	2.31	3.54	236,284	164,494	156,527	557,306	1.70	2.36	58,949	82,976	80,853	222,778	2.41	3.78

[1] Includes all full- and part-time jobs (not full-time equivalents).

TABLE 5-4
RECYCLING AND REUSE INDUSTRY MULTIPLIERS COMPARED TO MULTIPLIERS FOR OTHER INDUSTRIES

	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	*1.70*	*2.36*	*2.18*	*3.55*	*2.33*	*3.56*	*2.43*	*3.82*
Agriculture	1.90	2.82	1.51	2.11	2.01	3.29	2.08	3.42
Mining	1.54	2.31	1.97	3.93	1.63	2.66	1.46	2.20
Construction	1.90	3.02	1.84	3.16	1.84	3.01	2.17	3.93
Manufacturing	1.97	2.90	2.65	4.87	2.30	3.78	2.39	4.04
Transportation, Communications, & Utilities	1.56	2.41	1.87	3.54	1.69	2.80	1.55	2.43
Wholesale Trade	1.44	2.41	1.57	2.91	1.44	2.37	1.38	2.26
Retail Trade	1.34	2.37	1.13	1.59	1.24	2.02	1.25	2.08
Financial, Insurance, & Real Estate	1.38	1.98	1.67	3.01	1.57	2.60	1.33	1.83
Services	1.51	2.79	1.31	2.17	1.35	2.21	1.46	2.70
Government	1.14	2.51	1.06	1.88	1.06	1.72	1.08	2.01

TABLE 5-5
SUMMARY OF RECYCLING & REUSE INDUSTRY CONTRIBUTION TO GOVERNMENT REVENUES
(IN $ MILLIONS)

	Direct Effects Revenues				Total Effects Revenues			
Industry Sector	Federal	State	Local	Total	Federal	State	Local	Total
Recycling Collection	200	100	100	400	300	200	100	600
Recycling Processing	700	400	300	1,400	1,700	800	600	3,200
Recycling Manufacturing	5,400	2,600	2,100	10,000	20,500	9,900	7,800	38,200
Reuse/Remanufacturing	600	300	200	1,200	2,100	1,000	800	3,900
Total	6,900	3,400	2,600	12,900	24,600	11,900	9,400	45,800

TABLE 5-6
COMPONENTS OF RECYCLING & REUSE INDUSTRY EFFECTS ON OWN-SOURCE FEDERAL, STATE, AND LOCAL GOVERNMENT GENERAL REVENUES

	Direct Effects (in $ Millions)				Total Effects (in $ Millions)			
	Individual Income Tax	Corporate Income Tax	All Other Receipts	Total Revenues	Individual Income Tax	Corporate Income Tax	All Other Receipts	Total Revenues
Recycling Collection								
1. Government Staffed Residential Curbside Collection	48	0	47	95	81	6	79	166
2. Private Staffed Residential Curbside Collection	120	24	116	260	213	43	206	463
Subtotal	168	24	163	355	294	50	285	629
Recycling Processing								
3. Compost and Miscellaneous Organics Producers	66	13	64	143	210	42	203	455
4. Materials Recovery Facilities (MRFs)	53	11	51	115	137	28	133	298
5. Recyclable Material Wholesalers	508	103	492	1,103	1,111	225	1,075	2,410
Subtotal	627	127	607	1,361	1,457	295	1,411	3,163
Recycling Manufacturing								
6. Glass Container Manufacturing Plants	125	25	121	270	369	75	357	801
7. Glass Product Producers (other recycled uses)	15	3	15	33	46	9	44	99
8. Nonferrous Secondary Smelting and Refining Mills	72	14	69	155	439	89	425	954
9. Nonferrous Product Producers	223	45	216	484	1,167	236	1,130	2,533
10. Nonferrous Foundries	346	70	335	752	820	166	794	1,780
11. Paper, Paperboard, and Deinked Market Pulp Mills	1,063	215	1,029	2,308	4,436	897	4,295	9,628
12. Paper-Based Product Manufacturers	48	10	47	105	172	35	166	373
13. Pavement Mix Producers (asphalt and aggregate)	21	4	21	46	73	15	71	159
14. Plastics Reclaimers	87	18	84	188	289	58	279	626
15. Plastics Converters	831	168	804	1,803	2,770	560	2,681	6,011
16. Rubber Product Manufacturers	14	3	14	31	42	9	41	92
17. Steel Mills	995	201	964	2,160	4,732	957	4,581	10,270
18. Iron and Steel Foundries	714	144	692	1,550	2,011	407	1,947	4,365
19. Other Recycling Processors/Manufacturers	82	17	79	178	212	43	205	460
Subtotal	4,637	938	4,489	10,064	17,578	3,555	17,018	38,151
Reuse/Remanufacturing								
20. Computer and Electronic Appliance Demanufacturers	15	3	14	32	49	10	47	106
21. Motor Vehicle Parts (used)	153	31	148	331	564	114	546	1,224
22. Retail Used Merchandise Sales	229	46	222	497	784	158	759	1,701
23. Tire Retreaders	37	8	36	81	117	24	113	253
24. Wood Reuse	33	7	32	71	111	22	107	241
25. Materials Exchange Services	46	9	45	100	106	22	103	231
26. Other Reuse	20	4	19	43	69	14	66	149
Subtotal	532	108	515	1,156	1,799	364	1,742	3,904
Total All Groups	5,965	1,196	5,775	12,935	21,129	4,263	20,456	45,847

5.3 INTERPRETATION OF 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 (as has been done in the tables) results in some degree of duplicated accounting of economic activity. This is endemic in any broad sector input-output modeling scenario where direct industry businesses are related to each other as part of a chain – it is not a problem with recycling, *per se*, nor with this study, but arises simply because of the inter-business relationships that are included in this study.

For example, direct sales by a raw commodity processor are counted once as direct economic activity; however, those sales also represent an input purchase by an industry producing a finished good for sale, and are counted a second time as indirect economic activity stimulated by the industry producing the finished good. In this case, then, aggregation biases the subtotals and totals upwards for indirect, induced, and total effects. 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 possibly 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 an 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 to support economic investment or public spending. 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.

Before making any comparisons among multipliers, it is important to understand what influences them. Firms with strong linkages to supplying firms in the same economy or that pay relatively high wages may yield comparatively higher multipliers. Firms that are otherwise not linked strongly to suppliers in the same economy 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 because money stays and circulates through longer chains in their economies. Once money leaves an economy, no additional indirect or induced activity is accumulated to the credit to the initiating industry. For this reason the multipliers found in this report should never be compared to local or state multipliers because their much smaller economic boundaries necessarily produce smaller multipliers. For the same reason, multipliers from this report should not be used to estimate local or state impacts associated with expanding or implementing programs or policies in support of recycling and reuse.

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

- Manufacturing establishments generally pay well compared to other types of establishments because of their need for employees with high levels of skill and training. Furthermore, the nature of manufacturing places strong demands (linkages) on supplier firms for materials, supplies, and utilities (energy). These two factors contribute to high multipliers for manufacturing compared to other segments of the economy.
- Non-ferrous smelting and refining mills, paper and paperboard mills, non-ferrous product producers, and steel mills (all recycling manufacturing sector categories) tended to have higher multipliers than establishments in other recycling and reuse industry business categories.
- The recycling and reuse industry's multipliers generally exceed the multipliers of other major sectors of the U.S. economy, with the exception of manufacturing, which leads all sectors. The contribution of the recycling manufacturing sector to the overall recycling and reuse industry size explains why the industry's multipliers fall where they do in comparison to other major industry sector multipliers.
- Investments in local recycling collection and processing and policies that encourage recycling and reuse yield significant total federal, state, and local government tax revenues. For example, 83 percent of total tax revenues attributable to the recycling and reuse industry arise from recycling manufacturing establishments and their indirect and induced economic activity.
- The federal and stage governments collect 80 percent of total tax revenues attributable to the recycling and reuse industry. Local governments collect the remaining 20 percent of tax revenues.
- Corporate income taxes make up less than ten percent of taxes attributable to the recycling and reuse industry – personal income taxes paid by employees and a variety of charges and fees make up the remainder.

SECTION 6
RECOMMENDATIONS FOR FUTURE STUDIES

This section summarizes the recommendations for replicating the study in future years. Recommendations are:

- Consider using the new NAICS system code, 56292, which is specifically for MRFs, instead of using survey data. Because of inconsistencies between the NAICS MRF data and other published date, MRFs were surveyed for this study.
- Narrow the definition of compost and organics producers. 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, with very little organics economic activity.
- Conduct additional 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:
  - Improving 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 allow better comparisons between recycling and non-recycling businesses.
  - Identifying critical costs associated with the flow of recycled products into goods for final use.

Finally, follow-up studies that would be useful 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;
- 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 5 industry segments. The table is intended to comprehensively include all business establishments undertaking recycling and reuse economic activities, as defined in Section 2.

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 System* (NAICS), 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 NAICS codes that correspond to the traditional SIC codes. Where the NAICS categories differ significantly, the new category name is provided. Notable changes in the NAICS 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 INDUSTRY

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
Recycling Collection	**1. Government Staffed Residential Curbside Collection** Programs staffed by municipal, state or other government agencies that 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 that 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)
Recycling Processing	**3. Compost and Miscellaneous Organics Producers** Establishments that 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)

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Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
Recycling Processing (continued)	**4. Materials Recovery Facilities** Establishments that 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 NAICS category for materials recovery facilities.	4953 Refuse Systems	56292 Material Recovery Facilities
	5. Recyclable Material Wholesalers Establishments that process recycled materials by sorting, grading, densifying, removing contaminants and otherwise preparing the materials for shipment to manufacturing facilities for use in industrial production, and/or establishments that provide recovered material brokering services. 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 NAICS category for recyclable material wholesalers.	5093 Scrap & Waste Material Wholesalers	42193 Recyclable Material Wholesalers
Recycling Manufacturing	**6. Glass Container Manufacturing Plants** Establishments that 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 that 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.
	9. Nonferrous Product Producers Establishments that 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 that process unrefined nonferrous scrap.	3351 - 3356 Miscellaneous Nonferrous Products	331421, 331315, 331315, 331316, 331319 Miscellaneous Nonferrous Products
	10. Nonferrous Foundries Establishments that produce castings and die-castings of various nonferrous 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

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
Recycling Manufacturing (Continued)	**11. Paper and Paperboard Mills/Deinked Market Pulp Producers** Establishments that produce first stage intermediate paper and paper board products (e.g., paper rolls) using recovered paper or deinked market pulp as a feedstock. Also includes establishments that deink recovered 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 322123 Paperboard Mills
	12. Paper-based Product Manufacturers Establishments that 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	322299 Other Converted Paper Product Manufacturing (egg cartons, molded pulp)
	13. Pavement Mix Producers (asphalt and aggregate) Establishments that 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
	14. Plastics Reclaimers Establishments that 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 that manufacture intermediate products directly from unprocessed recycled plastic, such as plastic lumber products.	3087 Custom Compounding of Purchased Plastics Resins	325991 Custom Compounding of Purchased Plastics Resins
	15. Plastic Converters Establishments that produce intermediate plastic products (e.g., molded products and components, sheet and fiber) using recycled pellets or granulated plastic as a feedstock.	3081 – 3089 Miscellaneous Plastics Products	3261 Plastics Product Manufacturing
	16. Rubber Product Manufacturers Establishments that 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	3262 Rubber Product Manufacturing

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Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
Recycling Manufacturing (Continued)	**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
	18. Iron and steel foundries Establishments that 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 that 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.	5065 Electronic Parts, NEC 7378 Computer Maint. and Repair	421690 Other Electronic Parts & Equipment Wholesale 811212 Computer & Office Machine Repair and Maintenance
	21. Motor Vehicle Parts Establishments that clean, sort, inspect and remanufacture used motor vehicle parts.	5015 Wholesale Used Motor Vehicle Parts	42114 Motor Vehicle Parts (Used) Wholesale
	22. Retail Used Merchandise Sales Establishments that 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 that 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

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
Reuse and Remanufacturing (Continued)	**24. Wood Reuse** Establishments that produce graded lumber and/or finished goods by cleaning, grading, and otherwise processing used wood. Includes establishments that 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 Wood Container and Pallet Manufacturing 321999 Wood Products, NEC
	25. Materials Exchange Services Establishments that 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
	26. Other Reuse Establishments not elsewhere classified that 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, paper 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 that 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 that 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. 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
	30. Other Support Businesses Other support businesses such as accounting firms, janitorial firms, etc.	Various	Various

APPENDIX B
DATA SOURCES

Resource Number	Resource/Directory	Source Organization	Types of Data/Businesses Included	Resource Use		How Used
				Survey	Existing Data	
1	*Paper Matcher*	American Forest & Paper Association	Paper and paperboard mills, paper dealers, recycling centers		✓	Used to estimate percentage of mills consuming recovered paper for existing data adjustments.
2	*Wood Recycling Directory - 1996*	American Forest & Paper Association	C&D processors, miscellaneous organic products, compost producers	✓		Used for building survey contact list.
3	*Handler/Reclaimer Database*	American Plastics Council	Plastics handlers, reclaimers		✓	Used to estimate employment and establishments for plastics reclaimers.
4	*ARM Directory and Buyers Guide*	American Recycling Markets	Collectors, intermediate processors, processors, manufacturers, brokers and equipment dealers	✓		Used for building survey contact list.
5	*1998-1999 Directory*	Asphalt Recycling and Reclaiming Association	Aggregate producers and pavement mix, specialized reuse and recycling equipment manufacturers, consulting and engineering services	✓		Used for building survey contact list of aggregate and pavement mix producers.
6	*Recycling Product News*	Baum Publications	Recycling equipment manufacturers	✓		Used for building survey contact list of equipment manufacturers.
7	*Manufacturer Database (Access)*	Cellulose Insulation Manufacturers Association	Cellulose insulation manufacturers	✓		Used for building survey contact list for paper-based product manufacturers
8	*Reuse/Recycling of Glass Cullet for Non-Container Uses*	Dane County DPW	Manufacturers of recycled glass products other than containers	✓		Used for building survey contact list for glass product producers (other recycling uses).
9	*Product and Equipment Specifications Reports*	Downing & Associates	Compost and wood waste, recycling and solid waste equipment manufacturers	✓		Used for building survey contact list for equipment manufacturers.
10	*Organics Mailing List*	Downing & Associates	Compost and wood waste, recycling and solid waste	✓		3,800 listings, comprehensive source.
11	*Markets List*	Glass Packaging Institute	Glass beneficiation facilities/Glass container plants; Glass container manufacturing plants	✓		Used for building survey contact list for glass container manufacturing plants.

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Resource Number	Resource/Directory	Source Organization	Types of Data/Businesses Included	Resource Use		How Used
				Survey	Existing Data	
12	*MRF Yearbook*	Governmental Advisory Associates	MRFs and mixed waste processing facilities in US	✓		Used for building survey contact list for MRFs.
13	*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.	✓		Used for building survey contact list for reuse.
14	*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		✓	Used to estimate percentage of mills consuming recovered paper for existing data adjustments.
15	*Molded Pulp Product Manufacturers*	Molded Pulp Environmental Association	Molded pulp producers	✓		Used for building survey contact list for paper-based product manufacturers.
16	*Nebraska Recycling Resource Directory*	Nebraska Department of Environmental Quality	Recycled product manufacturers	✓		Used for building survey contact list for multiple categories.
17	*Member List*	North American Insulation Manufacturing Association	Fiberglass insulation producers	✓		Used for building survey contact list for glass product producers (other recycling uses).
18	*Scrap Tire and Rubber Users Directory*	Recycling Research Institute	Tire and rubber recyclers, equipment providers, general info	✓		Used for building survey contact list for rubber product manufacturers.
19	*Buyers Guide 1998*	Recycling Today Magazine	Equipment manufacturers	✓		Used for building survey contact list for equipment manufacturers.
20	*Mailing List*	Resource Recycling, Inc	Over 41,000 records in numerous categories	✓		Used for building survey contact list.
21	*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	✓		Used for building survey contact list.
22	*1997-98 Equipment Directory*	Resource Recycling, Inc	Recycling collection and intermediate processing equipment manufacturers, specialized reuse and recycling equipment manufacturers	✓		Used for building survey contact list for equipment manufacturers.
23	*1998 SMA Membership Directory*	Steel Manufacturers Association	Steel mills, Iron and steel foundries, Specialized reuse and recycling equipment manufacturers		✓	Contact and facility information for SMA members ; good information on electric arc furnaces.
24	*Member List*	Used Oil Management Association	Used oil processors	✓		Only five members; National Oil Recyclers Assoc. is a better resource.

Resource Number	Resource/Directory	Source Organization	Types of Data/Businesses Included	Resource Use		How Used
				Survey	Existing Data	
25	*Regional Accounts Data, Regional Economic Profiles*	US Bureau of Economic Analysis	State and national average wage and total jobs data		✓	Used for statewide data to place recycling and reuse data into perspective.
26	*Gross State Product in Current Dollars, 1992-1998*	US Bureau of Economic Analysis	Gross state and national product data		✓	Used for statewide data to place recycling and reuse data into perspective.
27	*Standard Statistical Establishments List (SSEL)*	US Census Bureau	Covers all businesses		✓	Good resource for categories with corresponding SIC/NAICS codes.
28	*Census of Manufactures*	US Census Bureau	Various manufacturing industries		✓	Contains more detail than *SSEL* on production workers and value added by manufacture for selected industries. Useful for estimates.
29	*Current Industrial Reports – Manufacturing Profiles*	US Census Bureau	Various manufacturing industries		✓	Contains some data on material throughput. Useful for estimates.
30	*1997 Economic Census*	US Census Bureau	Covers all businesses		✓	Good resource for categories with corresponding SIC/NAICS codes and national total/average throughput figures.
31	*Electronics Reuse and Recycling Directory*	US EPA	Electronic appliance demanufacturers. Includes donation, reuse, remanufacture, recycling of computers.	✓		Used for building survey contact list for computer and electronic equipment demanufacturers.
32	*Mineral Commodity Reports*	US Geological Survey	Ferrous and non-ferrous metals recycling statistics		✓	Used for scrap consumption (throughput) data.
33	*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	✓		Used for building survey contact list for equipment manufacturers.
34	*Resource 1998*	Waste News	Equipment guide, waste focus	✓		Used for building survey contact list for equipment manufacturers.
35	*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	✓		Used for building survey contact list for equipment manufacturers.
36	*Recycling Directory*	Yellow Page Publishers Association (YPPA)	Commercial recycling centers and intermediate processors, Paper processing and manufacture, Brokers which deal with old directories	✓		Used for building survey contact list for paper-based product manufacturers.

APPENDIX C

SAMPLE OF DATA FROM U.S. CENSUS BUREAU'S ECONOMIC CENSUS

Iron and Steel Mills

1997

Issued October 1999

EC97M-3311A

1997 Economic Census

Manufacturing

Industry Series

U S C E N S U S B U R E A U

Helping You Make Informed Decisions

U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU

ECONOMIC CENSUS 1997

Table 6a. **Products Statistics: 1997 and 1992**

[Includes quantity and value of products of this industry produced by (1) establishments classified in this industry (primary) and (2) establishments classified in other industries (secondary). Transfers of products of this industry from one establishment of a company to another establishment of the same company (interplant transfers) are also included. For meaning of abbreviations and symbols, see introductory text. For explanation of terms, see appendixes]

NAICS product code	Product	1997				1992			
		Number of companies with shipments of $100,000 or more	Quantity of production for all purposes	Product shipments		Number of companies with shipments of $100,000 or more	Quantity of production for all purposes	Product shipments	
				Quantity	Value ($1,000)			Quantity	Value ($1,000)
331111	**Iron and steel mill products**	**N**	**X**	**X**	**56 427 724**	**N**	**X**	**X**	**N**
3311111	Coke oven and blast furnace products, made in steel mills	N	X	X	2 232 247	N	X	X	N
33111111	Coke oven and blast furnace products, made in steel mills	N	X	X	2 232 247	N	X	X	N
3311111101	Coke oven products made in steel mills, coke, except screenings and breeze $ 1,000 s tons	13	15 176.1	11 313.5	937 747	N	N	N	N
3311111103	Coke oven products made in steel mills, screeings and breeze $ 1,000 s tons	17	[q]1 519.7	1 498.0	80 660	N	N	N	N
3311111105	Coke oven products made in steel mills, crude tar $ mil gal	12	D	[p]152.7	78 938	N	N	N	N
3311111107	Coke oven products made in steel mills, crude light oil $ mil gal	11	D	46.7	19 189	N	N	N	N
3311111109	Coke oven products made in steel mills, other, including tar derivatives, ammonia, light oil derivations, and coke oven gas $	9	X	X	169 391	N	X	X	N
3311111111	Blast furnace pig iron, except ferroalloys, including pig iron with silicon content up to and including 6 percent silicon 1,000 s tons	6	D	D	D	3	D	D	D
3311111113	Blast furnace slag, except ferroalloys 1,000 s tons	6	D	D	D	6	3 674.0	[p]983.1	5 425
3311111115	Blast furnace sinter from ore, flue dust, blast furnace gas and other materials, except ferroalloys	4	X	X	95 923	N	X	X	N
3311111117	Other blast furnace products, except ferroalloys 1,000 s tons	4	D	D	D	6	330.1	[p]369.5	10 930
3311111Y	Coke oven and blast furnace products, made in steel mills, nsk	N	X	X	–	N	X	X	N
3311111YWV	Coke oven and blast furnace products, made in steel mills, nsk	N	X	X	–	N	X	X	N
3311112	Iron and steel powders, paste, and flakes	N	X	X	520 341	N	X	X	N
33111121	Iron and steel powders, paste, and flakes	N	X	X	520 341	N	X	X	N
3311112100	Iron and steel powders, paste, and flakes mil lb	34	X	S	520 341	N	X	X	N
3311113	Steel ingots and semifinished shapes and forms @	N	X	X	4 504 723	N	X	X	3 677 756
33111131	Steel ingots and semifinished shapes and forms	N	X	X	4 504 723	N	X	X	N
3311113100	Steel ingots and semifinished shapes and forms	51	X	X	4 504 723	73	X	X	3 677 756
3311115	Hot rolled steel sheet and strip, including tin mill products, tinplate, blackplate, terneplate, and tin-free steel @	N	X	X	22 163 062	N	X	X	17 284 088
33111151	Hot rolled steel sheet and strip, including tin mill products, tinplate, blackplate, terneplate, and tin-free steel	N	X	X	22 163 062	N	X	X	N
3311115100	Hot rolled steel sheet and strip, including tin mill products, tinplate, blackplate, terneplate, and tin-free steel	39	X	X	22 163 062	46	X	X	17 284 088
3311117	Hot rolled steel bars and bar shapes, plates, structural shapes, and piling, including concrete reinforcing and tool steel bars @	N	X	X	13 465 065	N	X	X	10 032 507
33111171	Hot rolled steel bars and bar shapes, plates, structural shapes, and piling, including concrete reinforcing and tool steel bars	N	X	X	13 465 065	N	X	X	N
3311117100	Hot rolled steel bars and bar shapes, plates, structural shapes, and piling, including concrete reinforcing and tool steel bars	64	X	X	13 465 065	81	X	X	10 032 507
3311119	Steel wire, including galvanized and other coated wire, made in steel mills producing wire rods or hot rolled bars #	N	X	X	454 641	N	X	X	352 075
33111191	Steel wire, including galvanized and other coated wire, made in steel mills producing wire rods or hot rolled bars	N	X	X	454 641	N	X	X	N
3311119100	Steel wire, including galvanized and other coated wire, made in steel mills producing wire rods or hot rolled bars $	18	X	X	454 641	14	X	X	352 075
331111B	Steel pipes and tubes, made in steel mills producing semifinished shapes or plate #	N	X	X	2 575 188	N	X	X	1 692 939
331111B1	Steel pipes and tubes, made in steel mills producing semifinished shapes or plate	N	X	X	2 575 188	N	X	X	N
331111B100	Steel pipes and tubes, made in steel mills producing semifinished shapes or plate $	17	X	X	2 575 188	19	X	X	1 692 939

See footnotes at end of table.

APPENDIX D

SURVEY MATERIALS

April 12, 2000

Bill Camarillo
Chief Financial Officer
California Wood Recycling
2950 Johnson Drive #101
Ventura, CA 93003

Subject: U.S. Recycling Economic Information Study

Dear Colleague:

I am 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 organization, the National Recycling Coalition (NRC), has 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.

Once complete, 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 April 28, 2000. Thank you for your assistance.

Sincerely,

Will Ferretti
Executive Director,
National Recycling Coalition

National Recycling Coalition Inc.

U. S. Recycling Economic Information Study

Company	California Wood Recycling
Subsidiary of	
Mailing Address (location where contact can be reached)	2950 Johnson Drive #101 Ventura, CA 93003
Physical Address (establishment location)	3450-A Auto Center Dr Ventura, CA 93003
Establishment Telephone Number	(805) 650-1616 *Ext* _____ Please provide at least an area code that corresponds to the PHYSICAL ADDRESS.
Contact Name	Bill Camarillo
Title	Chief Financial Officer
Contact Telephone Number	(805) 650-1616 *Ext* _____
Fax Number	(805) 650-9630
E-mail Address	Bill@agromin.com

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):

Erwindale CA Simi Valley CA Sylmar CA

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

A. Name _____ B. Name _____ C. Name _____
City/State _____ City/State _____ City/State _____

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). Please complete a separate form for each location you have (make extra copies if needed).

ESTABLISHMENT CATEGORIES

	Recycling Collection	Code
	Government-staffed collection	18
	Private-staffed collection	19
	Recycling Processing and Manufacturing	
	Compost/organics processor	1
	Fiberglass insulation producer	2
	Glass container manufacturing plant	3
	Glass product producer (other recycled uses)	4
	Household hazardous waste processor	5
	Materials recovery facility (commingled matls.)	6
	Nonferrous product producer	20
	Nonferrous foundry	21
	Nonferrous smelting or refining mill	22
	Oil processor	7
	Paper, paperboard, or market pulp mill	23
	Paper-based product mfg. (e.g. insulation, bedding)	8
	Pavement mix producer (asphalt or aggregate)	9
	Plastics converter	24
	Plastics reclaimer	10
	Recyclable materials processors (e.g. paper, metal)	25
	Rubber product manufacturer	11
	Steel or Iron foundry	26
	Steel mill	27

	Reuse and Remanufacturing	Code
	Computer/electronic appliance demanufacturer	12
	Equipment or toner cartridge remanufacturer	28
	Motor vehicle parts remanufacturer	29
	Repair shop	30
	Retail used merchandise sales	31
	Tire retreader	32
	Wood reuse or pallet rebuilder	13
	Support Businesses	
	Broker	33
	Consulting/engineering company	34
	Materials exchange services	14
	Recycling and reuse equipment manufacturer	15
	Transporter	35
	Other (describe below)	
	Other recycling processor/manufacturer	16
	Other reuse/remanufacturer	17
	Other (none of the above)	36
	Describe your establishment here:	

2. If you placed a check mark by a category numbered from:

- **1-17**, 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 reuse products or recover self-generated scrap materials.

  If you checked two or more categories, please select a single category number from 1-17 that best represents the primary recycling, manufacturing (using recycled materials), reuse, or recycling equipment manufacturing activities conducted by your establishment.

  Please write the establishment category code (1-17) this form is being completed for here: ____

- **18-36** you may stop and return this survey in the postage-paid envelope. Thank you!

U. S. Recycling Economic Information Study

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

3. Establishment Size Information (total 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 - $99,999*
- ☐ *$100,000 - $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 establishment code is 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.

Appendix E
Analysis of Survey Results

The methodology and survey forms that were used in several state and regional recycling economic information studies[22] that were conducted in association with this US REI study were consistent with those of this study. This allowed survey data from those studies, which covered 16 states that compose 46 percent of the nation's population, to be used to partially determine national results for survey categories by summing the results of each individual study. The contribution of the remaining 34 states was determined by conducting surveys from a random sample of establishments in those remaining states and performing a statistical analysis of survey results for those states as a group. The results of the statistical analysis from the 34-state group were then added to the sum of the results of the other studies to arrive at national totals.

The statistical analysis of the survey data provided by establishments that completed surveys identified the recycling characteristics of the average establishment in each of the twelve survey business categories. These averages were then applied to all recycling and reuse establishments in each survey category to estimate the total number of employees[23] and dollar value of payroll and receipts.

Survey information was solicited from 627 establishments, just under ten percent of the 6,574 total establishments in the study database identified as potentially being in one of the twelve survey categories in the 34-state group. Data obtained from 212 establishments formed the basis of the statistical analysis. Because many of the establishments initially included in the database were found to have been misclassified or gone out of business, it was necessary to re-estimate the number of establishments in each survey category before extrapolating average statistical data. In the 34-state group, 3,576 establishments are believed to be involved in recycling activities in the twelve survey categories.

The procedure for estimating the total number of establishments in each category consisted of several steps. First, businesses in the database that were randomly selected to be surveyed were sent a survey in the mail, followed-up with several telephone calls if the failed to respond to the mailing. 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 1,069 establishments in category 3, compost and organics processors, for the 34-state group:

- From the initial list of 2,226 establishments that were classified as potentially being compost and organics processors, a random sample of 58 was contacted;
- Of these 58, 6 establishments moved out of this recycling category into other categories and 25 were eliminated (unrelated, unreachable, duplicate entries, or out of business) – furthermore, 3 moved into the category (from other categories) – resulting in 30 establishments in this category.

[22] Those studies include one conducted by the Northeast Recycling Council for the ten-state region as a whole (and state-level data for Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont); individual state-level studies conducted as part of this study for California, Florida, Indiana, Nebraska, and Ohio ; and an independent study conducted concurrently by Illinois with an agreement to share results.

[23] 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.

- To these 30, we added 1,039 additional establishments, based on the observed "success" rate of the attempted sample and the relative amount of establishments that moved into the category, for a total of 1069 establishments.[24]

For each variable (employment, payroll, and receipts), the sample mean, standard deviation, and other related statistics were calculated. Based on the sample size and estimate of the total number of establishments 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.[25] 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:

- 22 responses were usable of the 30 establishments that were surveyed and identified as belonging in the category;
- Average number of employees, payroll, and receipts for these 22 responses was calculated;
- Standard deviations and other related statistics necessary to determine a 95% confidence interval for the average of all establishments in this business category was calculated; and
- The low, average, and high values for the confidence interval were then multiplied by the estimated total establishments in this category (30) to yield the estimated range of the total number of employees, payroll, and receipts.

To finish this particular example, the sample of 22 establishments employed (on average) 22.1 persons per establishment in recycling activities on a full-time equivalent basis. However, given the sample size and the estimate of the total number of establishments in this business category, the actual average number of employees per establishment might range from a low of 0.5 to a high of 53. Thus, while 23,625 employees are expected to be involved in recycling activities for the entire set of 1,069 establishments in this business category, there may be as few as 486 or as many as 56,550.

Another point should also be made regarding small population sampling as it applies to certain categories. Given the small number of total establishments engaged in certain business categories, 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. This is the case for compost and organics processors where, for example, the expected value of 23,625 total employees is bounded by a low estimate of 486 because it is already known, through survey data, that 486 employees work for the establishments sampled in this category. As this issue affects the results, it serves to make certain estimates more accurate than would otherwise be possible.

As was mentioned previously, extrapolated results for the 34-state group were added to extrapolated survey results covering the other 16 states. A similar statistical analysis to that described above was conducted for each of those other studies. However, because much smaller numbers of establishments exist in each category at the state level, significantly larger percentages of establishments were surveyed in those cases (in many cases 100 percent) to ensure confidence in the results at the state level. In total, on the national level, 1,227 out of 4,964 establishments (25 percent) provided survey data for direct recycling and reuse industry survey categories.

[24] Of the 58 establishments we attempted to contact in this category, only 27 correctly belonged in the category. We applied this 47% "success" ratio to the 2,168 establishments not contacted of the originally estimated 2,226 establishments, adding 1,009 establishments. Furthermore, we added another 30 establishments through allocation from the group of establishments not surveyed, based on the relative proportion of surveyed establishments that were originally classified in another category but properly belonged in the compost and organics producers category.

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

APPENDIX F
STATE DATA TABLES

Table F-1
California 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 at the end of the data table.

		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 Establishments 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 Collection	Establishments							198	Derivation; multiple sources [6]	198
	Employment							1,900		1,900
	Annual Payroll							65,740		65,740
	Estimated Receipts							130,722		130,722
	Estimated Throughput							5,269	Derivation; multiple sources [7]	5,269
2. Private Staffed Collection	Establishments							323	Derivation; multiple sources [8]	323
	Employment							3,100		3,100
	Annual Payroll							107,260		107,260
	Estimated Receipts							213,283		213,283
	Estimated Throughput							34,381	Derivation; multiple sources [9]	34,381
3. Compost and Miscellaneous Organics Producers	Establishments							162	REI Study Database [10]	162
	Employment							1,892	Results extrapolated based on	1,892
	Annual Payroll							46,119	California survey statistical mean	46,119
	Estimated Receipts							304,722	(n=71). [11], [12]	304,722
	Estimated Throughput							9,208		9,208
4. Materials Recovery Facilities (MRFs)	Establishments							47	REI Study Database [10]	47
	Employment							2,606	Results extrapolated based on	2,606
	Annual Payroll							49,986	California survey statistical mean	49,986
	Estimated Receipts							206,424	(n=13). [11]	206,424
	Estimated Throughput							3,625		3,625
5. Recyclable Material Wholesalers	Establishments							1,000	U.S. Census, 1997 Econ. Census	1,000
	Employment							13,710	NAICS code 421930. [13], [14]	13,710
	Annual Payroll							344,894		344,894
	Estimated Receipts							4,549,177		4,549,177
	Estimated Throughput							26,817	Derivation [15]	26,817
6. Glass Container Manufacturing Plants	Establishments			8	U.S. Census, 1997 Econ. Census	8	From Column D [17]			8
	Employment			3,348	NAICS code 327213. [13]	3,013	Column D adjusted for			3,013
	Annual Payroll			136,544		122,890	non-covered activities. [17]			122,890
	Estimated Receipts			724,192		651,773				651,773
	Estimated Throughput			644	1996 CIWMB Data [16]	644	From Column D [17]			644
7. Glass Product Producers (other recycled uses)	Establishments					9	REI Study Database [10]			9
	Employment					697	Results extrapolated based on			697
	Annual Payroll					8,233	California survey statistical mean			8,233
	Estimated Receipts					52,749	(n=5). [11]			52,749
	Estimated Throughput					100	Survey & 1996 CIWMB data [18]			100

Continued

APPENDIX F – STATE DATA TABLES

		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 Establishments 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			43	U.S. Census, 1997 Econ. Census			43	From Column D [20]	43
	Employment			1,681	NAICS codes 331314, 331423,			1,597	Column D adjusted for	1,597
	Annual Payroll			65,794	and 331492. [13]			62,504	non-covered activities [20]	62,504
	Estimated Receipts			744,916				707,670		707,670
	Estimated Throughput			281	1997 Economic Census [19]			281	From Column D [20]	281
9. Nonferrous product producers	Establishments	36	U.S. Census, 1997 Econ. Census	18	Column C adjusted for	18	From Column D [17]			18
	Employment	3,260	NAICS codes 331315, 331316,	1,630	establishments that don't recycle	1,467	Column D adjusted for			1,467
	Annual Payroll	104,441	331319, and 331421. [13]	52,221	[21]	46,998	non-covered activities [17]			46,998
	Estimated Receipts	732,247		366,124		329,511				329,511
	Estimated Throughput			107	1997 Economic Census [22]	107	From Column D [17]			107
10. Nonferrous foundries	Establishments			166	U.S. Census, 1997 Econ. Census	166	From Column D [17]			166
	Employment			5,056	NAICS codes 331521, 331524,	4,550	Column D adjusted for			4,550
	Annual Payroll			148,607	331525, 331528. [13]	133,746	non-covered activities [17]			133,746
	Estimated Receipts			482,401		434,161				434,161
	Estimated Throughput			33	1997 Economic Census [23]	33	From Column D [17]			33
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	25	U.S. Census, 1997 Econ. Census	24	Derived from Column C with data	4	Derived from Column D with data	20	Derived from Column D with data	24
	Employment	3,893	NAICS code 3221. [13]	3,153	from AF&PA and Lockwood Post	155	from AF&PA and Lockwood Post	2,786	from AF&PA and Lockwood Post	2,940
	Annual Payroll	198,209		160,549	[24]	7,867	with an adjustment for non-	141,845	with an adjustment for non-	149,712
	Estimated Receipts	1,472,635		1,192,834		58,449	covered activities. [25]	1,053,869	covered activities [25]	1,112,318
	Estimated Throughput			2,369		116		2,203		2,319
12. Paper-based Product Manufacturers	Establishments							16	REI Study Database[10]	16
	Employment							520	Results extrapolated based on	520
	Annual Payroll							15,713	California survey statistical mean	15,713
	Estimated Receipts							104,528	(n=8). [11]	104,528
	Estimated Throughput							196		196
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					15	REI Study Database[10]			15
	Employment					228	Results extrapolated based on			228
	Annual Payroll					2,990	California survey statistical mean			2,990
	Estimated Receipts					41,370	(n=11). [11]			41,370
	Estimated Throughput					2,128				2,128
14. Plastics Reclaimers	Establishments							63	APC Database [26]	63
	Employment							1,499		1,499
	Annual Payroll							43,090	Derivation -'97 Econ. Census [26]	43,090
	Estimated Receipts							126,276	Derivation - Plastics News [26]	126,276
	Estimated Throughput							234	APC Database [26]	234
15. Plastics Converters	Establishments	1,895	SPI Economic Report 2000 for	309	Derivation; from SPI data [28]	309	From Column D [30]			309
	Employment	127,000	NAICS codes 325991 and 3261	20,683	Derivation; from SPI data [28]	16,546	Column D adjusted for			16,546
	Annual Payroll	3,862,900	plus captive plastics converting	629,101	Derivation; from SPI data [28]	503,281	non-covered activities [30]			503,281
	Estimated Receipts	19,008,200	[27]	3,095,621	Derivation; from SPI data [28]	2,476,497				2,476,497
	Estimated Throughput			229	APC Database [29]	229	From Column D [30]			229
16. Rubber Product Manufacturers	Establishments					15	REI Study Database[10]			15
	Employment					271	Results extrapolated based on			271
	Annual Payroll					9,363	California survey statistical mean			9,363
	Estimated Receipts					56,880	(n=2). [11]			56,880
	Estimated Throughput					19				19

continued

		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 Establishments 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	Association of Iron and Steel			1	From Column D [33]	1
	Employment			350	Engineers [31]			333	Column D adjusted for	333
	Annual Payroll			18,227	Derivation [32]			17,316	non-covered activities [33]	17,316
	Estimated Receipts			135,828				129,036		129,036
	Estimated Throughput			675	Assn. of Iron and Steel Eng. [31]			675	From Column D [33]	675
18. Iron and Steel foundries	Establishments			77	U.S. Census, 1997 Econ. Census	77	From Column D [36]			77
	Employment			5,175	NAICS code 33151. [13], [34]	4,916	Column D adjusted for non-			4,916
	Annual Payroll			149,345		141,878	covered activities D [36]			141,878
	Estimated Receipts			612,882		582,238				582,238
	Estimated Throughput			447	1997 Economic Census [35]	447	From Column D [36]			447
19. Other Recycling Processors/Manufacturers	Establishments					31	REI Study Database[10]			31
	Employment					871	Results extrapolated based on			871
	Annual Payroll					20,854	California survey statistical mean			20,854
	Estimated Receipts					84,661	(n=13). [11]			84,661
	Estimated Throughput					1,177				1,177
Recycling Industry Subtotals	**Establishments**					652		1,873		2,525
	Employment					32,715		29,942		62,657
	Annual Payroll					998,100		894,468		1,892,568
	Estimated Receipts					4,768,289		7,525,708		12,293,996

continued

APPENDIX F – STATE DATA TABLES

		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 Establishments 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					34	REI Study Database [10]			34
	Employment					956	Results extrapolated based on			956
	Annual Payroll					24,696	California survey statistical mean			24,696
	Estimated Receipts					125,120	(n=13). [11]			125,120
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							773	U.S. Census, 1997 Econ. Census	773
	Employment							5,288	NAICS code 421140; [15], [37]	5,288
	Annual Payroll							108,208		108,208
	Estimated Receipts							653,927		653,927
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							1,895	U.S. Census, 1997 Econ. Census	1,895
	Employment							13,845	NAICS code 453310; [15], [38]	13,845
	Annual Payroll							185,931		185,931
	Estimated Receipts							877,939		877,939
	Estimated Throughput							N/A		N/A
23. Tire Retreaders	Establishments							68	U.S. Census, 1997 Econ. Census	68
	Employment							893	NAICS code 326212; [15], [39]	893
	Annual Payroll							20,971		20,971
	Estimated Receipts							111,147		111,147
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					32	REI Study Database [10]			32
	Employment					375	Results extrapolated based on			375
	Annual Payroll					4,503	California survey statistical mean			4,503
	Estimated Receipts					29,088	(n=12). [11]			29,088
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							4	REI Study Database [10]	4
	Employment							19	Results extrapolated based on	19
	Annual Payroll							728	California survey statistical mean	728
	Estimated Receipts							7,456	(n=2). [11]	7,456
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					11	REI Study Database [10]			11
	Employment					212	Results extrapolated based on			212
	Annual Payroll					12,315	California survey statistical mean			12,315
	Estimated Receipts					83,501	n=(7). [11]			83,501
	Estimated Throughput					N/A				N/A
Reuse Industry Subtotals	**Establishments**					77		2,740		2,817
	Employment					1,543		20,045		21,588
	Annual Payroll					41,514		315,838		357,352
	Estimated Receipts					237,709		1,650,469		1,888,178

GRAND TOTALS	**Establishments**					729		4,613		5,342
Recycling and Reuse/Remanufacturing	**Employment**					34,258		49,987		84,245
	Annual Payroll					1,039,614		1,210,280		2,249,894
	Estimated Receipts					5,005,998		9,176,177		14,182,174

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.

Summary of Calculations

Data Type	Calculation[1]
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+N*P)*12 months/year

[1]Variables are defined in the following table.

Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	19,100,000	BioCycle (11/2000)
B	Persons per household	2.79	U. S. Census Bureau
C	Homes collected per truck per day	900	R. W. Beck Estimate
D	Percent of homes collected by government staffed collection	38%	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, etc.	5%	R. W. Beck Estimate
I	Average payroll per employee	$34,600	1997 U. S. Economic Census
J	Recycling collection cost per household per month	$2.50	R. W. Beck Estimate
K	Number of curbside programs	521	BioCycle (11/2000)
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	75%	Estimated from BioCycle (11/2000)
O	Percent of year collection takes place	100%	R. W. Beck Estimate
P	Yard Waste Collection Cost per Household per Month	$2.25	R. W. Beck Estimate

7 Due to the unavailability of California data throughput is estimated based on per-employee collection averages for recyclables from Florida plus an estimate for yard waste from California Compost and Miscellaneous Organics Products Producers.
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."
9 Throughput is derived by subtracting the Government Staffed Curbside Collection tonnage estimate from the sum of processing estimates for Compost and Organics Producers, Materials Recovery Facilities, and Recyclable Material Wholesalers.
10 Number of establishments for all survey categories is based on the REI study database.
11 Unless noted otherwise, number of employees, payroll, receipts, and throughput for all survey categories is based on a statistical analysis of California 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."

12 Surveys focused on active processing of organic materials for beneficial use. As a result, number of establishments, potential economic activity, and throughput associated with inactive composting techniques (i.e., allowing materials to slowly and independently decompose over time) may not be fully reflected in totals.
13 Data obtained from the U.S. Census, 1997 Economic Census. See Section 3.2.1.2 for a detailed description of the use of Census Bureau statistics.
14 Data are taken directly from U.S. Census, 1997 Economic Census for NAICS code 421930 – 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.
15 Throughput for Recyclable Material Wholesalers is derived as follows:
ferrous scrap processor revenue/$128 per ton + paper processor revenue/$126 per ton + other wholesalers/$300 per ton.
16 Data for 1996 taken from the California Integrated Waste Management Board's *Glass Marketing Guide*, June 11, 1998.
17 Number of establishments and throughput are taken from Column D with no adjustments. Employment, annual payroll, and estimated receipts are derived from Column D with an adjustment for the percent of covered activities (90 percent).
18 Throughput is derived from a combination of survey results and 1996 fiberglass plant consumption from the California Integrated Waste Management Board's *Glass Marketing Guide*, June 11, 1998.
19 Throughput for nonferrous smelting and refining is estimated based on national scrap consumption for smelting and refining mills from the 1997 Economic Census and information from the USGS' publication *Minerals Information – 1997, Recycling – Metals*. Allocation to the state level is based on a ratio of state employment to national employment for this industry.
20 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.
21 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.
22 Throughput for Nonferrous Product Producers is estimated based on nationwide scrap purchases for this industry as reported in the 1997 Economic Census. Allocation to the state level is based on a ratio of state employment to national employment for this industry.
23 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 NAICS code) / ($0.45/lb for aluminum or $0.72/lb. for copper) / (2,000 lbs/ton).
Tons of scrap on a state-level is estimated as:
Total tons x State Employees/U.S. Employees.
24 Estimates of establishments, employees, payroll, receipts, and throughput are derived from Column C based on information on mills that consume recovered paper from AF&PA's *Paper Matcher* and mill capacity data from Lockwood Post's *Directory of the Pulp, Paper, and Allied Trades*. Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999). Throughput numbers used are for 1997 to coincide with the data from the 1997 Economic Census.
25 Estimates of employees, payroll, and receipts are derived from Column D with an adjustment for the percent of covered activities (95 percent). The split between Columns E and F comes from mill capacity data from Lockwood Post's *Directory of the Pulp, Paper, and Allied Trades* and AF&PA's *Paper Matcher* which provided information on types of recovered paper consumed by individual mills.
26 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 California plastics industry employees ($28,746).

Estimated receipts is calculated by multiplying throughput of recycled resins produced times an average of recycled resin prices from Plastics News. Throughput is derived from per-employee averages from American Plastics Council statistics as compiled by R. W. Beck.

27 Establishments, employees, payroll, and receipts in Column C for Plastics Converters are obtained from the Society of the Plastics Industry's *Economic Report 2000* for plastics converters (NAICS codes 325991 and 3261) plus additional estimates for captive plastics converting operations by establishments classified in other non-plastics industries.

28 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).

29 Throughput is calculated from the state's percentage of national plastics converter employees multiplied by the total tons of plastics recycled nationally (APC Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled).

30 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).

31 Establishments, employees, and throughput data are derived from Association of Iron and Steel Engineers directory listings that exclude non-integrated mills (NAICS 3311114), which do not make steel.

32 Employment and payroll data are derived from national averages allocated on a per-employee basis.

33 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, utilizing anywhere from 15 percent-100 percent recovered steel. Therefore, the only deduction taken is to account for non-covered activities. Establishments and throughput are from Column D with no adjustment.

34 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.

35 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).

36 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.

37 The 1997 Economic Census only reported number of establishments for Motor Vehicle Parts to avoid disclosing individual company information. Estimates for employment, payroll, and receipts are derived from California per-establishment average data from the U.S. Census' 1996 Standard Statistical Establishments List for SIC code 5015 (Motor Vehicle Parts) times the number of establishments from the 1997 Economic Census for NAICS code 421140.

38 Estimates for Retail Used Merchandise Sales are taken directly from the 1997 Economic Census for NAICS code 453310 with no adjustments.

39 Estimates for Tire Retreaders are taken directly from the 1997 Economic Census for NAICS code 326212 with no adjustments.

Table F-2
Florida 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.

		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 Collection	Establishments							107	Derivation: multiple sources	107
	Employment							1,110	Derivation; multiple sources	1,110
	Annual Payroll							27,750	Derivation; multiple sources	27,750
	Estimated Receipts							31,870	Derivation: multiple sources	31,870
	Estimated Throughput							865	FL DEP 1997 Data [7]	865
2. Private Staffed Collection	Establishments							208	Derivation: multiple sources	208
	Employment							2,150	Derivation: multiple sources	2,150
	Annual Payroll							53,750	Derivation; multiple sources	53,750
	Estimated Receipts							61,867	Derivation; multiple sources	61,867
	Estimated Throughput							8,181	FL DEP 1997 data [9]	8,181
3. Compost and Miscellaneous Organics Producers	Establishments							56	REI Study Database [10]	56
	Employment							321	Survey results extrapolated	321
	Annual Payroll							9,515	based on state average.	9,515
	Estimated Receipts							36,003	(n=31). [11], [12]	36,003
	Estimated Throughput							1,725	FL DEP 1997 data [13]	1,725
4. Materials Recovery Facilities (MRFs)	Establishments							95	REI Study Database [10]	95
	Employment							2,218	Survey results extrapolated	2,218
	Annual Payroll							32,342	based on statistical average.	32,342
	Estimated Receipts							123,270	(n=31). [11], [14].	123,270
	Estimated Throughput							540	FL DEP 1997 data [15]	540
5. Recyclable Material Wholesalers	Establishments							408	US Census SSEL 1995 SIC	408
	Employment							4,164	code 5093. [16], [17]	4,164
	Annual Payroll							99,419		99,419
	Estimated Receipts							1,106,807		1,106,807
	Estimated Throughput							6,781	Derivation [18]	6,781
6. Glass Container Manufacturing Plants	Establishments					3	REI Study Database [10]			3
	Employment					998	Survey results extrapolated			998
	Annual Payroll					42,750	based on statistical average.			42,750
	Estimated Receipts					94,406	(n=2). [11],[19]			94,406
	Estimated Throughput					114	1997 Economic Census [20]			114
7. Glass Product Producers (other recycled uses)	Establishments					0	[21]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0
8. Nonferrous secondary smelting and refining mills	Establishments			5	US Census SSEL 1995; SIC			5	From Column D [24]	5
	Employment			122	code 3341. [16], [22]			116	Column D adjusted for	116
	Annual Payroll			4,090				3,886	non-covered activities [24]	3,886
	Estimated Receipts			57,460				54,587		54,587
	Estimated Throughput			12	1992 Economic Census [23]			12	From Column D [24]	12
9. Nonferrous product producers	Establishments	14	U.S. Census SSEL, 1996 SIC	7	Column C adjusted for	7	From column D [28]			7
	Employment	1,516	codes 3351-3356. [16], [25]	758	non-recycling establishments [26]	682	Column D adjusted for			682
	Annual Payroll	39,800		19,900		17,910	non-covered activities [28]			17,910
	Estimated Receipts	22,301		11,151		10,035				10,035
	Estimated Throughput			41	1997 Economic Census [27]	41	From column D [28]			41

APPENDIX F – STATE DATA TABLES

		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	
10. Nonferrous foundries	Establishments			36	US Census SSEL 1995; SIC	36	From column D [31]			36
	Employment			462	codes 3363-3369. [16], [29]	416	Column D adjusted for			416
	Annual Payroll			11,396		10,256	non-covered activities [31]			10,256
	Estimated Receipts			39,790		35,790				35,790
	Estimated Throughput			3	1997 Economic Census [30]	3	From column D [31]			3
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	15	US Census SSEL 1995: SIC	9	Derived from column C with	5	From Column D [35]	4	Derived from Column D with	9
	Employment	6,474	codes 2611, 2621, and 2631.	3,884	data from AF&PA Paper	1,495	Derived from Column D with	1,661	data from AF&PA [36]	3,156
	Annual Payroll	299,628	[16],[32]	179,777	Matcher. [33]	69,214	data from AF&PA and adjustment	76,855		146,069
	Estimated Receipts	2,148,050		1,288,830		496,200	for non-covered activities [35]	550,975		1,047,174
	Estimated Throughput			1,140	AF&PA [34]	439	Derived from Column D [35]	701	Column D - Column E [36]	1,140
12. Paper-based Product Manufacturers	Establishments							8	REI Study Database[10]	8
	Employment							244	Survey results extrapolated	244
	Annual Payroll							4,935	based on NERC regional	4,935
	Estimated Receipts							15,077	(n=5). [11],[37]	15,077
	Estimated Throughput							51	R.W. Beck estimate [38]	51
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					2	REI Study Database[10]			2
	Employment					19	Survey results extrapolated			19
	Annual Payroll					371	based on statistical average.			371
	Estimated Receipts					3,544	(n=2). [11],[39]			3,544
	Estimated Throughput					63	R.W. Beck estimate [40]			63
14. Plastics Reclaimers	Establishments							24	APC Database [41]	24
	Employment							402		402
	Annual Payroll							9,512	U.S. Census 1997 [41]	9,512
	Estimated Receipts							33,864	Plastics News [41]	33,864
	Estimated Throughput							63	APC Database [41]	63
15. Plastics Converters	Establishments	755	Probe Economics [42]	123	Derivation; from SPI data [43]	123	From Column D [45]			123
	Employment	22,454	Probe Economics [42]	3,657	Derivation; from SPI data [43]	2,925	Column D adjusted for			2,925
	Annual Payroll	531,284	Probe Economics [42]	86,523	Derivation; from SPI data [43]	69,219	non-covered activities [45]			69,219
	Estimated Receipts	4,154,800	Probe Economics [42]	676,639	Derivation; from SPI data [43]	541,311				541,311
	Estimated Throughput			29	APC Database [44]	29	From Column D [45]			29
16. Rubber Product Manufacturers	Establishments					8	REI Study Database[10]			8
	Employment					337	Survey results extrapolated			337
	Annual Payroll					15,833	based on statistical average.			15,833
	Estimated Receipts					34,833	(n=6). [11],[46]			34,833
	Estimated Throughput					8	Estimated from FL DEP data [47]			8
17. Steel mills	Establishments			1	AISE Directory [48]			1	From Column D [49]	1
	Employment			(D)				(D)		(D)
	Annual Payroll			(D)				(D)		(D)
	Estimated Receipts			(D)				(D)		(D)
	Estimated Throughput			(D)				(D)		(D)
18. Iron and Steel foundries	Establishments			19	US Census SSEL 1995; SIC	19	From Column D [52]			19
	Employment			502	codes 3321-3325. [16], [50]	477	(Column D-Column F) adjusted			477
	Annual Payroll			17,476		16,602	non-covered activities [52]			16,602
	Estimated Receipts			62,069		58,966				58,966
	Estimated Throughput			43	1997 Economic Census [51]	43	From Column D [52]			43
19. Other Recycling Processors/Manufacturers	Establishments					16	REI Study Database [10]			16
	Employment					516	Survey results extrapolated			516
	Annual Payroll					7,205	based on statistical average.			7,205
	Estimated Receipts					48,433	(n=8). [11],[53]			48,433
	Estimated Throughput					101	R.W. Beck estimate [54]			101
Recycling Industry Subtotals	**Establishments**					219		916		1,135
	Employment					7,865		12,385		20,251
	Annual Payroll					249,361		317,963		567,324
	Estimated Receipts					1,323,519		2,014,319		3,337,838

continued

		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					4	REI Study Database [10]			4
	Employment					49	Survey results extrapolated			49
	Annual Payroll					808	based on state average.			808
	Estimated Receipts					4,038	(n=4). [11],[55]			4,038
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							497	US Census SSEL. 1995	497
	Employment							2,999	SIC code 5015; [16],[56]	2,999
	Annual Payroll							62,383		62,383
	Estimated Receipts							307,764		307,764
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							1,899	US Census SSEL. 1995	1,899
	Employment							7,415	SIC code 5932; [16],[57]	7,415
	Annual Payroll							101,616		101,616
	Estimated Receipts							530,138		530,138
	Estimated Throughput							N/A		N/A
23. Tire Retreaders	Establishments							137	US Census SSEL. 1995	137
	Employment							663	SIC code 7534; [16],[58]	663
	Annual Payroll							14,063		14,063
	Estimated Receipts							74,013		74,013
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					4	REI Study Database[10]			4
	Employment					70	Survey results extrapolated			70
	Annual Payroll					1,832	based on statistical average.			1,832
	Estimated Receipts					4,422	(n=3). [11],[59]			4,422
	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 statistical average.	(D)
	Estimated Receipts							(D)	(n=1). [11],[60]	(D)
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					6	REI Study Database [10]			6
	Employment					387	Survey results extrapolated			387
	Annual Payroll					7,008	based on statistical average.			7,008
	Estimated Receipts					35,625	n=(3). [11],[61]			35,625
	Estimated Throughput					N/A				N/A
Reuse Industry Subtotals	**Establishments**					14		2,534		2,548
	Employment					506		11,077		11,583
	Annual Payroll					9,647		178,062		187,709
	Estimated Receipts					44,084		911,915		955,999

GRAND TOTALS	**Establishments**					233		3,450		3,683
Recycling and Reuse/Remanufacturing	**Employment**					8,371		23,462		32,138
	Annual Payroll					259,008		496,025		765,176
	Estimated Receipts					1,367,603		2,926,234		4,374,479

[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.

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

Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	11,070,000	BioCycle (4/99)
B	Persons per household	2.48	U. S. Census Bureau
C	Homes collected per truck per day	900	R. W. Beck 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	$25,000	1997 U. S. Economic Census
J	Recycling collection cost per household per month	$1.75	R. W. Beck Estimate
K	Number of curbside programs	315	BioCycle (4/99)
Additional Data for Yard Waste Collection			
L	Homes collected per truck per day	1000	R. W. Beck Estimate
M	Average crew per truck	2	R. W. Beck Estimate
N	Percent of households with yard waste collection	75%	Estimated from BioCycle (5/98)
O	Percent of year collection takes place	100%	R. W. Beck Estimate

[7] Estimated throughput is equal to total tons of residential recyclables plus yard waste from the FDEP's 1999 Solid Waste Management in Florida annual report times the percentage of homes collected by government staffed curbside 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 from 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."

[12] Number of employees, payroll, and receipts for Compost Producers are based on a statistical analysis of survey results. Statistics are extrapolated based on 31 completed surveys for the state. 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 FDEP.

[14] Number of employees, payroll, and receipts for Materials Recovery Facilities (MRFs) are based on a statistical analysis of survey results. Statistics are based on a total of 31 completed surveys for the state.

[15] Throughput is equal to the total tons of "minimum five" materials plus yard waste reported by FDEP multiplied by 66 percent (assumes that two-thirds of material collected goes to MRFs).

[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 (2 completed surveys out of a total of 3 establishments).

[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] No FL establishments in the REI database.

[22] 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.

[23] 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.

[24] 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.

[25] Data for Nonferrous Product Producers is taken from U.S. Census SSEL for SIC codes 3351-3355 with no adjustments.

[26] 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.

[27] 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) / (2000 lbs./ton).
Tons of scrap on the state-level is estimated as: Total tons of scrap x State Employees/U.S. Employees.

[28] 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.

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

[30] 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) / (2000 lbs./ton).
Tons of scrap on the state-level is estimated as: Total tons of scrap x State Employees/U.S. Employees.

[31] 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.

[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 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 FL, AF&PA reported recovered paper consumption combined with GA. Therefore, throughput is apportioned based on FL employees as a percent of total FL and GA 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).

[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 Producers are derived based on results from the NERC states because only one FL establishment responded for this category.

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

[39] Number of employees, payroll, and receipts for Pavement Mix Producers are based on a statistical analysis of survey results.

[40] Throughput for Pavement Mix Producers is estimated based on NERC web site data for asphalt/concrete and a limited number of survey responses for the NERC states and FL.

[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 the average wage for Florida plastics industry employees ($23,661 — *Contribution of Plastics to the U.S. Economy*, prepared for the Society of the Plastics Industry by Probe Economics). 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.
[47] Throughput for Rubber Product Manufacturers is estimated based on data provided by the FDEP 1999 Solid Waste Management in Florida report.
[48] Based on data from the AISE 1998 Directory of Iron and Steel Plants, only one steel mill is located in FL. Employment, payroll, receipts, and throughput are not shown due to disclosure issues. Data for disclosure issues is not shown in industry Subtotals, but is included in Grand Totals.
[49] Establishments in column F are based on the number of electric arc furnaces (EAF) (Steel Manufacturer's Association Member Directory, 1998). EAF's consume virtually 100 percent scrap. Number of employees, payroll, receipts, and throughput are not shown for Column F due to disclosure issues.
[50] Steel Recycling Institute states that all foundries as a matter of practice utilize a significant percentage of scrap in the making of new iron products.
[51] 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).
[52] 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.
[53] Number of employees, payroll, and receipts for Other Recycling Processors/Manufacturers are based on a statistical analysis of survey results.
[54] Throughput is estimated as 195 tons per employee based on a limited number of survey responses for the NERC region and Florida.
[55] Number of employees, payroll, and receipts for Computer and Electronic Appliance Demanufacturers are based on a statistical analysis of survey results.
[56] Estimates for Motor Vehicle Parts are taken directly from U.S. Census SSEL for SIC code 5015 with no adjustments.
[57] Estimates for Retail Used Merchandise Sales are taken directly from U.S. Census SSEL for SIC code 5932 with no adjustments.
[58] Estimates for Tire Retreaders are taken directly from U.S. Census SSEL for SIC code 7534 with no adjustments.
[59] Number of employees, payroll, and receipts for Wood Reuse are based on a statistical analysis of survey results.
[60] Number of employees, payroll, and receipts for Materials Exchange Services are not shown due to disclosure issues. Data for disclosure issues is not shown in industry Subtotals, but is included in Grand Totals.
[61] Number of employees, payroll, and receipts for Other Reuse are based on a statistical analysis of survey results.

Table F-3
Illinois 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 at the end of the data table.
(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.

		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 Establishments 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 Collection	Establishments							204	Derivation: multiple sources [6]	204
	Employment							900		900
	Annual Payroll							31,275		31,275
	Estimated Receipts							63,491		63,491
	Estimated Throughput							274	Derivation; multiple sources [7]	274
2. Private Staffed Collection	Establishments							270	Derivation: multiple sources [8]	270
	Employment							1,200		1,200
	Annual Payroll							41,700		41,700
	Estimated Receipts							84,161		84,161
	Estimated Throughput							3,511	Derived from IL EPA data [9]	3,511
3. Compost and Miscellaneous Organics Producers	Establishments							59	REI Study Database [10]	59
	Employment							325	Results extrapolated based on	325
	Annual Payroll							5,892	Illinois survey statistical mean	5,892
	Estimated Receipts							26,995	(n=26). [11], [12]	26,995
	Estimated Throughput							335	IL EPA data [13]	335
4. Materials Recovery Facilities (MRFs)	Establishments							28	REI Study Database [10]	28
	Employment							691	Results extrapolated based on	691
	Annual Payroll							12,328	Illinois survey statistical mean	12,328
	Estimated Receipts							43,714	(n=11). [11]	43,714
	Estimated Throughput							202	Derivation; multiple sources [14]	202
5. Recyclable Material Wholesalers	Establishments							493	U.S. Census. 1997 Econ. Census	493
	Employment							6,104	NAICS code 421930. [15], [16]	6,104
	Annual Payroll							194,916		194,916
	Estimated Receipts							3,002,687		3,002,687
	Estimated Throughput							3,248	Derivation [17]	3,248
6. Glass Container Manufacturing Plants	Establishments			4	U.S. Census. 1997 Econ. Census	4	From Column D [20]			4
	Employment			1,170	NAICS code 421930. [16], [18]	1,053	Column D adjusted for			1,053
	Annual Payroll			44,186		39,768	non-covered activities. [20]			39,768
	Estimated Receipts			201,014		180,912				180,912
	Estimated Throughput			133	1997 Economic Census [19]	133	From Column D [20]			133
7. Glass Product Producers (other recycled uses)	Establishments					4	REI Study Database [10]			4
	Employment					232	Results extrapolated based on			232
	Annual Payroll					4,953	Ohio survey statistical mean			4,953
	Estimated Receipts					20,055	(n=3). [21]			20,055
	Estimated Throughput					18	Derivation [22]			18
8. Nonferrous Secondary Smelting and Refining Mills	Establishments			19	U.S. Census. 1997 Econ. Census			19	From Column D [25]	19
	Employment			1,162	NAICS codes 331314, 331423,			1,104	Column D adjusted for	1,104
	Annual Payroll			47,115	and 331492. [15], [23]			44,759	non-covered activities [25]	44,759
	Estimated Receipts			702,386				667,267		667,267
	Estimated Throughput			160	1997 Economic Census [24]			160	From Column D [25]	160
9. Nonferrous Product Producers	Establishments	23	U.S. Census. 1997 Econ. Census	12	Column C adiusted for	12	From column D [29]			12
	Employment	6,220	NAICS codes 331315, 331316,	3,110	establishments that don't recycle	2,799	Column D adjusted for			2,799
	Annual Payroll	257,546	331319, and 331421. [15], [26]	128,773	[27]	115,896	non-covered activities [29]			115,896
	Estimated Receipts	1,919,116		959,558		863,602				863,602
	Estimated Throughput			231	1997 Economic Census [28]	231	From column D [29]			231

APPENDIX F – STATE DATA TABLES

		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 Establishments 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	
10. Nonferrous Foundries	Establishments			101	U.S. Census. 1997 Econ. Census	101	From column D [29]			101
	Employment			4,789	NAICS codes 331521, 331524,	4,310	Column D adjusted for			4,310
	Annual Payroll			150,946	331525, 331528. [15], [30]	135,851	non-covered activities [29]			135,851
	Estimated Receipts			549,566		494,609				494,609
	Estimated Throughput			33	1997 Economic Census [31]	33	From column D [29]			33
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments			10	U.S. Census, 1997 Econ. Census			10	From Column D [34]	10
	Employment			1,059	NAICS code 3221. [15], [32]			1,006	Column D adjusted for	1,006
	Annual Payroll			49,110				46,655	non-covered activities [34]	46,655
	Estimated Receipts			291,096				276,541		276,541
	Estimated Throughput			839	AF&PA data [33]			839	From Column D [34]	839
12. Paper-Based Product Manufacturers	Establishments							7	REI Study Database[10]	7
	Employment							143	Results extrapolated based on	143
	Annual Payroll							6,294	Illinois survey statistical mean	6,294
	Estimated Receipts							31,469	(n=3). [11]	31,469
	Estimated Throughput							63	R. W. Beck estimate [35]	63
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					1	REI Study Database[10]			1
	Employment					(D)	[36]			(D)
	Annual Payroll					(D)				(D)
	Estimated Receipts					(D)				(D)
	Estimated Throughput					(D)				(D)
14. Plastics Reclaimers	Establishments							38	APC Database [37]	38
	Employment							1,268		1,268
	Annual Payroll							37,351	Derivation -'97 Econ. Census [37]	37,351
	Estimated Receipts							106,816	Derivation - Plastics News [37]	106,816
	Estimated Throughput							198	APC Database [37]	198
15. Plastics Converters	Establishments	905	SPI Economic Report 2000 for	147	Derivation; from SPI data [39]	147	From Column D [41]			147
	Employment	93,600	NAICS codes 325991 and 3261	15,243	Derivation; from SPI data [39]	12,195	Column D adjusted for			12,195
	Annual Payroll	2,876,600	plus captive plastics converting	468,475	Derivation; from SPI data [39]	374,780	non-covered activities [41]			374,780
	Estimated Receipts	14,921,600	[38]	2,430,089	Derivation; from SPI data [39]	1,944,071				1,944,071
	Estimated Throughput			180	APC Database [40]	180	From Column D [41]			180
16. Rubber Product Manufacturers	Establishments					4	REI Study Database[10]			4
	Employment					226	Results extrapolated based on			226
	Annual Payroll					11,253	Illinois survey statistical mean			11,253
	Estimated Receipts					22,505	(n=2). [11]			22,505
	Estimated Throughput					54	Derivation [42]			54
17. Steel mills	Establishments	19	U.S. Census, 1997 Econ. Census	9	Column C minus non-integrated			9	From Column D [46]	9
	Employment	10,903	NAICS Code 331111[43]	9,683	mills (NAICS code 3311114) [44]			9,199	Column D adjusted for	9,199
	Annual Payroll	483,485		428,945				407,498	non-covered activities [46]	407,498
	Estimated Receipts	3,583,475		3,097,905				2,943,010		2,943,010
	Estimated Throughput			3,735	Derivation [45]			3,735	From Column D [46]	3,735
18. Iron and Steel foundries	Establishments			58	U.S. Census. 1997 Econ. Census	58	From Column D [49]			58
	Employment			6,094	NAICS code 33151. [15], [47]	5,789	Column D adjusted for non-			5,789
	Annual Payroll			211,467		200,894	covered activities D [49]			200,894
	Estimated Receipts			832,591		790,961				790,961
	Estimated Throughput			527	1997 Economic Census [48]	527	From Column D [49]			527
19. Other Recycling Processors/Manufacturers	Establishments					11	REI Study Database [10]			11
	Employment					257	Results extrapolated based on			257
	Annual Payroll					5,364	Illinois survey statistical mean			5,364
	Estimated Receipts					57,216	(n=3). [11]			57,216
	Estimated Throughput					284	Derivation [50]			284
Recycling Industry Subtotals	**Establishments**					342		1,137		1,479
	Employment					26,860		21,940		48,800
	Annual Payroll					888,758		828,667		1,717,425
	Estimated Receipts					4,373,933		7,246,151		11,620,084

continued

		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 Establishments 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 Remanufacturers	Establishments					9	REI Study Database [10]			9
	Employment					232	Results extrapolated based on			232
	Annual Payroll					5,240	Illinois survey statistical mean			5,240
	Estimated Receipts					22,767	(n=4). [11]			22,767
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							217	U.S. Census, 1997 Econ. Census	217
	Employment							2,137	NAICS code 421140: [15], [51]	2,137
	Annual Payroll							51,225		51,225
	Estimated Receipts							246,427		246,427
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							652	U.S. Census, 1997 Econ. Census	652
	Employment							3,632	NAICS code 453310: [15], [52]	3,632
	Annual Payroll							43,117		43,117
	Estimated Receipts							220,524		220,524
	Estimated Throughput							N/A		N/A
23. Tire Retreaders	Establishments							27	U.S. Census, 1997 Econ. Census	27
	Employment							487	NAICS code 326212; [15], [53]	487
	Annual Payroll							11,502		11,502
	Estimated Receipts							58,200		58,200
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					16	REI Study Database [10]			16
	Employment					312	Results extrapolated based on			312
	Annual Payroll					7,147	Illinois survey statistical mean			7,147
	Estimated Receipts					26,058	(n=6). [11]			26,058
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							2	REI Study Database [10]	2
	Employment							(D)	[35]	(D)
	Annual Payroll							(D)		(D)
	Estimated Receipts							(D)		(D)
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					10	REI Study Database [10]			10
	Employment					649	Results extrapolated based on			649
	Annual Payroll					13,981	Illinois survey statistical mean			13,981
	Estimated Receipts					73,124	n=(5). [11]			73,124
	Estimated Throughput					N/A				N/A
Reuse Industry Subtotals	**Establishments**					35		898		933
	Employment					1,193		6,256		7,449
	Annual Payroll					26,368		105,844		132,212
	Estimated Receipts					121,949		525,151		647,100

GRAND TOTALS	**Establishments**					377		2,035		2,412
Recycling and Reuse/Remanufacturing	**Employment**					28,053		28,196		56,249
	Annual Payroll					915,126		934,511		1,849,637
	Estimated Receipts					4,495,881		7,771,302		12,267,184

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.

Summary of Calculations

Data Type	Calculation[1]
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+N*P)*12 months/year

[1]Variables are defined in the following table.

Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	8,051,000	BioCycle (11/2000)
B	Persons per household	2.65	U. S. Census Bureau
C	Homes collected per truck per day	900	R. W. Beck Estimate
D	Percent of homes collected by government staffed collection	43%	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, etc.	5%	R. W. Beck Estimate
I	Average payroll per employee	$34,750	1997 U. S. Economic Census
J	Recycling collection cost per household per month	$2.15	R. W. Beck Estimate
K	Number of curbside programs	474	BioCycle (11/2000)
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	100%	Estimated from BioCycle (11/2000)
O	Percent of year collection takes place	66%	R. W. Beck Estimate
P	Yard Waste Collection Cost per Household per Month	$1.90	R. W. Beck Estimate

7 Throughput is estimated based on per-employee collection averages from Ohio due to the unavailability of Illinois data.
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."
9 Throughput is from the Illinois EPA publication *Nonhazardous Solid Waste Management and Landfill Capacity in Illinois, 1998 Annual Report* minus throughput by government staffed curbside collection.
10 Number of establishments for all survey categories is based on the REI study database.
11 Unless noted otherwise, number of employees, payroll, and receipts for all survey categories is based on a statistical analysis of Illinois 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."

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 from the Illinois EPA publication *Nonhazardous Solid Waste Management and Landfill Capacity in Illinois, 1998 Annual Report.*
14 Throughput is derived by multiplying an estimate for curbside tons by an estimate for the percentage of material collected that is processed by MRF's.
15 Data obtained from the U.S. Census, 1997 Economic Census. See Section 3.2.1.2 for a detailed description of the use of Census Bureau statistics.
16 Data are taken directly from U.S. Census, 1997 Economic Census for NAICS code 421930 – 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.
17 Throughput for Recyclable Material Wholesalers is derived as follows:
Government Staffed Collection Throughput + Private Staffed Collection Throughput – Compost/Organics Throughput – Materials Recovery Facilities Throughput.
18 The 1997 Economic Census figures included five glass container manufacturing establishments. Subsequent to the Census, one establishment was closed. Census figures have therefore been reduced by 20 percent due to the plant closure.
19 Throughput is estimated based on 1997 Economic Census reports showing a national average of 114 tons of cullet per employee multiplied by the number of Illinois employees.
20 Number of establishments and throughput are taken from Column D with no adjustments. Employment, annual payroll, and estimated receipts are derived from Column D with an adjustment for the percent of covered activities (90 percent).
21 Number of employees, payroll, and receipts for Glass Product Producers are based on a statistical analysis of survey results for Ohio. Those statistics were used because no Illinois establishments provided survey data.
22 Throughput is estimated as 76 tons per employee based on an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois 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 the 1997 Economic Census for NAICS codes 331314, 331423, and 331492.
24 Throughput for nonferrous smelting and refining is estimated based on national scrap consumption for smelting and refining mills from the 1997 Economic Census and information from the USGS' publication *Minerals Information – 1997, Recycling – Metals*. Allocation to the state level is based on a ratio of state employment to national employment for this industry.
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 the 1997 Economic Census for NAICS codes 331315, 331316, 331319, and 331421 with no adjustments.
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 nationwide scrap purchases for this industry as reported in the 1997 Economic Census. Allocation to the state level is based on a ratio of state employment to national employment for this industry.
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 the 1997 Economic Census for NAICS codes 331521, 331524, 331525, and 331528, with no adjustments.
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 NAICS code) / ($0.45/lb for aluminum or $0.72/lb. for copper) / (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 Mills is taken from the 1997 Economic Census for NAICS code 3221 with no adjustments.
33 Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999). Throughput numbers used are for 1997 to coincide with the data from the 1997 Economic Census.
34 Estimates of employees, 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 adjustments. AF&PA's *Paper Matcher* and Lockwood Post's *Directory of the Pulp, Paper, and Allied Trades* revealed that all Illinois paper mills depend on recovered paper.
35 Throughput is estimated by multiplying employees times a tons per employee figure (277) derived from an average of survey responses from the U.S. Recycling Economic Information Study.
36 (D) indicates that figures cannot be reported in order to avoid disclosure of individual company information.
37 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 Illinois plastics industry employees ($29,457). Estimated receipts is calculated by multiplying throughput of recycled resins produced times an average of recycled resin prices from Plastics News. Throughput is derived from per-employee averages from American Plastics Council statistics as compiled by R. W. Beck.
38 Establishments, employees, payroll, and receipts in column C for Plastics Converters are obtained from the Society of the Plastics Industry's *Economic Report 2000* for plastics converters (NAICS codes 325991 and 3261) plus additional estimates for captive plastics converting operations by establishments classified in other non-plastics industries.
39 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).
40 Throughput is calculated from the state's percentage of national plastics converter employees multiplied by the total tons of plastics recycled nationally (APC Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled).
41 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).
42 Throughput is estimated by multiplying employees times a tons per employee figure (240) derived from an average of survey responses from the U.S. Recycling Economic Information Study.
43 Data for Steel Mills comes from the 1997 Economic Census for NAICS code 331111 with no adjustments.
44 Establishments, employees, payroll, and revenue figures are derived from Column C by excluding non-integrated mills (NAICS 3311114), which do not make steel.
45 Throughput is calculated as state's percentage of national steel mill employees multiplied by the total tons of steel scrap consumed (1997 Economic Census) by steel mills nationally.
46 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, utilizing anywhere from 15 percent-100 percent recovered steel. Therefore, the only deduction taken is to account for non-covered activities. Establishments and throughput are from Column D with no adjustment.
47 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.

48 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).
49 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.
50 Throughput is estimated by multiplying employees times a tons per employee figure (1,105) derived from an average of survey responses from the U.S. Recycling Economic Information Study.
51 The 1997 Economic Census only reported number of establishments for Motor Vehicle Parts to avoid disclosing individual company information. Estimates for employment, payroll, and receipts are derived from Illinois per-establishment average data from the U.S. Census' 1996 Standard Statistical Establishments List for SIC code 5015 (Motor Vehicle Parts) times the number of establishments from the 1997 Economic Census for NAICS code 421140.
52 Estimates for Retail Used Merchandise Sales are taken directly from the 1997 Economic Census for NAICS code 453310 with no adjustments.
53 Estimates for Tire Retreaders are taken directly from the 1997 Economic Census for NAICS code 326212 with no adjustments.

Table F-4
Indiana 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 at the end of the data table.
(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.

		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 Establishments 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 Collection	Establishments							57	Derivation; multiple sources [6]	57
	Employment							290	Derivation; multiple sources [6]	290
	Annual Payroll							7,167	Derivation; multiple sources [6]	7,167
	Estimated Receipts							12,922	Derivation; multiple sources [6]	12,922
	Estimated Throughput							246	Derivation; multiple sources [7]	246
2. Private Staffed Collection	Establishments							112	Derivation; multiple sources [8]	112
	Employment							560	Derivation; multiple sources [8]	560
	Annual Payroll							13,839	Derivation; multiple sources [8]	13,839
	Estimated Receipts							25,083	Derivation; multiple sources [8]	25,083
	Estimated Throughput							1,106	Derivation; multiple sources [9]	1,106
3. Compost and Miscellaneous Organics Producers	Establishments							106	REI Study Database [10]	106
	Employment							848	Results extrapolated based on	848
	Annual Payroll							21,110	Indiana survey statistical mean	21,110
	Estimated Receipts							220,909	(n=51). [11], [12]	220,909
	Estimated Throughput							210	IDEM 1999 data [13]	210
4. Materials Recovery Facilities (MRFs)	Establishments							48	REI Study Database [10]	48
	Employment							672	Results extrapolated based on	672
	Annual Payroll							12,970	Indiana survey statistical mean	12,970
	Estimated Receipts							76,484	(n=27). [11]	76,484
	Estimated Throughput							484	Derivation; multiple sources [14]	484
5. Recyclable Material Wholesalers	Establishments							256	US Census SSEL 1996 SIC	256
	Employment							4,247	code 5093. [15], [16]	4,247
	Annual Payroll							126,556		126,556
	Estimated Receipts							1,322,875		1,322,875
	Estimated Throughput							657	Derivation [17]	657
6. Glass Container Manufacturing Plants	Establishments					4	REI Study Database [10]			4
	Employment					950	Results extrapolated based on			950
	Annual Payroll					50,667	Indiana survey statistical mean			50,667
	Estimated Receipts					237,500	(n=3). [11]			237,500
	Estimated Throughput					108	1997 Economic Census [18]			108
7. Glass Product Producers (other recycled uses)	Establishments					5	REI Study Database [10]			5
	Employment					965	Results extrapolated based on			965
	Annual Payroll					28,511	Indiana survey statistical mean			28,511
	Estimated Receipts					57,458	(n=3). [11]			57,458
	Estimated Throughput					73	Derivation [19]			73
8. Nonferrous secondary smelting and refining mills	Establishments			22	US Census SSEL 1996; SIC			22	From Column D [22]	22
	Employment			1,319	code 3341. [15], [20]			1,253	Column D adjusted for	1,253
	Annual Payroll			47,683				45,299	non-covered activities [22]	45,299
	Estimated Receipts			685,645				651,363		651,363
	Estimated Throughput			221	1992 Economic Census [21]			221	From Column D [22]	221

continued

APPENDIX F – STATE DATA TABLES

		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 Establishments 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	
9. Nonferrous product producers	Establishments	30	U.S. Census SSEL, 1996; SIC	15	Column C adjusted for	15	From Column D [26]			15
	Employment	6,352	codes 3351-3356. [15], [23]	3,176	non-recycling establishments [24]	2,858	Column D adjusted for			2,858
	Annual Payroll	262,514		131,257		118,131	non-covered activities [26]			118,131
	Estimated Receipts	2,184,231		1,092,116		982,904				982,904
	Estimated Throughput			208	1997 Economic Census [25]	208	From Column D [26]			208
10. Nonferrous foundries	Establishments			67	US Census SSEL 1996; SIC	67	From Column D [26]			67
	Employment			7,610	codes 3363-3369. [15], [27]	6,849	Column D adjusted for			6,849
	Annual Payroll			293,184		263,866	non-covered activities [26]			263,866
	Estimated Receipts			1,055,345		949,811				949,811
	Estimated Throughput			49	1997 Economic Census [28]	49	From Column D [26]			49
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments			14	US Census SSEL 1996; SIC	1	From Column D [31]	13	Derived from Column D with	14
	Employment			1,199	codes 2611, 2621, and 2631.	176	Derived from Column D with	900	data from AF&PA [32]	1,076
	Annual Payroll			49,776	[15], [29]	7,317	AF&PA data and adjustment	37,357		44,674
	Estimated Receipts			335,401		49,304	for non-covered activities [31]	251,718		301,022
	Estimated Throughput			834	Derived from AF&PA data [30]	175	Column D - Column F [31]	659	Derived from Column D [32]	834
12. Paper-based Product Manufacturers	Establishments							9	REI Study Database[10]	9
	Employment							728	Results extrapolated based on	728
	Annual Payroll							19,725	Indiana survey statistical mean	19,725
	Estimated Receipts							87,000	(n=3). [11]	87,000
	Estimated Throughput							93	Derived from AF&PA data [33]	93
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					24	REI Study Database[10]			24
	Employment					936	Results extrapolated based on			936
	Annual Payroll					32,908	Indiana survey statistical mean			32,908
	Estimated Receipts					232,198	(n=13). [11]			232,198
	Estimated Throughput					7,894	Derivation [34]			7,894
14. Plastics Reclaimers	Establishments							29	APC Database [35]	29
	Employment							566	APC Database [35]	566
	Annual Payroll							16,482	Derivation 1997 U.S. Census [35]	16,482
	Estimated Receipts							47,680	Plastics News [35]	47,680
	Estimated Throughput							88	APC Database [35]	88
15. Plastics Converters	Establishments	652	Probe Economics [36]	106	Derivation; from SPI data [37]	106	From Column D [39]			106
	Employment	57,548	Probe Economics [36]	9,372	Derivation; from SPI data [37]	7,498	Column D adjusted for			7,498
	Annual Payroll	1,502,800	Probe Economics [36]	244,742	Derivation; from SPI data [37]	195,793	non-covered activities [39]			195,793
	Estimated Receipts	10,961,600	Probe Economics [36]	1,785,175	Derivation; from SPI data [37]	1,428,140				1,428,140
	Estimated Throughput			117	APC Database [38]	117	From Column D [39]			117
16. Rubber Product Manufacturers	Establishments					10	REI Study Database[10]			10
	Employment					133	Results extrapolated based on			133
	Annual Payroll					2,341	Indiana survey statistical mean			2,341
	Estimated Receipts					11,709	(n=4). [11]			11,709
	Estimated Throughput					36	Derivation [40]			36
17. Steel mills	Establishments	18	U.S. Census, 1997 Econ. Census	12	Column C minus non-integrated			12	From Column D [44]	12
	Employment	30,605	NAICS Code 331111[41]	29,873	mills (NAICS code 3311114) [42]			28,379	Column D adjusted for	28,379
	Annual Payroll	1,689,945		1,657,221				1,574,360	non-covered activities [44]	1,574,360
	Estimated Receipts	11,298,600		11,007,258				10,456,895		10,456,895
	Estimated Throughput			11,523	Derivation [43]			11,523	From Column D [44]	11,523

continued

		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 Establishments 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			57	US Census SSEL 1996; SIC	57	From Column D [47]			57
	Employment			11,241	codes 3321-3325. [15], [45]	10,679	(Column D-Column F) adjusted			10,679
	Annual Payroll			441,634		419,552	for non-covered activities D [47]			419,552
	Estimated Receipts			1,479,196		1,405,236				1,405,236
	Estimated Throughput			972	1997 Economic Census [46]	972	From Column D [47]			972
19. Other Recycling Processors/Manufacturers	Establishments					12	REI Study Database [10]			12
	Employment					399	Results extrapolated based on			399
	Annual Payroll					17,185	Indiana survey statistical mean			17,185
	Estimated Receipts					38,283	(n=6). [11]			38,283
	Estimated Throughput					87	Derivation [48]			87
Recycling Industry Subtotals	**Establishments**					301		664		965
	Employment					31,443		38,443		69,886
	Annual Payroll					1,136,272		1,874,865		3,011,136
	Estimated Receipts					5,392,543		13,152,929		18,545,471

continued

APPENDIX F – STATE DATA TABLES

		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 Establishments 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					5	REI Study Database [10]			5
	Employment					25	Results extrapolated based on			25
	Annual Payroll					656	Indiana survey statistical mean			656
	Estimated Receipts					3,729	(n=3). [11]			3,729
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							169	US Census SSEL, 1996	169
	Employment							1,261	SIC code 5015; [15], [49]	1,261
	Annual Payroll							24,588		24,588
	Estimated Receipts							119,825		119,825
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							512	US Census SSEL, 1996	512
	Employment							3,092	SIC code 5932; [15], [50]	3,092
	Annual Payroll							36,891		36,891
	Estimated Receipts							172,265		172,265
	Estimated Throughput							N/A		N/A
23. Tire Retreaders	Establishments							43	US Census SSEL, 1996	43
	Employment							292	SIC code 7534; [15], [51]	292
	Annual Payroll							6,520		6,520
	Estimated Receipts							33,616		33,616
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					10	REI Study Database [10]			10
	Employment					330	Results extrapolated based on			330
	Annual Payroll					5,450	Indiana survey statistical mean			5,450
	Estimated Receipts					25,208	(n=6). [11]			25,208
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							1	REI Study Database [10]	1
	Employment							(D)	[52]	(D)
	Annual Payroll							(D)		(D)
	Estimated Receipts							(D)		(D)
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					4	REI Study Database [10]			4
	Employment					84	Results extrapolated based on			84
	Annual Payroll					1,092	NERC survey statistical mean			1,092
	Estimated Receipts					8,820	(n=15). [53]			8,820
	Estimated Throughput					N/A				N/A
Reuse Industry Subtotals	**Establishments**					19		725		744
	Employment					439		4,645		5,084
	Annual Payroll					7,198		67,999		75,197
	Estimated Receipts					37,757		325,706		363,463

GRAND TOTALS	**Establishments**					320		1,389		1,709
Recycling and Reuse/Remanufacturing	**Employment**					31,882		43,088		74,970
	Annual Payroll					1,143,470		1,942,864		3,086,333
	Estimated Receipts					5,430,300		13,478,635		18,908,934

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.

Summary of Calculations

Data Type	Calculation[1]
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

[1]Variables are defined in the following table.

Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	4,133,000	BioCycle (4/99)
B	Persons per household	2.61	U. S. Census Bureau
C	Homes collected per truck per day	900	R. W. Beck 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, etc.	5%	R. W. Beck Estimate
I	Average payroll per employee	$24,713	1997 U. S. Economic Census
J	Recycling collection cost per household per month	$2.00	R. W. Beck Estimate
K	Number of curbside programs	169	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	50%	Estimated from BioCycle (5/98)
O	Percent of year collection takes place	66%	R. W. Beck Estimate

7 Throughput tonnage for Indiana is estimated based on per-employee collection averages from the Northeast.
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."
9 Throughput is equal to total state recycling collection of all recyclables (as reported in BioCycle, April 1999 edition) minus throughput by government staffed curbside collection.
10 Number of establishments for all survey categories is based on the REI study database.
11 Unless noted otherwise, number of employees, payroll, and receipts 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."

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 comes from an on-line registered compost facility database maintained by the Indiana Department of Environmental Management, Office of Land Quality.
14 Throughput is derived by multiplying an estimate for curbside tons by an estimate for the percentage of material collected that is processed by MRFs.
15 Data derived from the 1996 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.
16 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.
17 Throughput for Recyclable Material Wholesalers is derived as follows:
Government Staffed Throughput + Private Staffed Throughput – Compost/Organics Throughput – Materials Recovery Facilities Throughput.
18 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.
19 Throughput is estimated as 76 tons per employee based on an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois and Glass Packaging Institute secondary glass use data of 614,000 tons per year nationally.
20 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.
21 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.
22 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.
23 Data for Nonferrous Product Producers is taken from U.S. Census SSEL for SIC codes 3351-3355 with no adjustments.
24 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 USGS nonferrous metals specialists.
25 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.
26 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.
27 Data for Nonferrous Foundries is taken from U.S. Census SSEL for SIC codes 3363, 3365, 3366, and 3369, with no adjustments.
28 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.
29 Data for Paper, Paperboard, and Deinked Market Pulp Producers is taken from the U.S. Census SSEL for SIC codes 2611, 2621, and 2631, with no adjustments.
30 Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999). Throughput numbers used are for 1996 to coincide with the data from U.S. Census SSEL.
31 Only one Indiana establishment consumes virgin fiber according to data from AF&PA's *Paper Matcher* – employment, payroll, and receipts figures are derived from the ratio of that mill's capacity to the state-wide mill capacity (taken from Lockwood Post's Directory of the Pulp Paper and Allied Trades) times Column D and again by 70 percent (average percent of employees involved in covered recycling–related activities in mills that are not entirely dependent on recycling). Throughput is equal to Column D – Column F.
32 Only one Indiana establishment consumes virgin fiber according to data from AF&PA's *Paper Matcher* – employment, payroll, receipts and throughput figures are derived from the ratio of the remaining recycling-dependent mills' capacity to the state-wide mill capacity (taken from Lockwood Post's Directory of the Pulp Paper and Allied Trades) times Column D times 95 percent (adjustment for non-covered activities). Note that there was no need to discount throughput for non-covered activities.
33 Throughput is estimated by multiplying employees times a tons per employee figure (260) derived from an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois.
34 Throughput is estimated by multiplying employees times a tons per employee figure derived from an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois.
35 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 throughput of recycled resins produced times an average of recycled resin prices from Plastics News.
36 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).
37 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).
38 Throughput is calculated from the state's percentage of national plastics converter employees multiplied by the total tons of plastics recycled nationally (APC Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled).
39 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).
40 Throughput is estimated by multiplying employees times a tons per employee figure (272) derived from an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois.
41 Steel Mill data comes from the U.S. Census Bureau's 1997 Economic Census, Geographic Area Series.
42 Establishments, employees, payroll, and revenue figures are derived from Column C by excluding non-integrated mills, which do not make steel.
43 Throughput is calculated as state's percentage of national steel mill employees multiplied by the total tons of steel scrap consumed (1997 Economic Census) by steel mills nationally.

44 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, utilizing anywhere from 15 percent-100 percent recovered steel. Therefore, the only deduction taken is to account for non-covered activities. Establishments and throughput are from Column D with no adjustment.
45 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.
46 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).
47 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.
48 Throughput is estimated by multiplying employees times a tons per employee figure (218) derived from an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois.
49 Estimates for Motor Vehicle Parts are taken directly from U.S. Census SSEL for SIC code 5015 with no adjustments.
50 Estimates for Retail Used Merchandise Sales are taken directly from U.S. Census SSEL for SIC code 5932 with no adjustments.
51 Estimates for Tire Retreaders are taken directly from U.S. Census SSEL for SIC code 7534 with no adjustments.
52 (D) indicates that figures cannot be reported in order to avoid disclosure of individual company information.
53 Number of employees, payroll, and receipts for Other Reuse are based on a statistical analysis of survey results for the ten states of the Northeast Recycling Council (NERC). Those statistics were used in order to ensure greater statistical confidence in the results, and only after the statistics for Indiana establishments were determined to be within the confidence interval of the NERC results.

Table F-5
Nebraska 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 at the end of the data table.
(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.

		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 Establishments 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 Collection	Establishments							3	Derivation; multiple sources [6]	3
	Employment							20	Derivation; multiple sources [6]	20
	Annual Payroll							454	Derivation; multiple sources [6]	454
	Estimated Receipts							803	Derivation; multiple sources [6]	803
	Estimated Throughput							17	Derivation; multiple sources [7]	17
2. Private Staffed Collection	Establishments							12	Derivation; multiple sources [8]	12
	Employment							90	Derivation; multiple sources [8]	90
	Annual Payroll							2,042	Derivation; multiple sources [8]	2,042
	Estimated Receipts							3,213	Derivation; multiple sources [8]	3,213
	Estimated Throughput							563	Derivation; multiple sources [9]	563
3. Compost and Miscellaneous Organics Producers	Establishments							18	REI Study Database [10]	18
	Employment							118	Results extrapolated based on	118
	Annual Payroll							2,595	Nebraska survey statistical mean	2,595
	Estimated Receipts							6,812	(n=12). [11], [12]	6,812
	Estimated Throughput							148	Derivation [13]	148
4. Materials Recovery Facilities (MRFs)	Establishments							14	REI Study Database [10]	14
	Employment							98	Results extrapolated based on	98
	Annual Payroll							1,298	Nebraska survey statistical mean	1,298
	Estimated Receipts							13,130	(n=7). [11]	13,130
	Estimated Throughput							25	Derivation; multiple sources [14]	25
5. Recyclable Material Wholesalers	Establishments							66	US Census SSEL 1996 SIC	66
	Employment							549	code 5093. [15], [16]	549
	Annual Payroll							11,246		11,246
	Estimated Receipts							126,749		126,749
	Estimated Throughput							407	Derivation [17]	407
6. Glass Container Manufacturing Plants	Establishments					0	[18]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0
7. Glass Product Producers (other recycled uses)	Establishments					0	[18]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					0				0
8. Nonferrous secondary smelting and refining mills	Establishments			1	US Census SSEL 1996; SIC			1	From Column D [21]	1
	Employment			2	code 3341. [15], [19]			2	Column D adjusted for	2
	Annual Payroll			69				66	non-covered activities [21]	66
	Estimated Receipts			1,001				951		951
	Estimated Throughput			0	1992 Economic Census [20]			0	From Column D [21]	0
9. Nonferrous product producers	Establishments	3	U.S. Census SSEL, 1996; SIC	2	Column C adjusted for	2	From column D [25]			2
	Employment	60	codes 3351-3356. [15], [22]	30	non-recycling establishments [23]	27	Column D adjusted for			27
	Annual Payroll	2,223		1,112		1,000	non-covered activities [25]			1,000
	Estimated Receipts	23,701		11,851		10,665				10,665
	Estimated Throughput			2	1997 Economic Census [24]	2	From column D [25]			2

continued

		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 Establishments 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	
10. Nonferrous foundries	Establishments			7	US Census SSEL 1996: SIC	7	From column D [25]			7
	Employment			140	codes 3363-3369. [15], [26]	126	Column D adjusted for			126
	Annual Payroll			4,136		3,722	non-covered activities [25]			3,722
	Estimated Receipts			14,793		13,314				13,314
	Estimated Throughput			1	1997 Economic Census [24]	1	From column D [25]			1
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	0	[18]							0
	Employment	0								0
	Annual Payroll	0								0
	Estimated Receipts	0								0
	Estimated Throughput	0								0
12. Paper-based Product Manufacturers	Establishments							0	[18]	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					40	Results extrapolated based on			40
	Annual Payroll					949	Nebraska survey statistical mean			949
	Estimated Receipts					4,875	(n=4). [11]			4,875
	Estimated Throughput					337	Derivation [27]			337
14. Plastics Reclaimers	Establishments							17	APC Database [28]	17
	Employment							98	APC Database [28]	98
	Annual Payroll							2,854	Derivation 1997 U.S. Census [28]	2,854
	Estimated Receipts							8,256	Plastics News [28]	8,256
	Estimated Throughput							8	APC Database [28]	8
15. Plastics Converters	Establishments	69	Probe Economics [29]	11	Derivation: from SPI data [30]	11	From Column D [32]			11
	Employment	5,304	Probe Economics [29]	864	Derivation; from SPI data [30]	691	Column D adjusted for			691
	Annual Payroll	129,948	Probe Economics [29]	21,163	Derivation; from SPI data [30]	16,930	non-covered activities [32]			16,930
	Estimated Receipts	774,826	Probe Economics [29]	126,186	Derivation; from SPI data [30]	100,949				100,949
	Estimated Throughput			8	APC Database [31]	8	From Column D [32]			8
16. Rubber Product Manufacturers	Establishments					4	REI Study Database[10]			4
	Employment					84	Results extrapolated based on			84
	Annual Payroll					1,596	NERC survey statistical mean			1,596
	Estimated Receipts					7,728	(n=15). [11], [33]			7,728
	Estimated Throughput					23	Derivation [34]			23
17. Steel mills	Establishments			1	Nebraska Dept. of Economic Dev.			1	From Column D [35]	1
	Employment			428	Nebraska Dept. of Economic Dev.			407	Column D adjusted for	407
	Annual Payroll			26,500	Nebraska Dept. of Economic Dev.			25,175	non-covered activities [35]	25,175
	Estimated Receipts			220,000	Nebraska Dept. of Economic Dev.			209,000		209,000
	Estimated Throughput			130	Nebraska Dept. of Economic Dev.			130	From Column D [35]	130
18. Iron and Steel foundries	Establishments			6	US Census SSEL 1996: SIC	6	From Column D [38]			6
	Employment			465	codes 3321-3325. [15], [36]	442	Column D adjusted for			442
	Annual Payroll			16,754		15,916	non-covered activities [38]			15,916
	Estimated Receipts			56,757		53,919				53,919
	Estimated Throughput			40	1997 Economic Census [37]	40	From Column D [38]			40
19. Other Recycling Processors/Manufacturers	Establishments					6	REI Study Database [10]			6
	Employment					216	Results extrapolated based on			216
	Annual Payroll					3,024	NERC survey statistical mean			3,024
	Estimated Receipts					21,816	(n=30). [11], [33]			21,816
	Estimated Throughput					47	Derivation [39]			47
Recycling Industry Subtotals	**Establishments**					40		132		172
	Employment					1,626		1,382		3,007
	Annual Payroll					43,138		45,729		88,868
	Estimated Receipts					213,266		368,913		582,179

continued

APPENDIX F – STATE DATA TABLES

		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 Establishments 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	[18]			0
	Employment					0				0
	Annual Payroll					0				0
	Estimated Receipts					0				0
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							64	US Census SSEL, 1996	64
	Employment							428	SIC code 5015; [15], [40]	428
	Annual Payroll							9,198		9,198
	Estimated Receipts							43,755		43,755
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							158	US Census SSEL, 1996	158
	Employment							762	SIC code 5932; [15], [41]	762
	Annual Payroll							8,330		8,330
	Estimated Receipts							39,539		39,539
	Estimated Throughput							N/A		N/A
23. Tire Retreaders	Establishments							11	US Census SSEL, 1996	11
	Employment							73	SIC code 7534; [15], [42]	73
	Annual Payroll							1,962		1,962
	Estimated Receipts							10,446		10,446
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					4	REI Study Database [10]			4
	Employment					32	Results extrapolated based on			32
	Annual Payroll					515	Nebraska survey statistical mean			515
	Estimated Receipts					3,188	(n=3), [11]			3,188
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							1	REI Study Database [10]	1
	Employment							(D)	[43]	(D)
	Annual Payroll							(D)		(D)
	Estimated Receipts							(D)		(D)
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					7	REI Study Database [10]			7
	Employment					21	Results extrapolated based on			21
	Annual Payroll					319	Nebraska survey statistical mean			319
	Estimated Receipts					4,025	(n=4), [11]			4,025
	Estimated Throughput					N/A				N/A
Reuse Industry Subtotals	**Establishments**					11		234		245
	Employment					53		1,263		1,316
	Annual Payroll					834		19,490		20,324
	Estimated Receipts					7,213		93,740		100,953

GRAND TOTALS	**Establishments**					51		366		417
Recycling and Reuse/Remanufacturing	**Employment**					1,679		2,645		4,323
	Annual Payroll					43,972		65,219		109,192
	Estimated Receipts					220,479		462,653		683,132

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.

Summary of Calculations

Data Type	Calculation[1]
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

[1]Variables are defined in the following table.

Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	425,000	BioCycle (4/99)
B	Persons per household	2.54	U. S. Census Bureau
C	Homes collected per truck per day	900	R. W. Beck Estimate
D	Percent of homes collected by government staffed collection	20%	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, etc.	5%	R. W. Beck Estimate
I	Average payroll per employee	$22,692	1997 U. S. Economic Census
J	Recycling collection cost per household per month	$2.00	R. W. Beck Estimate
K	Number of curbside programs	15	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	100%	Estimated from BioCycle (5/98)
O	Percent of year collection takes place	66%	R. W. Beck Estimate

7 Throughput tonnage for Nebraska is estimated based on per-employee collection averages from the Northeast.
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.”
9 Throughput is equal to total state recycling collection of all recyclables (as reported in BioCycle, April 1999 edition) minus throughput by government staffed curbside collection.
10 Number of establishments for all survey categories is based on the REI study database.
11 Unless noted otherwise, number of employees, payroll, and receipts 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.”
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 tonnage for Nebraska is estimated based on per-employee averages from the Northeast.
14 Throughput is derived by multiplying an estimate for curbside tons by an estimate for the percentage of material collected that is processed by MRFs.
15 Data derived from the 1996 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.
16 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.
17 Throughput for Recyclable Material Wholesalers is derived as follows:
Government Staffed Throughput + Private Staffed Throughput – Compost/Organics Throughput – Materials Recovery Facilities Throughput.
18 No Nebraska establishments.
19 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.
20 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.
21 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.
22 Data for Nonferrous Product Producers is taken from U.S. Census SSEL for SIC codes 3351-3355 with no adjustments.
23 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.
24 Throughput 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.
25 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.
26 Data for Nonferrous Foundries is taken from U.S. Census SSEL for SIC codes 3363, 3365, 3366, and 3369, with no adjustments.
27 Throughput is estimated by multiplying employees times a tons per employee figure derived from an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois.
28 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 throughput of recycled resins produced times an average of recycled resin prices from Plastics News.
29 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).
30 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).

31 Throughput is calculated from the state's percentage of national plastics converter employees multiplied by the total tons of plastics recycled nationally (APC Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled).
32 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).
33 Number of employees, payroll, and receipts are based on a statistical analysis of survey results for the ten states of the Northeast Recycling Council (NERC). Those statistics were used in order to ensure greater statistical confidence in the results, and only after the statistics for Nebraska establishments were determined to be within the confidence interval of the NERC results.
34 Throughput is estimated by multiplying employees times a tons per employee figure (272) derived from an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois.
35 Employment, payroll, and receipts are equal to estimates from Column D multiplied by 95 percent (5 percent deduction to account for downstream conversion). Electric arc furnace that utilizes virtually 100 percent recovered steel. Therefore, the only deduction taken is to account for non-covered activities. Establishments and throughput are from Column D with no adjustment.
36 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.
37 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).
38 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.
39 Throughput is estimated by multiplying employees times a tons per employee figure (218) derived from an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois.
40 Estimates for Motor Vehicle Parts are taken directly from U.S. Census SSEL for SIC code 5015 with no adjustments.
41 Estimates for Retail Used Merchandise Sales are taken directly from U.S. Census SSEL for SIC code 5932 with no adjustments.
42 Estimates for Tire Retreaders are taken directly from U.S. Census SSEL for SIC code 7534 with no adjustments.
43 (D) indicates that figures cannot be reported in order to avoid disclosure of individual company information.

Table F-6
Ohio 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 at the end of the data table.
(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.

		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 Establishments 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 Collection	Establishments							149	Derivation; multiple sources	149
	Employment							700	Derivation; multiple sources	700
	Annual Payroll							18,753	Derivation; multiple sources	18,753
	Estimated Receipts							30,579	Derivation; multiple sources	30,579
	Estimated Throughput							263	OH EPA 1996 data [7]	263
2. Private Staffed Collection	Establishments							223	Derivation; multiple sources	223
	Employment							1,060	Derivation; multiple sources	1,060
	Annual Payroll							28,397	Derivation; multiple sources	28,397
	Estimated Receipts							45,869	Derivation; multiple sources	45,869
	Estimated Throughput							2,164	OH EPA 1996 data [9]	2,164
3. Compost and Miscellaneous Organics Producers	Establishments							241	REI Study Database [10]	241
	Employment							1,248	Survey results extrapolated	1,248
	Annual Payroll							23,509	based on OH responses.	23,509
	Estimated Receipts							78,404	(n=131). [11], [12]	78,404
	Estimated Throughput							495	OH EPA 1996 data [13]	495
4. Materials Recovery Facilities (MRFs)	Establishments							40	REI Study Database [10]	40
	Employment							1,281	Survey results extrapolated	1,281
	Annual Payroll							20,043	based on OH responses.	20,043
	Estimated Receipts							147,939	(n=22). [11], [14].	147,939
	Estimated Throughput							187	OH EPA 1996 data [15]	187
5. Recyclable Material Wholesalers	Establishments							577	U.S. Census SSEL, 1996:	577
	Employment							7,593	code 5093. [16], [17]	7,593
	Annual Payroll							219,846		219,846
	Estimated Receipts							2,392,720		2,392,720
	Estimated Throughput							1,745	Derivation [18]	1,745
6. Glass Container Manufacturing Plants	Establishments					1	REI Study Database [10]			1
	Employment					(D)	[19]			(D)
	Annual Payroll					(D)	[19]			(D)
	Estimated Receipts					(D)	[19]			(D)
	Estimated Throughput					(D)	[19]			(D)
7. Glass Product Producers (other recycled uses)	Establishments					10	REI Study Database [10]			10
	Employment					791	Survey results extrapolated			791
	Annual Payroll					18,194	based on OH responses.			18,194
	Estimated Receipts					120,729	(n=4). [11],[20]			120,729
	Estimated Throughput					60	R. W. Beck estimate [21]			60
8. Nonferrous secondary smelting and refining mills	Establishments			22	U.S. Census SSEL, 1996; SIC			22	From Column D [24]	22
	Employment			1,049	code 3341. [16], [22]			997	Column D adjusted for	997
	Annual Payroll			36,173				34,364	non-covered activities [24]	34,364
	Estimated Receipts			515,698				489,913		489,913
	Estimated Throughput			176	1992 Economic Census [23]			176	From Column D [24]	176
9. Nonferrous product producers	Establishments	45	U.S. Census SSEL, 1996; SIC	23	Column C adjusted for	23	From column D [28]			23
	Employment	6,332	codes 3351-3356. [16], [25]	3,166	non-recycling establishments [26]	2,849	Column D adjusted for			2,849
	Annual Payroll	237,356		118,678		106,810	non-covered activities [28]			106,810
	Estimated Receipts	1,868,642		934,321		840,889				840,889
	Estimated Throughput			207	1997 Economic Census [27]	207	From column D [28]			207

APPENDIX F – STATE DATA TABLES

		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 Establishments 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	
10. Nonferrous foundries	Establishments			161	U.S. Census SSEL, 1996; SIC	161	From column D [28]			161
	Employment			10,619	codes 3363-3369. [16], [29]	9,557	Column D adjusted for			9,557
	Annual Payroll			339,077		305,169	non-covered activities [28]			305,169
	Estimated Receipts			1,198,399		1,078,559				1,078,559
	Estimated Throughput			68	1997 Economic Census [30]	68	From column D [28]			68
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	34	U.S. Census SSEL, 1996; SIC	31	Derived from column C with	17	From Column D [34]	14	Derived from Column D with	31
	Employment	7,792	codes 2611, 2621, and 2631.	7,104	data from AF&PA Paper	2,735	Derived from Column D with	3,037	data from AF&PA [35]	5,772
	Annual Payroll	328,353	[16], [31]	299,381	Matcher. [32]	115,262	data from AF&PA and adjustment	127,985		243,247
	Estimated Receipts	2,116,833		1,930,054		743,071	for non-covered activities [34]	825,098		1,568,169
	Estimated Throughput			1,525	AF&PA [33]	587	Derived from Column D [34]	938	Column D - Column E [35]	1,525
12. Paper-based Product Manufacturers	Establishments							9	REI Study Database [10]	9
	Employment							1,807	Survey results extrapolated	1,807
	Annual Payroll							35,959	based on OH responses.	35,959
	Estimated Receipts							84,236	(n=3). [11],[36]	84,236
	Estimated Throughput							470	R. W. Beck estimate [37]	470
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					20	REI Study Database [10]			20
	Employment					1,446	Survey results extrapolated			1,446
	Annual Payroll					67,260	based on OH responses.			67,260
	Estimated Receipts					280,820	(n=7). [11],[38]			280,820
	Estimated Throughput					12,196	R. W. Beck estimate [39]			12,196
14. Plastics Reclaimers	Establishments							48	APC Database [40]	48
	Employment							561		561
	Annual Payroll							16,336	U.S. Census 1997 [40]	16,336
	Estimated Receipts							47,259	Plastics News [40]	47,259
	Estimated Throughput							88	APC Database [40]	88
15. Plastics Converters	Establishments	1,322	Probe Economics [41]	215	Derivation: from SPI data [42]	215	From Column D [44]			215
	Employment	99,804	Probe Economics [41]	16,254	Derivation; from SPI data [42]	13,003	Column D adjusted for			13,003
	Annual Payroll	2,740,400	Probe Economics [41]	446,294	Derivation; from SPI data [42]	357,035	non-covered activities [44]			357,035
	Estimated Receipts	18,122,000	Probe Economics [41]	2,951,297	Derivation; from SPI data [42]	2,361,038				2,361,038
	Estimated Throughput			193	APC Database [43]	193	From Column D [44]			193
16. Rubber Product Manufacturers	Establishments					6	REI Study Database [10]			6
	Employment					186	Survey results extrapolated			186
	Annual Payroll					3,806	based on OH responses.			3,806
	Estimated Receipts					9,113	(n=4). [11],[45]			9,113
	Estimated Throughput					51	R. W. Beck estimate [46]			51
17. Steel mills	Establishments	24	U.S. Census 1997 Econ. Census	16	Column C minus non-integrated			16	From Column D [50]	16
	Employment	22,764	NAICS code 331111. [47]	21,788	mills (NAICS code 3311114). [48]			20,699	Column D adjusted for	20,699
	Annual Payroll	1,199,146		1,155,514				1,097,738	non-covered activities [50]	1,097,738
	Estimated Receipts	10,088,697		9,700,241				9,215,229		9,215,229
	Estimated Throughput			8,405	1997 Economic Census [49]			8,405	From Column D [50]	8,405
18. Iron and Steel foundries	Establishments			130	U.S. Census SSEL. 1996: SIC	130	From Column D [53]			130
	Employment			19,961	codes 3321-3325. [16], [51]	18,963	(Column D-Column F) adjusted			18,963
	Annual Payroll			875,358		831,590	for non-covered activities [53]			831,590
	Estimated Receipts			2,897,708		2,752,823				2,752,823
	Estimated Throughput			1,726	1997 Economic Census [52]	1,726	From Column D [53]			1,726
19. Other Recycling Processors/Manufacturers	Establishments					33	REI Study Database [10]			33
	Employment					1,028	Survey results extrapolated			1,028
	Annual Payroll					24,533	based on OH responses.			24,533
	Estimated Receipts					169,688	(n=16). [11],[54]			169,688
	Estimated Throughput					224	R. W. Beck estimate [55]			224
Recycling Industry Subtotals	**Establishments**					616		1,339		1,955
	Employment					50,559		38,982		89,541
	Annual Payroll					1,829,658		1,622,931		3,452,590
	Estimated Receipts					8,356,728		13,357,245		21,713,974

continued

		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 Establishments 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					6	REI Study Database [10]			6
	Employment					17	Survey results extrapolated			17
	Annual Payroll					200	based on OH responses.			200
	Estimated Receipts					1,550	(n=3). [11],[56]			1,550
	Estimated Throughput					N/A				N/A
21. Motor Vehicle Parts (used)	Establishments							351	U.S. Census SSEL. 1996	351
	Employment							2,358	SIC code 5015; [16],[57]	2,358
	Annual Payroll							51,698		51,698
	Estimated Receipts							253,146		253,146
	Estimated Throughput							N/A		N/A
22. Retail Used Merchandise Sales	Establishments							704	U.S. Census SSEL. 1996	704
	Employment							4,200	SIC code 5932; [16],[58]	4,200
	Annual Payroll							52,027		52,027
	Estimated Receipts							237,940		237,940
	Estimated Throughput							N/A		N/A
23. Tire Retreaders	Establishments							79	U.S. Census SSEL. 1996	79
	Employment							576	SIC code 7534; [16],[59]	576
	Annual Payroll							12,344		12,344
	Estimated Receipts							63,581		63,581
	Estimated Throughput							N/A		N/A
24. Wood Reuse	Establishments					69	REI Study Database [10]			69
	Employment					1,232	Survey results extrapolated			1,232
	Annual Payroll					26,338	based on OH responses.			26,338
	Estimated Receipts					177,604	(n=32). [11],[60]			177,604
	Estimated Throughput					N/A				N/A
25. Materials Exchange Services	Establishments							5	REI Study Database [10]	5
	Employment							10	Survey results extrapolated	10
	Annual Payroll							552	based on OH responses.	552
	Estimated Receipts							2,865	(n=3). [11],[61]	2,865
	Estimated Throughput							N/A		N/A
26. Other Reuse	Establishments					8	REI Study Database [10]			8
	Employment					368	Survey results extrapolated			368
	Annual Payroll					6,994	based on OH responses.			6,994
	Estimated Receipts					64,118	(n=2). [11],[62]			64,118
	Estimated Throughput					N/A				N/A
Reuse Industry Subtotals	**Establishments**					83		1,139		1,222
	Employment					1,617		7,144		8,761
	Annual Payroll					33,532		116,621		150,153
	Estimated Receipts					243,272		557,532		800,804

GRAND TOTALS	**Establishments**					699		2,478		3,177
Recycling and Reuse/Remanufacturing	**Employment**					52,176		46,126		98,302
	Annual Payroll					1,863,191		1,739,552		3,602,743
	Estimated Receipts					8,600,001		13,914,777		22,514,778

[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.

Summary of Calculations

Data Type	Calculation[1]
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

[1] Variables are defined in the following table.

Summary of Data Sources Used for
Government Staffed Residential Curbside Collection

Data Label	Data Type	Value	Reference
A	Population with curbside collection	6,600,000	BioCycle (4/99)
B	Persons per household	2.59	U. S. Census Bureau
C	Homes collected per truck per day	900	R. W. Beck Estimate
D	Percent of homes collected by government staffed collection	40%	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, etc.	5%	R. W. Beck Estimate
I	Average payroll per employee	$26,790	1997 U. S. Economic Census
J	Recycling collection cost per household per month	$2.50	R. W. Beck Estimate
K	Number of curbside programs	372	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	100%	Estimated from BioCycle (5/98)
O	Percent of year collection takes place	100%	R. W. Beck Estimate

[7] Estimated throughput is equal to total tons of residential recyclables plus yard waste as provided by Ohio EPA's *1997 Summary of Solid Waste Management in Ohio* 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.”

[9] Throughput is equal to total state recycling collection of all recyclables 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."

[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 Ohio EPA's *1997 Summary of Solid Waste Management in Ohio* report.

[14] Number of employees, payroll, and receipts for Materials Recovery Facilities (MRF's) are based on a statistical analysis of survey results.

[15] Throughput is derived by multiplying the curbside tons from state reports by percent of material collected that is estimated to go to MRF's.

[16] Data derived from the 1996 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] (D) indicates that figures cannot be reported in order to avoid disclosure of individual company information.

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

[21] Throughput is estimated as 76 tons per employee based on a nationwide average of survey responses and Glass Packaging Institute secondary glass use data of 614,000 tons per year nationally.

[22] 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.

[23] 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.

[24] 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.

[25] Data for Nonferrous Product Producers is taken from U.S. Census SSEL for SIC codes 3351-3355 with no adjustments.

[26] 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.

[27] 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.

[28] 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.

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

[30] 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.

[31] 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.

[32] 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*).

[33] Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999). Throughput numbers used are for 1996 to coincide with the data from U.S. Census SSEL.

[34] 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, receipts, and throughput 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).

[35] 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.

[36] Number of employees, payroll, receipts, and throughput for Paper-Based Product Manufacturers are based on a statistical analysis of survey results.

[37] Throughput is estimated by multiplying employees times a tons per employee figure (260) derived from a nationwide average of survey responses.

[38] Number of employees, payroll, and receipts for Pavement Mix Producers are based on a statistical analysis of survey results.

[39] Throughput is estimated by multiplying employees times a tons per employee figure derived from a nationwide average of survey responses.

[40] 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 throughput of recycled resins produced times an average of recycled resin prices from Plastics News.

[41] 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).

[42] 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).

[43] Throughput is calculated from the state's percentage of national plastics converter employees multiplied by the total tons of plastics recycled nationally (APC Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled).

[44] 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).

[45] Number of employees, payroll, and receipts for Rubber Product Manufacturers are based on a statistical analysis of survey results.

[46] Throughput is estimated by multiplying employees times a tons per employee figure (272) derived from a nationwide average of survey responses.

[47] Steel Mill data comes from the U.S. Census Bureau's 1997 Economic Census, Geographic Area Series.

[48] Establishments, employees, payroll, and revenue figures are derived from Column C by excluding non-integrated mills, which do not make steel.

[49] Throughput is calculated as 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, utilizing anywhere from 15 percent-100 percent recovered 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 by multiplying employees times a tons per employee figure (218) derived from a nationwide average of survey responses.
[56] Number of employees, payroll, and receipts for Computer and Electronic Appliance Demanufacturers are based on a statistical analysis of survey results.
[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.
[62] Number of employees, payroll, and receipts for Other Reuse are based on a statistical analysis of survey results.

Table F-7
Delaware 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 at the end of this appendix.
(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	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	1
	Employment							39	DE SW Authority 1998 data	39
	Annual Payroll							911	DE SW Authority 1998 data	911
	Estimated Receipts							2,303	DE SW Authority 1998 data	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
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

APPENDIX F – STATE DATA TABLES

		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	
10. Nonferrous foundries	Establishments	0	[30]							0
	Employment	0								0
	Annual Payroll	0								0
	Estimated Receipts	0								0
	Estimated Throughput	0								0
11. Paper, Paperboard, and Deinked Market Pulp Mills	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
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 F-8
Massachusetts 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 at the end of this appendix.
(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
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	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

		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	
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, Paperboard, and Deinked Market Pulp Mills	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
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

APPENDIX F – STATE DATA TABLES

		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 F-9
New Jersey 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 at the end of this appendix.
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
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	857	Column D adjusted for			857
	Annual Payroll	68,439		34,220	[27]	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

APPENDIX F – STATE DATA TABLES

		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	
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, Paperboard, and Deinked Market Pulp Mills	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
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			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 F-10
New York 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 at the end of this appendix.
(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 [6]	500
	Employment							1,200	Derivation; multiple sources [6]	1,200
	Annual Payroll							36,386	Derivation; multiple sources [6]	36,386
	Estimated Receipts							47,135	Derivation; multiple sources [6]	47,135
	Estimated Throughput							974	NY DEC 1998 Data [7]	974
2. Private Staffed Residential Curbside Collection	Establishments							972	Derivation; multiple sources [8]	972
	Employment							2,340	Derivation; multiple sources [8]	2,340
	Annual Payroll							70,954	Derivation; multiple sources [8]	70,954
	Estimated Receipts							91,497	Derivation; multiple sources [8]	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)
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

		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	
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, Paperboard, and Deinked Market Pulp Mills	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
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**

APPENDIX F – STATE DATA TABLES

		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 F-11
Pennsylvania 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 at the end of this appendix.
(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)
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	[27]	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

APPENDIX F – STATE DATA TABLES

		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	
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, Paperboard, and Deinked Market Pulp Mills	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
18. Iron and Steel foundries	Establishments			106	U.S. Census SSEL, 1996; SIC	106	From Column D [53]			106
	Employment			9,846	codes 3321-3325. [16], [51]	9,354	(Column D-Column F) adjusted for			9,354
	Annual Payroll			312,717		297,081	non-covered activities [53]			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 F-12
Vermont 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 at the end of this appendix.
(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)
8. Nonferrous secondary smelting and refining mills	Establishments			0	U.S. Census SSEL, 1996; SIC					0
	Employment			0	code 3341. [16], [23]					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							0
	Employment	0	codes 3351-3356. [16], [26]							0
	Annual Payroll	0								0
	Estimated Receipts	0								0
	Estimated Throughput	0								0

VERMONT RECYCLING AND REUSE INDUSTRY

		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	
10. Nonferrous foundries	Establishments			1	U.S. Census SSEL. 1996: SIC	1	From column D [29]			1
	Employment			2	codes 3363-3369. [16], [30]	2	Column D adjusted for			2
	Annual Payroll			56		50	non-covered activities [29]			50
	Estimated Receipts			193		174				174
	Estimated Throughput			0	1997 Economic Census [31]	0	From column D [29]			0
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	6	U.S. Census SSEL. 1996: SIC	6	Derived from column C with	3	From Column D [35]	3	Derived from Column D with	6
	Employment	1,152	codes 2611, 2621, and 2631.	1,152	data from AF&PA Paper	444	Derived from Column D with	492	data from AF&PA [36]	936
	Annual Payroll	43,869	[16], [32]	43,869	Matcher. [33]	16,890	data from AF&PA and adjustment	18,754		35,644
	Estimated Receipts	324,805		324,805		125,050	for non-covered activities [35]	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			8
	Annual Payroll					215	based on VT responses.			215
	Estimated Receipts					3,363	(n=7). [11],[39]			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			334
	Annual Payroll	72,488	Probe Economics [42]	11,805	Derivation; from SPI data [43]	9,444	non-covered activities [45]			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
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

APPENDIX F – STATE DATA TABLES

		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 F-13
NERC Region 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 at the end of this appendix.
(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	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	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	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	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
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 adiusted 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

APPENDIX F – STATE DATA TABLES

		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	
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, Paperboard, and Deinked Market Pulp Mills	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
18. Iron and Steel foundries	Establishments			196	U.S. Census SSEL, 1996; SIC	196	From Column D [53]			196
	Employment			17,013	codes 3321-3325. [16], [51]	16,162	(Column D-Column F) adjusted for			16,162
	Annual Payroll			547,296		519,931	non-covered activities [53]			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 RECYCLING AND REUSE INDUSTRY

		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

[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.

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

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.

Indirect Effects – A measurement of the value of additional economic demands that direct firms or institutions place on supplying industries in a region under study. 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 output of direct establishments.

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

Induced Effects – These effects accrue when workers in 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, 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.

Jobs – The number of paid full- and part-time positions (counted at equal weight), not the number of full time equivalents.

Multiplier or Multiplier Effect – A term 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 all 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.

Payroll – Includes the wages and salaries of employees before taxes or other deductions are taken (includes paid vacation, bonuses, commissions, etc.). Does not include employer-paid benefits such as social insurance match, retirement, and medical benefits.

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).

Production Workers – Workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant's own use (e.g., power plant), record-keeping, and other services closely associated with these production operations at the

establishment covered by the report. Employees above the working-supervisor level are excluded from this item.

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.

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 this 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).