

RECYCLING MEANS BUSINESS

**IN
BALTIMORE, D.C., AND RICHMOND**

**Analysis of the Current and Potential Economic Benefits
of Recycling in the National Capital Area**

Prepared for:

National Capital Area Project
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The Institute for Local Self-Reliance (ILSR) is a nonprofit research and educational organization that provides technical assistance and information to government, citizen organizations, and industry. Since 1974, ILSR has researched the technical feasibility and commercial viability of environmentally sound, state-of-the-art technologies with a view to strengthening local economies. ILSR works to involve citizens, government, and private enterprise in the development of a comprehensive materials policy oriented towards efficiency, recycling, and maximum utilization of renewable energy sources.

This document is one in a series of manuals prepared for the National Capital Area Project. The other five manuals listed below are available from the Institute for Local Self-Reliance's (ILSR's) National Office:

Recycling Economic Development through Scrap-Based Manufacturing

Minimizing Waste, Maximizing Recycling

Creating Local Recycling Markets

Expanding Scrap-Based Manufacturing through the Community Joint-Venture Process

Preparing a Business Plan for a Small-Scale Recycling-Related Venture

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INTRODUCTION

Since September 1993, the Institute for Local Self-Reliance (ILSR) has worked closely with local governments, community development and environmental organizations, and businesses in Baltimore, Maryland, Washington, D.C., and Richmond, Virginia, to document the current status of recycling and to identify opportunities for recycling-based economic development in this Tri-City Region. This report presents a summary and analysis of the economic benefits of recycling, both current and potential, for the Tri-City Region.¹ ILSR has also produced a companion *Recycling Means Business* poster, which presents these benefits graphically.

ILSR's goal in each of the three cities is to help make recycling a major subsector of the local economy. A clear understanding of the current recycling activities and flow of materials in the region will enable us to assess the types and amounts of materials available for recovery and the current and potential markets for the materials. For this reason, ILSR has documented recycling operations, the tonnage they handle, the jobs they sustain, and the revenues they generate in each city and in each city's surrounding metropolitan area. A map of the Tri-City Region for which we gathered data is presented in Figure 1.

Appendix A describes the jurisdictions in each city's metropolitan area. Appendices B, C, and D detail each city's current recycling activities. Appendix E identifies the dozens of recycling-related operations in the region that ILSR staff contacted and documented.²

Surveys of these existing recycling-related enterprises verify that recycling already means business in the Tri-City Region. Increased materials recovery and expanded local markets for recovered materials offer the potential for dramatic economic growth.

ECONOMIC BENEFITS OF MATERIALS RECOVERY

Through well-established recycling programs in the Baltimore, Washington, D.C., and Richmond metropolitan areas, the Tri-City Region overall has reached a recycling rate of 23 percent.³ Table 1 lists the components of the waste stream and the tonnages generated and recovered that account for this recycling rate. (See Table A-5 in Appendix A for a breakdown for each metropolitan area.)

Figure 1. Map of Tri-City Region

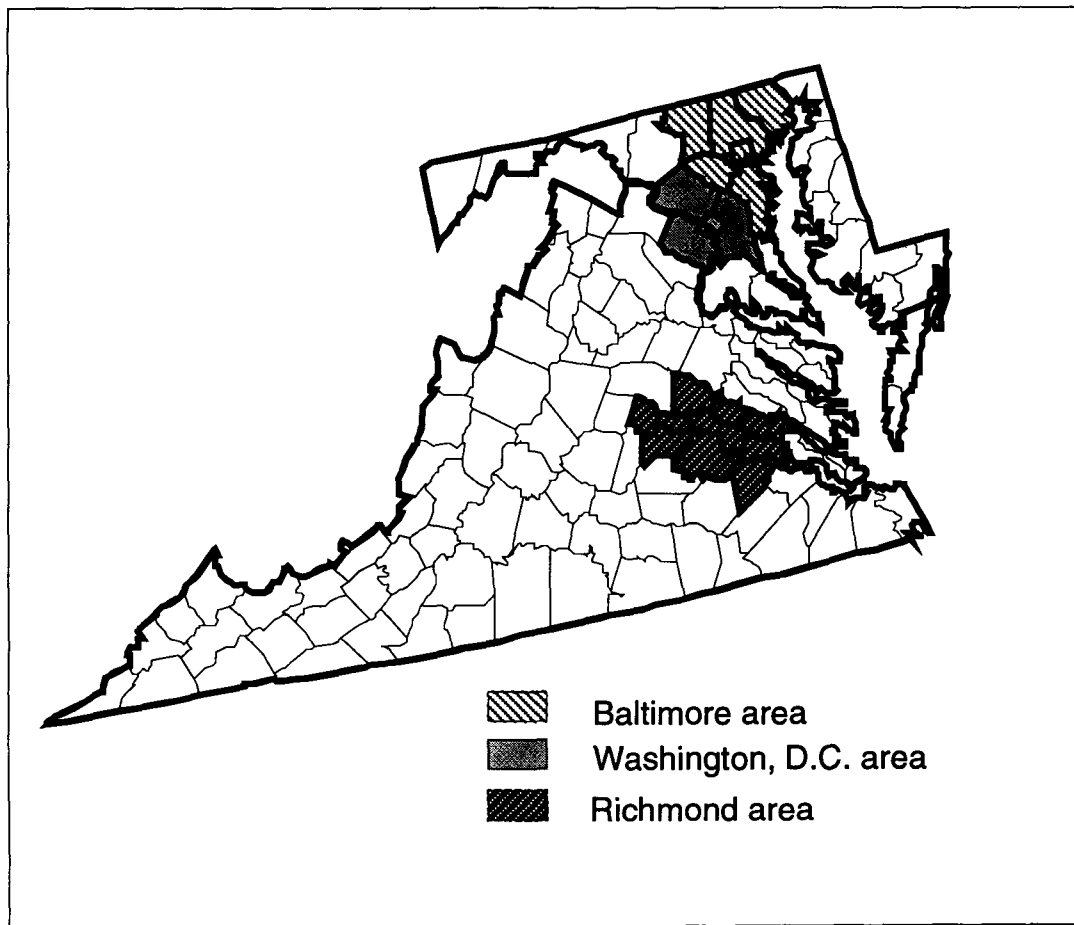


Table 1. Waste Generated and Recycled by Material

Material Type	Generated (TPY)	Recovered (TPY)	Percent Recovered
Paper	3,663,500	1,003,700	27%
Plastic	608,600	14,700	2%
Glass	507,000	68,300	13%
Metals	1,228,700	414,600	34%
Other materials	1,363,300	187,400	14%
Organics	2,090,000	525,500	25%
Construction & demolition debris	1,718,900	411,100	24%
Total Materials	11,180,000	2,625,300	23%

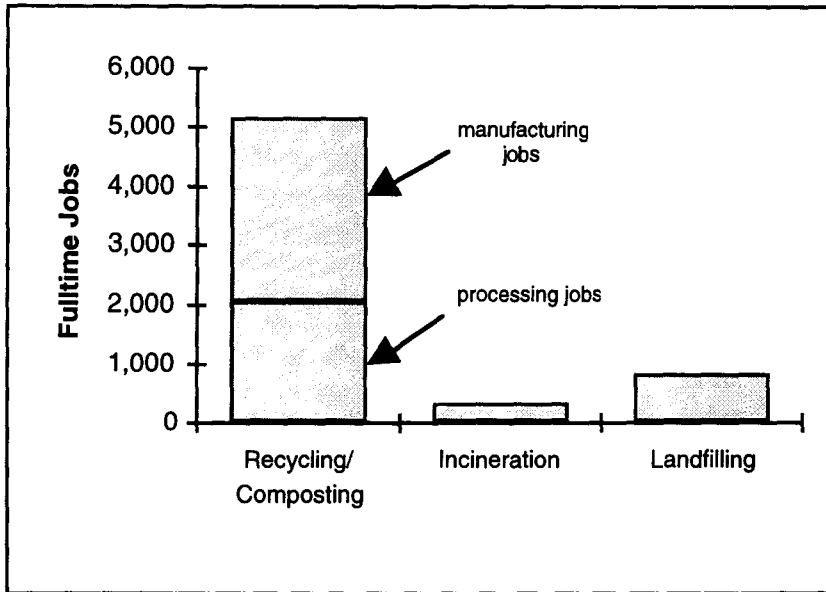
Key: TPY = tons per year

Source: Institute for Local Self-Reliance, 1994.

Although less than one-quarter of the materials in the region's waste stream are recovered for recycling or composting, recycling-related enterprises provide significantly greater economic benefits than waste disposal. Revenues from recycling-related enterprises in the Tri-City Region amount to more than \$2.1 billion, whereas revenues from waste disposal in the area come to less than \$404 million. More than 5,100 individuals are employed in recycling-related enterprises in the Tri-City Region as compared to a little over 1,100 jobs sustained by waste disposal.⁴ See Figure 2.

Already close to five times as many people are employed in recycling as in waste disposal, yet disposal handles four times the quantity of material. On a per ton basis, recycling operations in the Tri-City Region create more than ten times as many jobs as disposal operations (transfer stations, incinerators, and landfills). See Tables 2 and 3 and Figure 3. Averaged over all materials and facilities, 79 jobs are sustained for every 100,000 tons of materials processed for recovery, and another 162 jobs are sustained for every 100,000 tons of materials made into new final end products. In comparison, only 13 jobs are sustained for every 100,000 tons of materials processed at transfer stations, and another 10 jobs for every 100,000 tons incinerated or landfilled. Likewise, a ton of processed material generates \$120 in revenue, and a ton of recovered material manufactured into an end product generates \$1,140 in revenue. A ton of material disposed generates only \$40 in revenue.

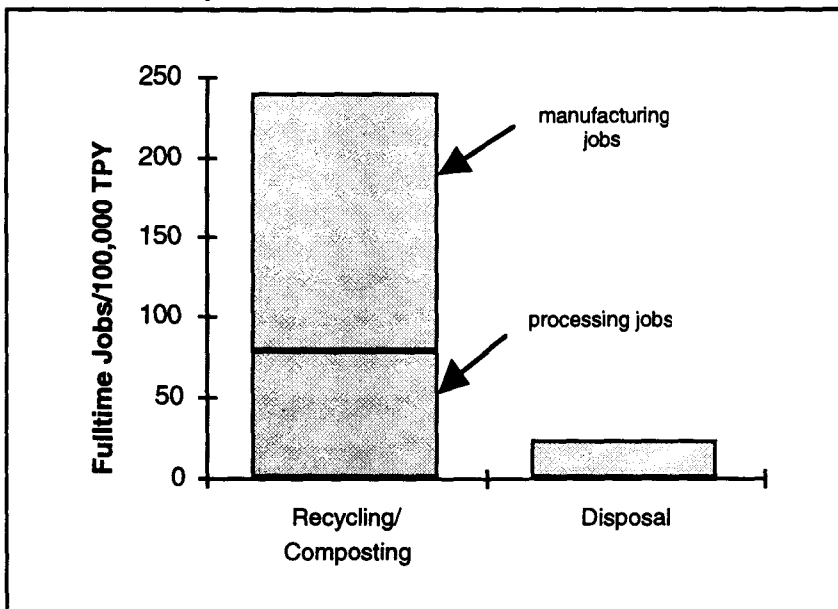
Figure 2. Current Waste-Related Jobs Located in the Tri-City Region



Note: Collection jobs are excluded from figures above. Garbage transfer station jobs are included under incineration and landfilling.

Source: Institute for Local Self-Reliance, 1994.

Figure 3. Jobs Sustained on a Per-Ton Basis, Comparison of Recycling/Composting to Disposal



Source: Institute for Local Self-Reliance, 1994.

Table 2. Comparison of Jobs Sustained and Revenue Generated by Materials Recovery and Waste Disposal Facilities

Type of Facility	Total Number of Facilities	Material Handled (TPY) (a)	FTE Total (b)	Total Jobs/100,000 TPY (c)	Range in Jobs/100,000 TPY (d)	Annual Revenue per Ton
Processors						
Paper	19	614,500	533	87	8 - 545	\$100
Plastic	3	14,100	117	830	230 - 5000+	\$650
Metals	25	546,100	533	98	33 - 1600+	\$290
Organics	11	316,900	91	29	0 - 225	\$60
C&D	8	474,200	116	24	2 - 370	\$40
Durables	6	27,900	123	441	185 - 650+	\$240
Other (e)	4	83,000	64	77	20 - 125	(f)
Mixed materials	21	509,600	473	93	37 - 1500	\$50
Total	91 (g)	2,586,300	2,050	79		\$120
Manufacturers						
Paper	8	1,630,600	927	115	6 - 250	\$300
Metals	4	3,180,600	1,839	181	350 - 1900+	\$1,600
Wood pallets	8	75,500	161	213	130 - 400+	\$100
Other (h)	7	19,900	160	(f)	37 - 3600+	(f)
Total	27	4,906,600	3,087	162		\$1,140
Materials Recovery Total	118	NA	5,137	241		NA
Transfer Stations						
Total	25	2,061,000	275	13	3 - 55	\$40
Disposal Facilities						
Incinerators	5	2,438,100	241	10	4 - 34	\$50
Sanitary Landfills	21	3,789,100	577	15	6 - 27	\$40
C&D Landfills	11	2,227,700	50	2	2 - 3	\$30
Total	37	8,454,900	868	10		\$40
Disposal Total	62	NA	1,143	23		NA

Key: TPY = tons per year, FTE = full-time equivalent employees, C&D = construction and demolition debris
NA = not available

Notes:

- (a) Total tons per year listed in this column are as follows: for processors, total tons of recovered materials processed; for manufacturers, total tons of product manufactured; for transfer stations, total tons of waste handled; for disposal facilities, total tons of waste disposed.
- (b) Actual FTE jobs sustained by manufacturers utilizing secondary materials in the region is 7,964. The jobs listed in this column for manufacturers represent "recycling-related" jobs. For manufacturers utilizing less than 50% recycled feedstock, recycling-related jobs were determined by multiplying total jobs by the percentage of recycled feedstock utilized. For other manufacturers, all jobs were considered recycling related. Only five manufacturers utilize less than 50% recycled feedstock.
- (c) Manufacturing figures are based on total employees and not just on the "recycling-related" jobs. See note (b) and Table 5.
- (d) Range in Jobs/100,000 TPY gives the lowest and the highest calculated values for individual facilities in the category.
- (e) Data for three tire processors and one salvage/reuse operation are included in the "Other" category.
- (f) Jobs/100,000 TPY and Revenue/Ton are not meaningful because the facilities included are so diverse.
- (g) Number of individual facilities do not add up to the total since some processors handle multiple materials.
- (h) "Other" category includes one plastic manufacturer, two oil and solvent recovery facilities, one furniture remanufacturer, one laser toner cartridge remanufacturer, and two end users of recycled tires.

Source: Institute for Local Self-Reliance, 1994.

Analysis of jobs and revenues by material provides further information about the economic development potential of materials recovery. Organics and construction and demolition debris (C&D) sustain the lowest number of jobs per ton, and generate the lowest revenue per ton, of all the types of materials recovered. However, these materials make up a significant portion of the waste stream and could be recovered at higher rates (see Table 1). Increased recovery of plastics and durable materials can also contribute to an increase in processing jobs and revenues. Although the tonnages of these materials in the waste stream are relatively low, their processing generates a relatively high number of jobs and high revenue per ton processed.

Table 2 also suggests the variability in the number of jobs sustained by a facility. For example, one scrap metal processing facility in the Tri-City Region employs 33 individuals per 100,000 tons processed annually; another has a ratio of more than 1,600 employees per 100,000 tons. In general, as the size of the facility increases, fewer jobs tend to be created per ton handled. As materials recovery increases, more total jobs will be created if smaller processing and manufacturing facilities are attracted to the region to handle the materials than if larger facilities are established.

Table 3. Current Waste-Related Jobs Located in Each Metropolitan Area

	Baltimore Region	D.C. Region	Richmond Region	Total
Recycling/Composting				
Entry processing/composting	325	448	276	1,049
Skilled processing/composting	425	341	235	1,001
Entry manufacturing (a)	417	2	335	754
Skilled manufacturing (a)	1,636	14	683	2,333
Subtotal: Processing	750	789	511	2,050
Subtotal: Manufacturing (a)	2,053	16	1,018	3,087
Subtotal: Entry Level	742	450	866	1,803
Subtotal: Skilled Level	2,061	355	1,619	3,334
Total Recycling/Composting	2,803	805	1,529	5,137
Incineration				
Entry level	8	10	0	18
Skilled level	154	144	0	297
Total Incineration	162	153	0	315
Landfilling				
Entry level	38	43	34	115
Skilled level	259	243	210	712
Total Landfilling	297	287	243	827
Total Disposal	459	440	243	1,142
TOTAL JOBS	3,262	1,245	1,772	6,279

Notes: Waste transfer station jobs are included under incineration and landfilling, and are allocated to each of these according to tonnage landfilled versus tonnage incinerated. In the Baltimore region, 72% of the waste disposed is landfilled; in the Washington, D.C. region, 66% is landfilled.

(a) Actual FTE jobs sustained by manufacturers utilizing recycled feedstock in the region is 7,964—more than double the 3,087 figure reported above. The 3,087 figure represents “recycling-related” jobs only. For the five manufacturers utilizing less than 50% recycled feedstock, recycling-related jobs were determined by multiplying total jobs by the secondary feedstock utilization rate. For other manufacturers, all jobs were considered recycling related.

Source: Institute for Local Self-Reliance, 1994.

CURRENT RECYCLING-BASED ENTERPRISES

Table 4 summarizes data for the 91 processing facilities documented in the Tri-City Region. These facilities process more than 2.5 million tons of recovered materials each year, create more than 2,000 jobs, and generate more than \$300 million in gross annual revenue.

Overall, roughly half the jobs require skilled workers. The pay scale ranges from minimum wage to \$10 per hour for entry-level employees and from \$7 to \$20 per hour for skilled employees. Processing facilities in the Tri-City Region pay out between \$30 million and \$45 million in annual wages.

Almost all these facilities process some materials that are not collected locally. Capacity, currently used for imported materials could be used for locally collected materials instead.

To some extent, the processing facilities in each metropolitan area reflect the local supply of and demand for recycled materials. Manufacturers in Baltimore provide local markets for paper and steel, and 17 of the 32 processors in the Baltimore area specialize in these materials. The large supply of paper in the Washington area's waste stream supports nine paper processors. The four paper processors in the Richmond area have steady local markets.

By far the largest economic benefits of recycling come from recycling-based manufacturing. Tables 5 and 6 present the current status of recycling-based manufacturing in the Tri-City Region. The 27 manufacturers identified in the region use over 1.4 million tons of recycled materials to produce close to 5 million tons of products each year. Sales of these products generate almost \$5.6 billion annually—more than \$1,100 per ton of recycled-content product, compared to \$120 per ton of processed material.⁵

Although less than one-quarter of materials recovered are locally recycled into new products, recycling-based manufacturing sustains one and a half times as many jobs in the region as materials processing. Remanufacturing businesses also provide a larger proportion of highly skilled and high-paying jobs than do processing facilities. Of the more than 3,000 recycling-based manufacturing jobs in the region, more than 2,300 are skilled positions and about 750 are entry-level positions. Average wages range from \$7 to \$12 per hour for entry-level employees and from \$10 to \$20 per hour for skilled employees. These wages translate to a range of \$190 million to \$270 million circulating in the local economy each year.

Manufacturers in the region import a significant portion of their recycled feedstock. Despite the ample supply in the local waste stream, paper manufacturers only use 28 percent local waste and metal product manufacturers only use 22 percent local waste. Closing the loop locally by diverting more materials from the local waste stream to this established market can provide economic benefits in the form of more processing jobs, lower waste disposal costs, and potentially lower feedstock costs for the manufacturer.

Table 4. Profile of Local Processing Facilities, by Region and Material

Material	Number of Facilities	Range in Plant Throughput (TPY)	Material Processed (TPY)	Percent from Local Waste Stream	Estimated TPY Local Waste	Estimated TPY Imported Waste	FTE Total	FTE - Entry	FTE - Skilled	Estimated Annual Wages Paid-low (a)	Estimated Annual Wages Paid-high (a)	Annual Revenue	Annual Revenue per Ton
Baltimore Region													
Paper	6	4,500 - 72,000	194,800	60%	117,800	77,000	139	82	57	\$2,073,800	\$2,907,800	\$22,386,000	\$110
Plastic (b)													
Metals	11	200 - 200,000+	329,900	88%	289,900	40,000	240	69	171	\$4,472,000	\$6,302,400	\$85,841,000	\$260
Organics	3	20,000 - 50,000+	106,900	70%	74,800	32,100	34	14	20	\$563,700	\$742,600	\$5,809,200	\$50
C&D	2		220,000	70%	155,000	65,000	17	8	9	\$285,000	\$364,000	\$3,200,000	\$10
Durables	4	200 - 15,000+	24,200	94%	22,800	1,400	113	53	60	\$1,691,000	\$2,184,000	\$4,975,000	\$210
Other (b)	3		60,000	68%	40,800	19,200	115	35	80	\$1,934,400	\$2,662,400	\$7,250,000	(c)
Mixed materials	3	500 - 60,000	68,800	91%	62,400	6,400	92	64	28	\$1,156,500	\$1,710,800	\$2,862,800	\$40
Total	32		1,004,600	76%	763,500	241,100	750	325	425	\$12,176,400	\$16,874,000	\$132,324,000	\$130
Washington, D.C. Region													
Paper	9	100 - 90,000	294,400	86%	253,300	41,100	272	158	114	\$3,515,700	\$5,111,800	\$24,368,700	\$80
Plastic	0												
Metals	7	200 - 18,000	37,400	75%	28,000	9,400	73	14	59	\$1,349,900	\$1,847,000	\$17,888,000	\$480
Organics	5	4,000 - 75,000	182,000	72%	130,200	51,800	47	24	23	\$894,400	\$981,800	\$11,385,000	\$60
C&D (d)	6		229,100	96%	220,600	8,500	90	42	48	\$1,462,200	\$1,899,100	\$16,885,800	\$70
Durables (d)							0						
Mixed Materials	13	200 - 85,000	331,200	86%	284,500	46,700	307	210	97	\$4,300,400	\$6,086,100	\$16,392,500	\$50
Total	36 (e)		1,074,100	85%	916,600	157,500	789	448	341	\$11,522,600	\$15,925,600	\$86,920,000	\$80
Richmond Region													
Paper	4	1,600 - 70,000	125,300	54%	67,700	57,600	122	69	53	\$1,793,500	\$2,430,500	\$15,165,000	\$120
Plastic (f)													
Metals	7	600 - 100,000+	178,800	48%	85,500	93,300	220	128	92	\$4,604,000	\$6,630,600	\$55,364,700	\$310
Organics	3	8,000 - 10,000	28,000	100%	28,000	0	10	0	10	\$145,600	\$208,000	\$840,000	\$30
C&D (f)													
Durables (f)													
Other (f)	6		65,900	55%	36,300	29,600	85	48	37	\$1,184,700	\$1,440,500	\$8,205,900	(c)
Mixed Materials	5	1,200 - 36,000	109,600	72%	78,800	30,800	74	31	43	\$1,091,000	\$1,304,700	\$4,758,100	\$40
Total	23 (e)		507,600	58%	296,300	211,300	511	276	235	\$8,818,800	\$12,014,300	\$84,333,700	\$170
Tri-City Region													
Paper	19	100 - 90,000	614,500	71%	438,800	175,700	533	309	224	\$7,383,000	\$10,449,900	\$61,919,700	\$100
Plastic	3		14,100	23%	3,200	10,900	117	60	57	\$1,817,900	\$2,435,700	\$9,106,600	\$650
Metals	25	200 - 200,000+	546,100	74%	403,400	142,700	533	211	322	\$10,425,900	\$14,780,000	\$159,093,700	\$290
Organics	11	4,000 - 75,000	316,900	74%	233,000	83,900	91	38	53	\$1,603,700	\$1,932,400	\$18,034,200	\$60
C&D	8	4,000 - 200,000	474,200	85%	401,600	72,600	116	48	68	\$1,853,300	\$2,437,800	\$21,051,300	\$40
Durables	6	200 - 20,000	27,900	92%	25,700	2,200	123	58	65	\$1,838,700	\$2,400,300	\$6,633,800	\$240
Other (g)	4		83,000	54%	45,100	37,900	64	20	44	\$1,047,400	\$1,276,200	\$3,725,000	(c)
Mixed materials	21	500 - 85,000	509,600	84%	425,700	83,900	473	305	168	\$6,547,900	\$9,101,600	\$24,013,400	\$50
Total (or Average)	91 (e)		2,586,300	76%	1,976,500	609,800	2,050	1,049	1,001	\$32,517,800	\$44,813,900	\$303,577,700	\$120

Key: C&D = construction and demolition debris, FTE = full-time equivalent employees, TPY = tons per Year

Notes:

(a) Entry-level and skilled wage ranges were obtained from each processor surveyed. The range in estimated annual wages paid by each type of facility was calculated by multiplying each wage by the corresponding number of employees and by the number of hours worked annually (40 hours/week, 52 weeks/year).

(b) Data for a plastic processor are included in the "Other" category to maintain confidentiality. Data for a salvage/reuse operation and tire processor are also included in this category.

(c) Revenue/ton is not meaningful for this category since the processors included are so diverse.

(d) The "C&D" category includes data for one durables processor to maintain confidentiality.

(e) Number of individual facilities do not add up to the total because some processors handle multiple materials.

(f) In order to maintain confidentiality, data for two plastics, one C&D, and one durables processor are included in the "other" category. Data for tire processors are also included in this category.

(g) Data for three tire processors and one salvage/reuse operation are included in the "Other" category.

Source: Institute for Local Self-Reliance, 1994.

Many opportunities exist for further recycling-based manufacturing development in the Tri-City Region. The Baltimore area utilizes much of the paper and scrap metal recovered from the local waste stream, but lacks capacity for recovered glass, plastic materials, and tires. The Washington area has almost no capacity for using recycled material feedstocks. The Richmond area has a well-established paper recycling infrastructure and successful pallet remanufacturing enterprises. A major manufacturer that uses recovered glass as a feedstock is located just outside the Richmond area, but was not included in this study. However, there are few end users of recovered scrap metals, plastic materials, and C&D debris in the Richmond area.

Table 5. Profile of Local Recycling-Based Manufacturing Facilities, by Material

Material	Total No. of Facilities	Range in Plant Production (TPY)	Total Production (TPY)	Waste Material Consumed (TPY)	% from Local Waste Stream	FTE Total (a)	FTE-Entry	FTE-Skilled	Estimated Range in Annual Wages Paid, (millions)	Annual Revenue (millions)	Annual Revenue per Ton
Paper	8	200 - 700,000+	1,630,600	685,100	28%	1,883	528	1,355	\$41-\$45	\$483	\$300
Metals	4	600 - 3,000,000	3,180,630	663,630	22%	5,759	1,070	4,689	\$146-\$220	\$5,075	\$1,600
Wood pallets	8	1,000 - 15,000	75,460	75,460	61%	161	49	112	\$3.1-\$3.4	\$8	\$100
Other (b)	7		19,932	16,122	67%	161	62	99	\$2.9-\$4.0	\$17	(c)
Total	27		4,906,622	1,440,312	28%	7,964	1,709	6,255	\$193-\$273	\$5,583	\$1,140

Key: FTE = full-time equivalent employees, TPY = tons per year

Notes:

(a) These figures represent the total people employed by these facilities. "Recycling-related" manufacturing jobs, which total 3,087, are presented in Table 2.

(b) "Other" category includes one plastic manufacturer, two oil and solvent recovery facilities, one laser toner cartridge remanufacturer, and two rubber material manufacturers.

(c) Revenue per ton is not meaningful because the facilities included are so diverse.

Source: Institute for Local Self-Reliance, 1994.

Table 6. Number of Manufacturing Facilities by Region

Type of Manufacturing Facility	Baltimore Region	Washington, D.C. Region	Richmond Region	Total
Paper products	3		5	8
Plastic products	1			1
Metal products	3		1	4
Pallets	1		7	8
Rubber products	2			2
Oil/solvent/fluids		1	1	2
Other		1	1	2
Total	10	2	15	27

Source: Institute for Local Self-Reliance, 1994.

CURRENT DISPOSAL FACILITIES

Table 7 presents data on 62 disposal facilities in the Tri-City Region. Roughly 8.5 million tons of waste are landfilled or incinerated at these facilities each year. They employ more than 1,100 workers, most of whom must have the skills to operate the heavy equipment used in waste disposal. Wages are comparable to those in recycling facilities, and range from \$5.65 to \$11 per hour for entry-level employees and from \$8 to \$15 per hour for skilled employees. Total revenue generated from tipping fees amounts to more than \$400 million.

Table 7. Profile of Local Disposal Facilities, by Region and Type

Type of Facility	Number of Facilities	Range in Size (TPY)	Waste Disposed (TPY)	Percent from Local Waste Stream	Estimated TPY Local Waste	FTE - Entry	FTE - Skilled	FTE Total	Estimated Annual Wages Paid (low)	Estimated Annual Wages Paid (high)	Annual Revenue	Annual Revenue/ Ton
Baltimore												
Transfer stations	3	97,800 - 234,000	472,200	100%	472,200	15	80	95	\$1,945,800	\$2,657,200	\$11,700,000	\$20
Incinerators	3	115,000 - 779,000	1,102,000	92%	1,008,500	7	128	135	\$3,318,600	\$4,153,800	\$61,166,100	\$60
MSW landfills	6	73,000 - 490,000	1,532,200	100%	1,532,200	36	173	209	\$3,301,800	\$4,917,100	\$53,399,100	\$30
C&D landfills	5	1,500 - 361,000	816,800	90%	735,100	0	20	20	\$325,400	\$488,000	\$21,197,900	\$30
Total (a)	17		3,451,000	95%	3,275,800	58	401	459	\$8,891,600	\$12,216,100	\$147,463,100	NA
Washington, D.C.												
Transfer stations (b)	4	68,000 - 434,000	1,086,800	96%	1,043,400	11	128	139	\$2,845,400	\$4,222,400	\$46,919,600	\$40
Incinerators	2	356,000 - 980,000	1,336,100	96%	1,276,400	6	100	106	\$2,425,300	\$3,167,800	\$64,131,900	\$50
MSW landfills	4	280,000 - 437,000	1,443,600	97%	1,401,900	36	131	167	\$3,323,800	\$4,836,000	\$76,713,800	\$50
C&D landfills	5	103,000 - 525,000	1,410,900	76%	1,065,400	0	28	28	\$591,900	\$887,800	\$37,485,100	\$30
Total (a)	15		4,190,600	89%	3,743,700	53	387	440	\$9,186,400	\$13,114,000	\$225,250,400	NA
Richmond												
Transfer stations (c)	18	3,000 - 200,000+	502,000	100%	502,000	5	36	41	\$693,000	\$730,000	\$14,914,800	\$30
Landfills (d)	12	12000 - 90,000+	813,300	100%	813,300	29	174	203	\$3,899,800	\$3,899,800	\$15,875,800	\$20
Total (a)	30		813,300	100%	813,300	34	210	244	\$4,592,800	\$4,629,800	\$30,790,600	NA
Totals												
Transfer stations	25		2,061,000	98%	2,017,600	31	244	275	\$5,484,200	\$7,609,600	\$73,534,400	\$40
Incinerators	5		2,438,100	94%	2,284,900	13	228	241	\$5,743,900	\$7,321,600	\$125,298,000	\$50
MSW landfills	21		3,789,100	99%	3,747,400	101	478	579	\$10,525,400	\$13,652,900	\$145,988,700	\$40
C&D landfills	11		2,227,700	81%	1,800,500	0	48	48	\$917,300	\$1,375,800	\$58,683,000	\$30
Total (a)	62		8,454,900	93%	7,832,800	145	998	1,143	\$22,670,800	\$29,959,900	\$403,504,100	NA

Key: C&D = construction and demolition debris, FTE = full-time equivalent employees, NA = not applicable, TPY = tons per year

Notes:

- (a) Totals for "Waste Disposed" and "Estimated TPY Local Waste" do not include transfer station tonnages.
- (b) In addition to four publicly operated transfer stations in the Washington, D.C. area, an unconfirmed number of private facilities exist.
- (c) Total tons disposed through the transfer stations are estimated for several counties since figures were not available.
- (d) Landfill data include figures for facilities that were in operation in 1993, but have since closed. One C&D landfill is also included.

Source: Institute for Local Self-Reliance, 1994.

MAXIMIZING RECYCLING-BASED ECONOMIC DEVELOPMENT—ONE FUTURE SCENARIO

Figure 4 shows the relative amounts of materials recovered from the waste stream versus materials disposed. The portion of waste recovered is broken down into materials composted, materials used as feedstock in local recycling-based manufacturing, and materials exported for recycling. Currently, less than half of the recovered materials available as feedstocks are used locally. The flow of resources out of the region is especially pronounced in Washington, D.C., because of its limited manufacturing capacity. (See Table A-5 in Appendix A for the tonnages composted, recycled locally, and exported for recycling by metropolitan area.)

The current data shown in Figure 4 suggests two opportunities for maximizing economic development through recycling in the Tri-City Region: recovering more materials from the waste stream, and using more of the recovered materials locally. Figure 4 depicts a “maximum recycling” scenario that incorporates waste reduction, increased materials recovery, and increased local utilization of recovered materials. This scenario assumes that by the year 2005, the region reduces waste by 10 percent per capita, achieves a 70 percent overall recycling rate, and utilizes 75 percent of the materials recovered locally. Table 8 compares the current tonnages of total waste generated, materials recovered, and waste disposed to the tonnages for this one future scenario.

Table 8. Current and Potential Waste Generation and Recovery Totals

	Current Totals		2005 Totals (a)	
	TPY	%	TPY	%
Recycled/Composted	2,625,200	23%	7,897,900	70%
Composted	525,500	5%	1,734,800	15%
Recycled Locally (b)	596,200	5%	4,188,500	37%
Exported (c)	1,503,500	13%	1,974,500	18%
Incinerated	2,284,900	20%	1,217,900	11%
Landfilled	6,270,100	56%	2,127,500	19%
Total Generated (a)	11,180,100	100%	11,243,100	100%

Key: TPY = tons per year

Notes:

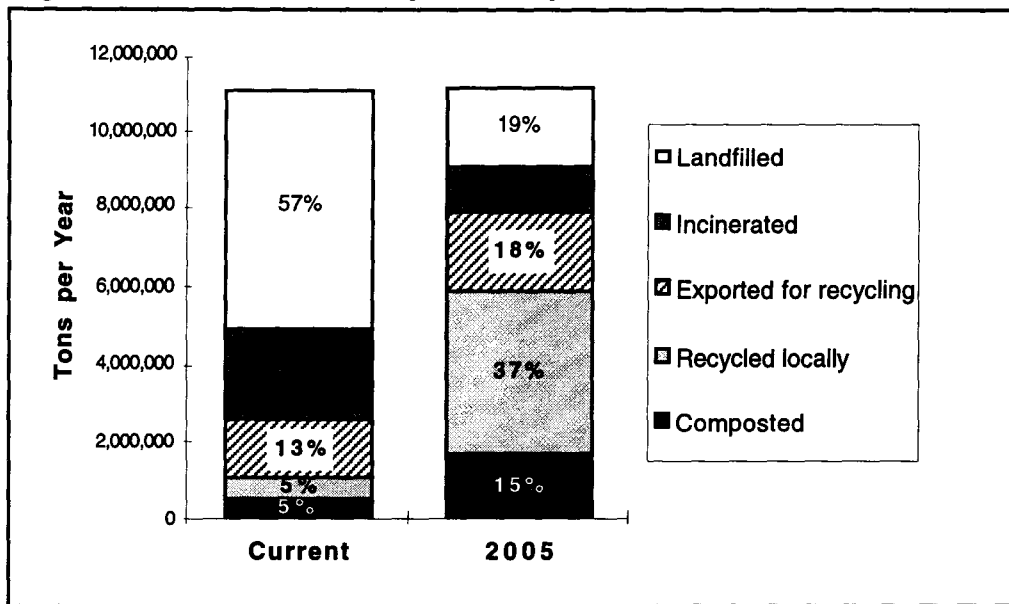
(a) 2005 totals are based on the assumption that 70% of the materials in the waste stream can be recovered, and that 75% of the materials recovered will be composted or recycled locally.

(b) Represents materials manufactured into new products or materials reused locally such as furniture and clothing.

(c) Represents material recovered locally but exported out of the region for recycling.

Source: Institute for Local Self-Reliance, 1994.

Figure 4. Materials Recovery and Disposal, Current and Possible Future



Source: Institute for Local Self-Reliance, 1994.

If the region achieves the waste reduction and recycling goals of the maximum recycling scenario, the total tonnage of material recovered will triple. The local use of these materials can generate significant economic development:

- Processing jobs could increase to a total of 8,400, four times the current number.
- Annual gross revenues from processing materials could more than double, to \$720 million.
- Almost 9,000 recycling-based manufacturing jobs would be sustained—nearly three times as many as the current number.
- Local recycling-based manufacturers could generate additional revenues of more than \$1.3 billion each year.
- A minimum of 100 new recycling-based businesses could be attracted to the Tri-City Region.
- Although 570 disposal jobs will be lost due to the decrease in tonnage of waste disposed, the more than 12,000 new recycling jobs that will be created will more than compensate for the loss.

Tables 9 and 10 show the number of facilities, tons handled, number of jobs, and annual revenues for processing and remanufacturing of the materials recovered under this maximum recycling scenario. Table 11 presents the corresponding data for the waste disposed in this scenario. Table 12 lists the number of jobs that could be sustained in each category and skill level for each metropolitan area. (The methodology used to make projections on waste generation, jobs, and revenues under this future scenario is described in Appendix A.)

Table 9. Summary of Local Processing Facilities, Maximum Recycling 2005 Scenario

Material	1993 Number of Facilities in Region	2005 Number of Facilities (Low Estimate) (a)	2005 Number of Facilities (High Estimate) (a)	Range in Plant Throughput (TPY)	Estimated Local Waste Processed (TPY)	Increase in Processing Since 1993 (TPY)	FTE Total	New Jobs Since 1993	Annual Revenue	Annual Revenue per Ton
Paper	19	32	169	100 - 90,000	1,190,600	751,800	1,226	693	\$62,498,970	\$50
Plastic	3	7	97	25,000	96,800	93,600	1,147	1,030	\$76,663,894	\$710
Glass (b)	1	8	22	60,000	429,000	429,000	171	171	\$14,584,600	\$30
Metals	25	30	331	200,000+	1,322,827	919,427	1,988	1,455	\$282,944,076	\$190
Organics	11	30	246	75,000	1,640,600	1,407,600	571	480	\$54,214,700	\$30
C&D	8	12	143	200,000	1,210,800	809,400	231	115	\$39,311,300	\$30
Durables	6	21	191	200 - 20,000	395,900	370,100	1,532	1,409	\$139,277,500	\$350
Other (c)	4	4	6	40,000	58,000	12,900	114	50	\$3,455,812	(d)
Materials	21	30	177	500 - 85,000	1,203,358	777,658	1,415	942	\$47,504,974	\$40
Total	91 (e)	173	1,382		7,547,885	5,571,485	8,395	6,345	\$720,455,826	\$90

Key: C&D = construction and demolition debris, FTE = full-time equivalent employees, TPY = tons per year

Notes:

(a) The low estimate assumes that all new facilities in the area will have throughput comparable to the largest existing facilities of that type in the area. The high estimate assumes that all new facilities will have throughput comparable to the smallest existing facilities for the corresponding material type.

(b) Data for glass processor existing in 1993 were included under mixed materials.

(c) The "Other" category includes data for three tire processors and two salvage/reuse operations.

(d) Revenues/ton is not meaningful for this category since the processors included are so diverse.

(e) Numbers of individual facilities do not add up to the total since some processors handle multiple materials.

Source: Institute for Local Self-Reliance, 1994.

Table 10. Summary of Manufacturing Facilities, Maximum Recycling 2005 Scenario

	1993 No. of Mfrs.	2005 Est. No. of Mfrs. (a)	Range in Plant Production (TPY)	Total Production (TPY)	Waste Material Consumed (TPY)	% from Local Region	FTE Total (b)	New Jobs Since 1993	Annual Revenue (mil. \$)	Revenue per Ton
Paper	8	23	200 - 700,000+	2,800,500	2,088,600	81%	5,460	3,577	\$822	\$290
Plastic	1	13	< 2,000 - 25,000	156,200	96,000	100%	1,437	1,437	\$192	\$1,230
Glass	0	7	2,000 - 100,000	336,300	50,000	100%	285	285	\$53	\$160
Metals	4	11	600 - 3,000,000	3,810,600	969,900	73%	6,029	270	\$5,554	\$1,460
Wood Pallets	8	10	1,000 - 15,000	120,500	120,500	81%	251	90	\$12	\$100
Other (c)	9	8		101,900	97,600	73%	306	145	\$236	(d)
Total	27	72		7,326,000	3,422,600	79%	13,768	5,804	\$6,868	\$830

Key: C&D = construction and demolition debris, FTE = full-time equivalent employees, TPY = tons per year

Notes:

(a) The estimated number of facilities assumes that existing manufacturers in the region will remain in operation and additional manufacturers that can be supported by the waste stream move into the area.

(b) These figures represent the total people employed by these facilities. "Recycling-related" jobs total 8,891 (4,504 of the 5,460 paper manufacturing jobs and only 2,109 of the 6,029 metal product manufacturing jobs are considered recycling related). For manufacturers utilizing less than 50% recycled feedstock, recycling-related jobs were determined by multiplying total jobs by the percentage of recycled feedstock utilized. For other manufacturers, all jobs were considered recycling related. Only five manufacturers utilize less than 50% recycled feedstock. These five represent currently operating facilities. All new facilities attracted to the region under the maximum recycling scenario utilize more than 50% recycled feedstock.

(c) "Other" category includes data for the existing plastic manufacturer as well as two oil and solvent recovery facilities, one furniture remanufacturer, one laser toner cartridge remanufacturer, three end users of recycled tires, and a battery recovery plant.

(d) Revenue per ton is not meaningful for this category because the facilities included are so diverse.

Source: Institute for Local Self-Reliance, 1994.

Table 11. Summary of Local Disposal Facilities, Maximum Recycling 2005 Scenario

Type of Facility	Number of Facilities in Region	Waste Disposed (TPY)	FTE 1993	FTE Total	Decrease in Jobs from 1993	Annual Revenue	Annual Revenue/Ton
Transfer Stations	NA	NA	275	108	167	\$29,705,000	NA
Incinerators	4	1,217,800	241	171	70	\$98,054,000	\$80
Landfills	NA	2,127,500	627	293	334	\$89,772,000	\$40
Total	NA	3,345,300	1,143	572	571	\$217,531,000	NA

Key: C&D = construction and demolition debris, FTE = full-time equivalent employees, NA = not available, TPY = tons per year

Source: Institute for Local Self-Reliance, 1994.

Table 12. Jobs That Could Be Located in Tri-City Region Under Maximum Recycling 2005 Scenario

Type of Job	Baltimore Region	D.C. Region	Richmond Region	Total
Recycling/Composting				
Entry processing/composting	1,431	1,985	880	4,296
Skilled processing/composting	1,366	1,894	839	4,099
Entry manufacturing	992	547	368	1,908
Skilled manufacturing	3,631	2,004	1,349	6,983
Subtotal: Processing	2,797	3,879	1,719	8,395
Subtotal: Manufacturing	4,623	2,551	1,717	8,891
Subtotal: Entry Level	2,423	2,532	1,248	6,204
Subtotal: Skilled Level	4,997	3,898	2,188	11,082
Total Recycling/Composting	7,420	6,430	3,436	17,286
Incineration				
Entry level	3	8	0	12
Skilled level	74	125	0	199
Total Incineration	77	133	0	210
Landfilling				
Entry level	13	12	20	45
Skilled level	108	84	124	316
Total Landfilling	122	96	144	362
Total Disposal	199	229	144	572
TOTAL JOBS	7,619	6,659	3,580	17,858

Note: Waste transfer station jobs are included under incineration and landfilling, and are allocated to each of these according to tonnage landfilled versus tonnage incinerated. In the Baltimore region, 66% of the waste disposed is landfilled; in the Washington, D.C. region, 50% is landfilled. This scenario is based on the assumption that the Pulaski incinerator will shut down.

Source: Institute for Local Self-Reliance, 1994.

INITIATIVES NEEDED TO MAXIMIZE RECYCLING BASED ECONOMIC DEVELOPMENT

The recycling loop consists of three parts: collection, processing, and end use manufacturing. "Closing the loop locally" by recovering more materials and developing local remanufacturing businesses as markets for these materials is the key to maximizing recycling-based economic development.

The following strategies, which address each part of the recycling loop, are recommended:

Actively work to prevent waste and encourage reuse.

- Charge by volume or weight for waste collection.
- Substitute reusable products for disposable ones.
- Mount a public education campaign on waste prevention.
- Encourage commodity reuse through repair (e.g., appliance repair), and products such as cloth diapers and refillable containers.

Maximize the amount of recyclable and compostable material collected for recovery.

- Minimize waste incineration and landfill disposal. Reliance on disposal options promotes a throw-away society and competes with recycling for materials and funds.
- Implement weekly, year-round curbside collection of a wide range of recyclable and compostable materials (including food waste).
- Make participation mandatory.
- Provide households with recycling containers and backyard composters, and educate citizens to recycle and compost.
- Establish a network of recycling drop-off sites.
- Require garbage haulers, businesses, and institutions to recycle and compost.
- Provide adequate processing capacity for residential, commercial, institutional, and industrial materials.

Create a local and regional recycling-based manufacturing infrastructure.

- Buy recycled-content products.
- Mandate minimum recycled-content standards for certain products such as newsprint, glass bottles, insulation, trash bags, and phone books.
- Utilize recycled materials in road construction projects.
- Educate local manufacturers on the advantages of using recycled materials.
- Enlist economic development agencies in recycling planning.
- Actively encourage recycling industries to locate in your community, especially those that represent high-value end uses and "closed loop" recycling (such as making old newspapers into new newsprint and old glass bottles into new glass bottles).

- Offer financing incentives to recycling-based enterprises, particularly those that are community based.
- Work with industrial park businesses, developers, and operators to include community-based organizations as partners in joint ventures.

The decisions and policies implemented now will determine the extent to which the Tri-City Region can maximize the economic benefits of recycling. Each city has shown some progress toward “closing the loop locally.” ILSR will continue to provide technical assistance and promote aggressive policies aimed at maximizing materials recovery and economic development in the Tri-City Region.

NOTES

¹While a comparison was made between materials recovery and waste disposal in terms of the jobs sustained and revenue generated, no net benefit/cost comparison was made.

²Processing facilities prepare collected materials for end users by sorting, baling, washing, flaking, pelletizing, and/or shredding materials. For this study, ILSR also included composting, construction and demolition debris (C&D) processing, and salvage/reuse facilities in the processing category.

³ The waste stream used as a basis for these percentages includes not only municipal solid waste (MSW), but also construction and demolition debris (C&D), scrap metals and autos, and salvage/reuse items. See Appendix A for more detailed information on the waste stream analyzed.

⁴ Since materials must be collected and hauled whether they are to be recycled or disposed, jobs associated with collection and hauling of waste and recyclables were not included in the totals. Garbage transfer station jobs, however, are included with landfills and incinerators.

There are actually 10,104 people employed by businesses doing some recycling. For the five manufacturers utilizing less than 50% recycled feedstock, we did not count all of their jobs. Rather, for these we only considered the “recycling-related” jobs, which was calculated by multiplying total jobs by the recycled feedstock utilization rate. Bethlehem Steel in the Baltimore Region, for example, employs 5,600 people and utilizes 30% scrap in its feedstock. The 5,100 total jobs sustained by recycling businesses in the Tri-City Region only attributes 1,680 jobs to Bethlehem Steel. If a manufacturer utilized more than 50% recycled feedstock, we considered all the jobs recycling related.

⁵Recycling-based manufacturers in the region generate about \$2.1 billion in “recycling-related” product sales revenues. For the five manufacturers utilizing less than 50 percent recycled feedstock, recycling-related sales revenue is calculated by multiplying the recycled feedstock utilization rate by the total product sales. For other manufacturers, all revenue is considered recycling related. One manufacturer, which utilizes 30 percent recycled feedstock, accounts for the lionshare of the \$5.6 billion in total sales revenue—it generates \$5 billion annually in product sales.

Appendix A

Data Collection and Analysis Methodology

Introduction

As part of its National Capital Area Project funded by the U.S. Environmental Protection Agency, the Institute for Local Self-Reliance (ILSR) has researched and documented (1) the current level of jobs and revenues sustained through recycling as compared to disposal options and (2) the potential increase in economic development opportunities by the year 2005 (10 years from now) if the Tri-City Region implements policies to maximize recycling and link it to economic development. Data collected are summarized in this report as well as in a companion poster entitled *Recycling Means Business*, which ILSR conceived, developed, and printed. The poster also compares the maximum recycling 2005 scenario with the jobs and revenues that would be sustained given no change in current policies—a current policy 2005 scenario. For all three scenarios (current, maximum recycling 2005, and current policy 2005), the poster shows the tonnages of waste generated, recovered, incinerated, and landfilled. This appendix explains the methodology used to collect and analyze current data and to calculate figures for the 2005 scenarios.

Data gathered include waste generation and recovery tonnages for each area as well as detailed information on transfer stations, landfills, compost sites, materials processing facilities, and end-use manufacturers located in each metropolitan area.

Jurisdictions Documented

Materials generated by the cities of Baltimore, Washington, D.C., and Richmond often end up disposed or recycled at facilities outside each city's limits. Thus, in order to provide a comprehensive picture of the recycling-based economic development associated with each city, we gathered data for each city's greater metropolitan area.

For Baltimore, Maryland, the metropolitan area comprises the City of Baltimore and five surrounding counties: Anne Arundel, Baltimore, Carroll, Howard, and Harford.

For Washington, DC, the metropolitan area comprises the District of Columbia; two suburban Maryland counties, Montgomery and Prince George's; and several northern Virginia jurisdictions—Fairfax City, the city of Alexandria, Arlington County, and Fairfax County.

For Richmond, Virginia, the metropolitan area comprises 13 jurisdictions: the cities of Richmond, Petersburg, Colonial Heights, Hopewell, and the Town of Ashland, and the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan, and Prince George.

Table A-1 shows the populations of the cities and of their metropolitan areas. Each of the three cities is similar in terms of population distribution. The major urban hub is surrounded by suburban communities, and the region gradually becomes more rural as distance from the city increases. The total population for the Tri-City Region was close to 6.6 million in 1993, and will increase to almost 7.3 million by 2005.

Table A-1. Population in Each City and Metropolitan Area

City/Region	1993 Population	2005 Population
City of Baltimore	726,100	708,000
Baltimore Region	2,398,600	2,606,600
Washington, DC	607,900	612,600
Washington, DC Region	3,286,600	3,635,600
City of Richmond	212,600	210,300
Richmond Region	893,300	1,032,800
Tri-City Region Total	6,578,500	7,275,000

Sources: Maryland Office of Planning, personal communication; *District of Columbia Comprehensive Solid Waste Management Plan, Draft*, Gershman, Brickner, & Bratton, Inc., November, 1993; Prince George's County *Solid Waste Management Plan*; Fairfax County *Solid Waste Management Plan*; Central Virginia Waste Management Authority *Solid Waste Management Plan, 1992*.

Current Waste Generation, Waste Composition, Waste Recovery and Disposal

ILSR staff gathered the most recent figures on total waste generation, waste composition, and recycling tonnages for each material by contacting the solid waste management authorities in each city and county in the targeted metropolitan areas.

The waste stream documented in this report and in the *Recycling Means Business* poster includes not only municipal solid waste (residential and commercial waste), but also other recyclable materials such as construction and demolition (C&D) debris, tires, autos, and scrap steel. The data obtained demonstrate the importance of expanding the range of materials targeted for recovery as well as improving recovery rates for currently targeted materials.

Because different cities and counties compile and record waste generation and waste composition data in different forms, ILSR research staff used slightly different methodologies to calculate the waste generation tonnages in each metropolitan area in order to present the waste stream data in a form that is consistent for all three areas. The methodologies used to arrive at the tonnage figures for each metropolitan area are described below.

Table A-2. Waste Recovery by Material in the Baltimore Metropolitan Region

1993 TPY Waste Recycled by County							
Material	Anne Arundel	Baltimore City	Baltimore Region (a)	Carroll County	Harford County	Howard County	Total
ONP	3,320	10,899	10,899	892	4,278	366	19,755
OCC	18,228	14,273	14,812	3,208	6,879	9,801	52,928
Office paper	5,444	27,821	27,821	NA	500	1,424	35,189
Other paper	15,071	45,472	160,390	9,261	2,964	15,479	203,165
Paper Total	42,063	98,465	213,922	13,361	14,621	27,070	311,037
Plastic Total	1,883	147	1,334	676	826	652	5,371
Glass Total	7,192	164	7,098	1,965	2,460	3,956	22,671
Aluminum	1,645	780	1,374	488	506	132	4,146
Ferrous	2,264	1,168	2,244	471	856	296	206,130
Other Metals	3,779	NA	13,262	NA	NA	836	17,877
White Goods	2,283	NA	9,506	1,858	820	1,329	15,796
Metal Total	9,970	1,948	26,386	2,817	2,182	2,593	243,949
Yard Waste	23,234	17,217	19,490	3,859	20,127	686	67,396
Pallets/ Wood	1,041	NA	24,283	2,940	NA	6,087	34,351
Food Waste	2,719	NA	8,963	NA	864	NA	12,546
Organic Total	26,994	17,217	52,736	6,799	20,991	6,773	114,293
Autos (b)	NA	NA	NA	NA	NA	NA	99,000
Auto Batteries	3,105	826	2,317	17	21	109	5,569
C&D (b)	NA	NA	NA	NA	NA	NA	164,600
Durables, Textiles	NA	NA	1,897	NA	23	57	1,977
Motor Oil	NA	NA	NA	NA	NA	NA	NA
Tires	236	5,076	6,393	55	NA	506	7,190
Other	5,495	NA	829	NA	NA	1,114	7,438
Misc. Total	8,836	5,902	11,436	72	44	1,786	285,774
Total	96,939	123,843	312,911	25,690	41,124	42,830	983,095

Key: C&D = construction and demolition debris, NA = not available, OCC = old corrugated cardboard, ONP = old newspaper

Notes:

(a) Baltimore Region includes Baltimore City and Baltimore County.

(b) Recycled tonnage based on information from local processors.

Source: Maryland Recycling Act (MRA) Tonnage Reporting System, County Recycling Accounting Forms.

Baltimore Metropolitan Area

The Maryland Recycling Act (MRA) differentiates between types of waste that are used to calculate the recycling rate (MRA wastes) and wastes that are not included in the calculation (NMRA wastes). Counties and cities report the totals disposed for these types of waste, but do not break them down by material. Waste composition data were available only for Anne Arundel County. ILSR researchers decided that the disposal tonnages reported for the Baltimore metropolitan area were not detailed enough to use in determining total waste generation and waste composition. Instead, ILSR used the per capita waste generation tonnages calculated for the Richmond region as a basis for calculating the Baltimore region waste generation. Both regions consist of a major city surrounded by suburban population centers and rural areas. Therefore, we assumed that per capita waste generation would be similar in the two areas. Current tonnage of each material in the waste stream and total waste generation rates were calculated by multiplying the 1993 Baltimore metropolitan area population by the tons per year per capita generated in Richmond metropolitan area.

The Maryland Department of the Environment provided detailed waste recovery data for Baltimore city and the surrounding counties. Additional data from scrap steel and C&D processors were used to determine steel and C&D recovery rates. These data are presented in Table A-2.

Washington, D.C. Metropolitan Area

Detailed waste generation and waste recovery information was available for Washington, D.C., in the *Waste Stream Analysis* study prepared by GBB Solid Waste Management Consultants. Montgomery and Fairfax Counties provided waste composition data as well. For each city and county in the D.C. metropolitan area, the total waste generation and the corresponding waste stream were well defined. Therefore, the tonnage of each material generated could be calculated using the known waste composition figures and the known total tons of waste generated.

Each city and county in the area also provided detailed breakdowns by material of tonnages recovered from municipal solid waste. Construction and demolition firms provided researchers with C&D recovery rates for the region. These figures are presented in Table A-3.

Richmond Metropolitan Area

The city of Richmond, eight surrounding counties, and four other municipalities form a regional solid waste management authority, the Central Virginia Waste Management Authority (CVWMA). As a result, waste generation and recovery data are reported on a regional basis. The Central Virginia Solid Waste Management Plan contains waste generation tonnages, from which we calculated waste composition percentages and tonnage generated per capita. The Authority also provided a detailed report of annual tonnages recovered for each material except C&D debris and durables. Tonnages recovered for these materials were obtained from processors in the region. As not all materials were included in composition/generation data, ILSR used national EPA per capita generation figures

for food waste, auto batteries, tires, and an "other" category—miscellaneous packaging, inorganic waste, and nondurables.

Table A-3. Waste Recovery by Material in the Washington, D.C. Metropolitan Area

1993 TPY Waste Recycled								
Material	District of Columbia (a)	Montgomery County (b)	Prince George's County (c)	City of Fairfax (d)	Fairfax County (e)	City of Alexandria (f)	Arlington County (g)	Total Recycled
ONP	58,689	50,284	32,380	2,069	49,798	7,254	7,605	208,078
OCC	14,904	39,847	36,377	1,575	30,072	2,132	4,333	129,241
Office paper	29,623	13,571	16,283	881	15,755	1,884	6,115	84,111
Other paper	3,349	12,897	18,067	1,196	22,076	892	119	58,596
Paper Total	106,565	116,599	103,107	5,721	117,701	12,161	18,173	480,027
HDPE, PET	1,200	2,857	1,281	90	1,700	204	59	7,391
Plastic film	NA	NA	NA	NA	NA	162	NA	162
Plastic Total	1,200	2,857	1,281	90	1,700	367	59	7,553
Glass Total	6,027	511	12,357	713	18,526	2,127	1,271	41,532
Aluminum	9,672	1,246	4,027	187	1,350	494	66	17,042
Ferrous	21,737	14,665	7,391	2,617	NA	1,050	699	48,159
Other metals	740	1,345	465	NA	30,000	6	NA	32,556
White goods	NA	4,091	12,232	NA	NA	NA	NA	16,323
Metal Total	32,149	21,347	24,115	2,804	31,350	1,550	765	114,080
Yard waste	17,382	138,986	20,689	2,351	36,133	3,922	11,246	230,709
Land clearing debris	NA	2,894	11,504	1,304	18,622	NA	1,362	35,686
Wood/ pallet waste	NA	109	9,873	2,437	NA	NA	NA	12,419
Organic Total	17,382	141,989	42,066	6,092	54,755	3,922	12,608	278,814
Autos	3,575	NA	NA	NA	NA	NA	NA	3,575
Auto batteries	NA	72	NA	NA	164	51	NA	287
C&D debris (h)	43,238	NA	NA	NA	NA	NA	NA	219,837
Durables	NA	56	2,979	135	NA	NA	NA	3,170
Motor oil	448	NA	NA	324	NA	NA	791	1,563
Tires	15	1,065	2,306	NA	2,620	71	NA	6,076
Other	1,446	NA	NA	NA	NA	NA	NA	1,446
Misc. Total	48,722	1,193	5,285	459	2,784	122	791	235,954
Total Generated	212,045	284,496	188,210	15,879	226,816	20,249	33,666	1,157,960

Key: HDPE = high-density polyethylene, NA = not available, OCC = old corrugated cardboard, ONP= old newspaper
 PET = polyethylene terephthalate

Notes:

- (a) District of Columbia Comprehensive Solid Waste Management Plan, Draft, Gershman, Brickner, & Bratton, Inc., November 1993. Data for Washington, D.C. are 1992 data, not 1993.
- (b) "Maryland Recycling Act Tonnage Reporting System, Montgomery County Office of Recycling, 1993.
- (c) "Maryland Recycling Act Tonnage Reporting System, Prince George's County Office of Recycling, 1993.
- (d) "1993 Principal Recyclable Materials" issued by City of Fairfax Office of Recycling, 1994.
- (e) "1993 Recycling Information" issued by Fairfax County Department of Public Works, 1994.
- (f) "1993 Principal Recyclable Materials" issued by City of Alexandria Office of Recycling, 1994.
- (g) "1993 Principal Recyclable Materials" issued by Arlington County Department of Environmental Services, 1994.
- (h) Recycled tonnage based on information from local processors of the material. This figure includes tonnage for Washington, D.C.

Waste Composition

The tonnages generated in each metropolitan area were totaled according to seven major material categories: paper, glass, plastic, metal, organics, C&D, and miscellaneous materials. Table A-4 shows the tonnage generated for each type of material in each metropolitan area. The overall waste composition for the Tri-City Region is represented by the pie chart on the *Recycling Means Business* poster.

Table A-4. Estimated Waste Composition for Each Metropolitan Area Major Materials

Material	Baltimore		Washington, DC		Richmond		Total	
	TPY	%	Total TPY	%	Total TPY	%	TPY	%
Paper	1,533,587	35%	1,558,792	30%	571,150	35%	3,663,529	33%
Plastic	257,768	6%	254,879	5%	96,000	6%	608,647	5%
Glass	184,465	4%	253,882	5%	68,700	4%	507,047	5%
Metal	614,030	14%	386,177	7%	228,500	14%	1,228,707	11%
Organics	628,048	14%	1,228,096	24%	233,903	14%	2,090,047	19%
C&D	674,419	15%	793,274	15%	251,172	15%	1,718,865	15%
Reusable goods and other	486,510	11%	695,634	13%	181,190	11%	1,363,334	12%
Total	4,378,827	100%	5,170,734	100%	1,630,615	100%	11,180,176	100%

Key: C&D = construction and demolition debris (such as wood waste, concrete, asphalt, and bricks)
TPY = tons per year

Waste Disposal

ILSR staff derived the figures for total tons incinerated in the Baltimore and the Washington metropolitan areas from the total tons processed at incinerators and the estimated proportion of this waste originating in each of the two metropolitan areas. Operators at each facility provided this information. No incinerators exist in the Richmond metropolitan area. The tonnage landfilled for each metropolitan area was calculated by subtracting tons recovered and tons incinerated from total tons generated. Data collected from solid waste authorities and landfill operators were consistent with these calculations.

Calculating Future Waste Generation and Waste Recovery

The *Recycling Means Business* poster presents two alternative paths that the Tri-City Region can follow over the next ten years and the results of those choices in terms of economic development by the year 2005. One alternative is to follow the current policy of moderate increases in waste recovery and market development—a current policy 2005 Scenario. The second alternative is based on implementation of

comprehensive policies to maximize waste reduction and recovery—a maximum recycling 2005 scenario. The poster shows dramatic differences in potential economic benefits between the two scenarios.

Waste Generation, Recovery, and Disposal for Current Policy 2005 Scenario

To calculate waste generated for the current policy 2005 scenario, we used city and county waste generation projections for 2005, as reported in their solid waste management plans, and assumed the same waste composition as 1993. If the projected tonnage did not include specific materials that we considered as part of the waste stream (e.g., autos, C&D), we added in the tonnage for these materials based on current per capita generation rates and the 2005 population figures. In order to come up with an overall recycling rate for the year 2000, (1) where appropriate, we used slightly higher recycling rates for specific materials in calculating waste recovery totals, (2) we took account goals stated in the solid waste management plans, and (3) we reviewed current recovery levels and current solid waste management program and policies.

Current solid waste management policy in the Tri-City Region calls for increased incineration capacity in Baltimore and Washington, D.C. The tonnage incinerated for the Baltimore metropolitan area, in the current policy 2005 scenario is based on the existing 350 ton-per-day Harford incinerator and 2,340 ton-per-day BRESCO facility, and on two new facilities, one at the Pulaski site with a capacity of 1,650 tons per day and one in Anne Arundel County with a capacity of 1,800 tons per day. In the Washington D.C. metropolitan area, the Lorton and Alexandria, Virginia facilities provide 3,000 ton-per-day and 975 ton-per-day incineration capacities respectively, and a new facility planned for Montgomery County, Maryland, is slated to provide an additional 1,800 tons per day of capacity. Tonnages incinerated were calculated on the assumption that facilities will operate 365 days a year and that 90 percent of their available capacity will be met by waste generated in the corresponding metropolitan area. Waste not recovered or incinerated was assumed to be landfilled.

Waste Generation, Recovery, and Disposal for Maximum Recycling 2005 Scenario

The maximum recycling 2005 scenario is characterized by significant waste reduction and high waste recovery rates. Assuming that the annual waste generation per capita decreases by 10 percent over the next ten years, the total tonnage of waste generated in 2005 will be about the same as the current figure, even with a projected increase of almost 700,000 people in the Tri-City Region. (See Tables 1 and 8.) We calculated the totals for waste recovery using aggressive yet appropriate and realistic recycling rates for each material to come up with an overall recycling rate of 70 percent in each metropolitan area. (These recycling rates are based on reasonable increases in current recovery levels as well as on what other communities have already achieved.)

For this scenario, we assumed that only 10 percent of the waste from the Baltimore metropolitan area and 15 percent of the waste from the Washington metropolitan area would be incinerated. Baltimore’s incineration capacity would decrease with the closing of the Pulaski incinerator. The Lorton and Alexandria incinerators would remain in operation, but no new incineration capacity would be added in the region. Local waste would account for 43 percent of incineration capacity in Baltimore and 54 percent of incineration capacity in Washington, D.C. Either waste from other regions would be imported to fill the remaining incineration capacity, or the incinerators could operate at these lower capacities. Landfills in the region would dispose the local waste not incinerated or recovered.

Current Recycling-Based Economic Development in the Tri-City Region

Current Processors of Recovered Materials and Recycling-Based Manufacturers

ILSR researchers used the MAC/REDO Recyclable Material Market Directory, local waste management authority contact lists, and other sources to develop a comprehensive list of recycling processors and manufacturers in each metropolitan area. See Appendix E for the list of processors and manufacturers contacted in the Tri-City Region.

Processors include material recovery facilities (MRFs), composting operations, C&D recovery operations, sorting operations, scrap yards, commodity-reuse enterprises, and other operations that add value to a recovered material by preparing it for use by a recycling-based manufacturer. Hauling operations and brokering businesses that do no processing are not included. Businesses that manufacture products with post-consumer content are considered recycling-based manufacturers.

ILSR research staff contacted each company and operation to obtain information including:

- lists of recyclable materials processed or used by the facility,
- total tons of each type of recovered material processed or used,
- recycled content of products,
- percentage of materials derived from the local (metropolitan area) waste stream,
- number of skilled and entry-level full-time equivalent (FTE) employees at the facility,
- skilled and entry-level hourly wages, and
- gross annual revenues.

Of the twenty-three processors in the Richmond metropolitan area, only two did not provide FTE numbers, and only seven withheld revenue information.

An important part of our research was determining the extent to which the region has “closed the loop locally”—identifying the percentage of the recovered waste stream that is being used as feedstock for local manufacturers and other end uses.

Locally recovered materials include composted organics, recycled C&D materials, and salvage and reuse items, as well as materials from the local waste stream used by local manufacturers. To determine the current total tons used locally, we added together the data from manufacturers concerning locally -recovered feedstocks, the reported totals for organics recovered, and the reported tons recovered locally by C&D and salvage and reuse businesses. To calculate the current percentage of recovered materials used locally, we divided the total tons used locally by the total tons recovered from the region.

Current Materials Recovery Jobs

The total number of entry-level and skilled jobs in processing and manufacturing recyclable materials, presented in this report and the *Recycling Means Business* poster, is based on actual numbers reported by businesses. Jobs were estimated for the few cases in which the company would not disclose numbers.

While we documented all the full-time equivalent jobs at manufacturing facilities handling secondary feedstock, we did not necessarily consider all of these jobs "recycling related." If manufacturers utilized more than 50 percent secondary feedstock, we considered all of their jobs recycling related. For the five manufacturers in the region utilizing less than 50 percent secondary feedstock, we determined recycling-related jobs by multiplying the total jobs by the secondary feedstock utilization rate. Table A-6 compares total manufacturing jobs with those we consider recycling related.

Table A-5. Current and Future Waste Generation, Recovery, and Disposal in Each Metropolitan Area

	Baltimore (a)		Washington, DC (a)		Richmond (a)		Total	
	TPY	%	TPY	%	TPY	%	TPY	%
Current Totals								
Recycled/Composted	983,100	22%	1,158,000	22%	484,100	30%	2,625,200	23%
Composted locally	114,300	3%	278,800	5%	132,400	8%	525,500	5%
Recycled locally (b)	377,300	9%	80,200	2%	138,700	9%	596,200	5%
Exported (c)	491,500	11%	799,000	15%	213,000	13%	1,503,500	13%
Incinerated	1,008,500	23%	1,276,400	25%	0	0%	2,284,900	20%
Landfilled	2,387,200	55%	2,736,400	53%	1,146,500	70%	6,270,100	56%
Total (d)	4,378,800	100%	5,170,800	100%	1,630,600	100%	11,180,200	100%
2005 Current Policy Totals								
Recycled/Composted	1,840,200	37%	2,240,800	40%	759,200	39%	4,840,200	39%
Composted locally	365,400	8%	644,900	12%	175,000	11%	1,185,300	11%
Recycled locally (b)	591,500	14%	363,400	7%	318,500	20%	1,273,400	11%
Exported (c)	883,300	20%	1,232,500	24%	265,700	16%	2,381,500	21%
Incinerated	2,017,000	41%	1,897,100	34%	0	0%	3,914,100	31%
Landfilled	1,084,600	22%	1,508,800	27%	1,209,200	61%	3,802,600	30%
Total (d)	4,941,800	100%	5,646,700	100%	1,968,400	100%	12,556,900	100%
2005 Maximum Recycling Policy Totals								
Recycled/Composted	3,007,500	70%	3,700,100	70%	1,190,300	70%	7,897,900	70%
Composted locally	497,200	11%	1,040,600	20%	197,000	12%	1,734,800	16%
Recycled locally (b)	1,758,400	40%	1,734,400	34%	695,700	43%	4,188,500	37%
Exported (c)	751,900	17%	925,000	18%	297,600	18%	1,974,500	18%
Incinerated	428,300	10%	789,600	15%	0	0%	1,217,900	11%
Landfilled	846,900	20%	774,100	15%	506,500	30%	2,127,500	19%
Total (d)	4,282,700	100%	5,263,800	100%	1,696,800	100%	11,243,300	100%
Population Data								
1993 population	2,398,600		3,286,600		893,300		6,578,500	
2005 population	2,606,600		3,635,600		1,032,800		7,275,000	

Key: TPY = tons per year

Notes:

(a) Figures above represent metropolitan areas, not city jurisdictions. For information on waste generation and recovery in the cities of Baltimore and Washington, D.C., see Appendices B and C.

(b) Represents materials manufactured into new products or materials reused locally such as furniture and clothing.

(c) Represents material recovered locally but exported out of the region for recycling.

(d) Some totals may not add up due to rounding.

Source: Institute for Local Self-Reliance, 1994.

Table A-6. Current Jobs at Manufacturing Facilities Handling Recycled Feedstock, Total and Recycling-Based

	Baltimore		DC Region		Richmond		Total	
	Recycling -Based	Total	Recycling -Based	Total	Recycling -Based	Total	Recycling -Based	Total
Paper	262	262	0	0	665	1,621	927	1,883
Plastic	25	25	0	0	0	0	25	25
Glass	0	0	0	0	0	0	0	0
Metal	1,737	5,657	0	0	102	102	1,839	5,759
Wood Pallets	20	20	0	0	141	141	161	161
Other	9	10	16	16	110	110	135	136
Total	2,053	5,974	16	16	1,018	1,974	3,087	7,964

Source: Institute for Local Self-Reliance, 1994.

Current Disposal Jobs

The total number of jobs currently sustained by waste incineration and landfilling was obtained through surveys of these facilities. In addition transfer station jobs were allocated to the incineration and landfill job totals in proportion to the ratio of tons incinerated to tons landfilled in each metropolitan area. Because many facilities import waste from outside the region, we calculated the "local" incineration and landfilling jobs at each facility by multiplying the number of jobs by the percentage of materials from the local metropolitan area.

Current Revenues

More important than the current revenue figures is the net increase in revenue achievable by the year 2005 under the two alternative scenarios. Total current revenues earned by facilities handling solid waste or recovered material are already very high—close to \$6 billion. This figure is skewed, however; \$5 billion are due to one manufacturer.

The *Recycling Means Business* poster depicts "gross revenues created by the Tri-City Region's waste stream." These revenues are a function of the percentage of local materials used by each processor and manufacturer, and the recycled content of the products manufactured. They represent the annual gross revenues earned by facilities recycling, incinerating, and landfilling discarded materials. Such revenues contribute significantly to the regional tax base and the amount of dollars circulating within local economies.

We obtained actual revenue figures for materials recovery through interviews and surveys of processors and manufacturers in the region. Revenues for recycling operations reflect annual materials sales revenues. Where possible, these are based on actual revenues received by companies. Where such data were not available, we calculated revenues based on materials prices reported for the Mid-Atlantic region

in *Recycling Times*, and in Roy F. Weston, Inc., *Value Added to Recyclable Materials in the Northeast* (May 8, 1994).

Revenues for composting operations, landfills, and incinerators generally reflect tipping fees received. Waste transfer station jobs and revenues are included under incineration and landfilling, and are allocated to each of these according to tonnage landfilled versus tonnage incinerated. For the Baltimore and Washington metropolitan areas, disposal revenues are based on each facility's tipping fee. Annual total revenues for public landfills in the Richmond metropolitan area were obtained from county public works departments; and revenues for private landfills are based on average tipping fees.

Future Recycling-based Economic Development in the Tri-City Region

Future 2005 Scenario Assumptions

In order to estimate the number of jobs sustained and revenues generated from the waste stream in 2005, the following assumptions were made:

- **Existing Processing Facilities:** Although the tonnage of waste recovered from the local waste stream will increase, processors will continue to handle the same amount of materials from outside the Tri-City Region as they currently do. Therefore total jobs and total revenues will continue to reflect the processing of materials delivered from outside the region. (The assumption that the same tonnage continues to be "imported" means that the increased local tonnage recovered creates new jobs and revenues, not merely transfers from jobs and revenues related to "imported" waste.)
- **Amounts and Types of Materials Processed:** Data from processing companies show that a portion of some recovered materials goes directly to end users, is processed at facilities handling mixed materials, is processed by facilities specializing in one or more materials, or is exported. For example, more than 300,000 tons of paper were recycled in the Baltimore metropolitan area in 1993, yet processing companies in the region report a total of 118,000 tons processed. For current policy 2005 scenario calculations, we assumed:
 - 50 percent of all recovered paper is processed by paper brokers.
 - approximately 10 to 15 percent of the total tonnage recovered is processed at materials recovery facilities (MRFs).
 - 50 percent of the plastic recovered in Baltimore and Richmond areas and 25 percent of that recovered in the Washington, D.C. region is processed locally.
 - Almost all of Baltimore area's recovered metal is processed locally (92 percent), while in the D.C. area, only 25 percent is (little capacity is currently available in this metropolitan area) and in the Richmond area, close to two thirds is processed locally.

For maximum recycling 2005 scenario calculations, we assumed:

—50 percent of office paper and corrugated cardboard go directly to paper processors; the other 50 percent goes directly to paper manufacturers.

—50 percent of old newsprint and mixed paper is processed at materials recovery facilities (MRFs) handling mixed segregated materials; the rest is processed by paper processors.

—glass and plastics are processed at MRFs; half the recovered plastic then goes to local intermediate plastic processors and all the glass is beneficiated locally.

—metals are processed by local metal scrap yards/processors.

- **New plants already planned:** Specific plans for new or expanded processing and manufacturing capacity in each of the metropolitan areas were incorporated, including:
 - a new glass beneficiation plant in Baltimore,
 - a new pallet remanufacturer in Washington, D.C., and
 - expanded capacity in Richmond for a plastic processor and a tire processor.
- **New Processing Capacity:** New processors will move in or existing processors will expand to accommodate the additional tonnage recovered in 2005.
- **Substituting Local Waste for Imported Waste:** If the local supply of recovered paper and metals increases, manufacturers will probably substitute these local materials for some of their “imported” feedstocks. Manufacturers that currently use up to 25 percent from the local waste stream would either double their use of local feedstock or utilize at least 25 percent local waste, whichever was higher (unless specific company data indicated otherwise); those using 25 percent to 75 percent local feedstock would increase that proportion to 75 percent (unless specific company data indicated otherwise).
- **Recycled-Content:** For the maximum recycling 2005 scenario, paper products have a minimum 50 percent recycled content. Otherwise, recycled content of products remained the same.
- **New Manufacturing Capacity:** The maximum recycling 2005 scenario is based on data from existing businesses. We assumed that these operations or similar ones could move into each metropolitan area. Jobs and revenues are based on the types and amounts of recovered materials available in the Tri-City Region.

Future Processing Jobs

We used our averages for current jobs per ton by material and metropolitan area to calculate the number of processing jobs for each material in each metropolitan area in 2005. In cases where specific materials are not currently processed in the metropolitan area, we used figures from Roy F. Weston, Inc., *Value Added to Recyclable Materials in the Northeast* (May 8, 1994). Calculations are based on Weston figures for all organic processing jobs, for glass processing jobs in Baltimore and Washington, D.C., and for plastic and tire processing jobs in Washington, D.C.

No detailed analysis was performed to project the number of skilled versus entry-level jobs in the future. We used the ratios of skilled processing jobs to entry-level processing jobs as calculated for 1993 in each metropolitan area to determine the number of skilled versus entry-level jobs in 2005.

Future Processing Revenues

Because of the variations in the revenues per ton reported by processors for identical materials and because of the fluctuation in the market, ILSR researchers compared average revenues per ton based on processors reports to figures quoted for the mid-Atlantic region in *Recycling Times*, as well as those reported in Weston in order to come up with intermediate values for use in calculating total revenues in 2005.

Future revenue figures are only useful to illustrate the potential for substantially increasing these from current figures. It is the relative value of the figures that is useful, not their absolute values.

Future Manufacturing Jobs

The only new manufacturing jobs projected for the current policy 2005 scenario are pallet remanufacturing jobs in the Washington, D.C. metropolitan area. The total manufacturing jobs sustained by each metropolitan area's waste stream will increase due to manufacturers substituting locally recovered materials for "imported" materials.

The real opportunity for job creation lies in the establishment of new recycling-based manufacturing businesses in each metropolitan area. Researchers assessed the recovered materials that would be available in each metropolitan area under the maximum recycling 2005 Scenario, and identified manufacturers that could utilize these materials to make high-value products (i.e., manufacturers that can be supported by the waste stream). Data from existing recycling-based manufacturers were used to determine feedstock tonnage requirements, the number of jobs that could be sustained, and potential gross revenues. The manufacturing facilities that would be located in each metropolitan area under the maximum recycling 2005 scenario are listed in Table A-7.

Total manufacturing jobs for the maximum recycling 2005 scenario were calculated by adding together the number of jobs sustained by existing manufacturers and the number of jobs created as listed in Table A-7. Table A-8 compares total jobs at manufacturers handling recycled feedstock to those jobs we consider recycling related.

The ratios of skilled manufacturing jobs to entry-level manufacturing jobs as calculated for 1993 in each metropolitan area were used to determine the number of skilled and entry-level manufacturing jobs in 2005.

Table A-7. New Manufacturers Located in Each Region

Baltimore Region							
Facility	Materials	Total Production (TPY)	Waste Material Consumed (TPY)	Percentage From Local Waste Stream	Estimated TPY Local Waste	FTE Total	Annual Revenue
Newsprint mill	ONP	280,000	280,000	100%	180,000	220	\$57,000,000
Tissue mill	MP	160,000	160,000	100%	160,000	1100	\$30,000,000
Printing & writing mill	HGOP	80,000	80,000	100%	80,000	210	\$56,000,000
Linerboard/ corrugated paper manufacturer	OCC	100,000	100,000	100%	100,000	61	\$25,000,000
Paperboard manufacturer	MP, ONP, OCC	60,000	60,000	100%	60,000	90	\$16,000,000
Cellulose building insulation manufacturer	MP, ONP, OCC	33,300	31,000	100%	31,000	100	\$6,000,000
Animal bedding producer (a)	MP, ONP, OCC	15,000	15,000	100%	15,000	10	\$6,000,000
Total Paper:		728,300	726,000		626,000	1,791	\$196,000,000
Plastic lumber manufacturer	HDPE	4,200	4,000	100%	4,000	55	\$3,000,000
HDPE product manufacturer	HDPE pellets	14,700	11,000	100%	11,000	230	\$41,000,000
HDPE sheet manufacturer	HDPE	2,000	2,000	100%	2,000	30	\$2,000,000
PET container manufacturer (a)	PET	18,000	9,000	100%	9,000	64	\$18,000,000
Total Plastic:		38,900	26,000		26,000	379	\$64,000,000
Glass tile manufacturer	glass	14,300	10,000	100%	10,000	75	\$38,460,000
Art glass manufacturer	glass	2,000	2,000	100%	2,000	20	\$1,200,000
Pressed glass manufacturer	glass	10,000	4,000	100%	4,000	80	\$2,000,000
Glasphalt facility	glass	100,000	10,000	100%	10,000	10	\$3,000,000
Total Glass:		126,300	26,000		26,000	185	\$44,660,000
Steel product manufacturer	scrap steel	50,000	50,000	100%	50,000	50	\$150,000,000
Total Metal:		50,000	50,000		50,000	50	\$150,000,000
Battery recovery plant	batteries	52,000	51,500	25%	12,875	120	\$210,000,000
Tire recovery plant	tires	30,000	30,000	40%	12,000	25	\$9,000,000
Total Miscellaneous:		82,000	81,500		24,875	145	\$219,000,000
Pallet remanufacturer	wood pallets	15,000	15,000	100%	15,000	20	\$1,540,000
Total Pallet:		15,000	15,000		15,000	20	\$1,540,000
Paving material recycler	asphalt roofing debris	114,300	80,000	100%	80,000	20	\$4,000,000
Aggregate recycler	concrete aggregate	40,000	40,000	100%	40,000	10	\$320,000
Asphalt recycler	roofing asphalt	200,000	200,000	100%	200,000	5	\$3,000,000
Total C&D:		354,300	320,000		320,000	35	\$7,320,000
Total Manufacturing: (excludes C&D)		1,040,500	924,500		767,875	2,570	\$675,200,000

Table A-7. New Manufacturers Located in Each Region, cont.

Washington, D.C. Region							
Facility	Materials	Total Production (TPY)	Waste Material Consumed (TPY)	Percentage From Local Waste Stream	Estimate TPY Local Waste	FTE Total	Annual Revenue
Newsprint mill in Baltimore	ONP	(b)	(a)	100%	100,000	(b)	(b)
Existing paper mills in Virginia	ONP, OCC	(b)	(b)	100%	150,000	(b)	(b)
Tissue mill	MP	160,000	160,000	100%	160,000	1100	\$30,000,000
Printing & writing mill	HGOP	80,000	80,000	100%	80,000	210	\$56,000,000
Linerboard/ corrugated paper manufacturer	OCC	100,000	100,000	100%	100,000	61	\$25,000,000
Molded pulp/packaging manufacturer	MP, ONP, OCC	10,000	10,000	100%	10,000	100	\$7,000,000
Cellulose building insulation manufacturer	MP, ONP, OCC	33,300	31,000	100%	31,000	100	\$6,000,000
Animal bedding producer (a)	MP, ONP, OCC	15,000	15,000	100%	15,000	15	\$6,000,000
Total Paper		398,300	396,000		646,000	1,586	\$130,000,000
LDPE bags plant	LDPE, HDPE	50,000	25,000	100%	25,000	475	\$37,500,000
Plastic lumber manufacturer	HDPE	8,400	8,000	100%	8,000	110	\$6,000,000
HDPE sheet manufacturer	HDPE	2,000	2,000	100%	2,000	30	\$2,000,000
PET container manufacturer (a)	PET	18,000	9,000	100%	9,000	64	\$18,000,000
Total Plastic:		78,400	44,000		44,000	679	\$63,500,000
Pressed glass manufacturer	glass	10,000	4,000	100%	4,000	80	\$2,000,000
Glasphalt facility	glass	100,000	10,000	100%	10,000	10	\$3,000,000
Total Glass:		110,000	14,000		14,000	90	\$5,000,000
Steel product manufacturer	scrap steel	50,000	50,000	100%	50,000	50	\$150,000,000
Detinning facility	ferrous cans	60,000	60,000	100%	60,000	40	\$12,000,000
Aluminum dross facility	aluminum dross	180,000	18,000	100%	18,000	20	\$2,500,000
Existing aluminum and steel facilities in Baltimore	aluminum, scrap steel	(b)	(b)	100%	155,000	(b)	(b)
Total Metal:		290,000	128,000		283,000	110	\$164,500,000
Battery recovery plant in Baltimore	batteries	(b)	(b)	30%	15,450	(b)	(b)
Tire recovery plant in Baltimore	tires	(b)	(b)	50%	15,000	(b)	(b)
Total Miscellaneous:		0	0		30,450	0	\$0
Pallet remanufacturer at Marshall Heights	wood pallets	30,000	30,000	100%	30,000	70	\$2,500,000
Total Pallet:		30,000	30,000		30,000	70	\$2,500,000
Paving material recycler	asphalt roofing debris	114,300	80,000	100%	80,000	20	\$4,000,000
Aggregate recycler	concrete aggregate	40,000	40,000	100%	40,000	10	\$320,000
Asphalt recycler	asphalt pavement	200,000	200,000	100%	200,000	5	\$3,000,000
Commodity reuse facility	building supplies	15,000	15,000	100%	15,000	15	\$500,000
Total C&D and Commodity Reuse:		369,300	335,000		335,000	50	\$7,820,000
Total Manufacturing (excludes C&D):		906,700	612,000		1,047,450	2,535	\$365,500,000

Table A-7. New Manufacturers Located in Each Region, cont.

Richmond Region							
Facility	Materials	Total Production (TPY)	Waste Material Consumed (TPY)	Percentage From Local Waste Stream	Estimated TPY Local Waste	FTE Total	Annual Revenue
Molded pulp/packaging manufacturer	MP, ONP, OCC	10,000	10,000	100%	10,000	100	\$7,000,000
Cellulose building insulation manufacturer	MP, ONP, OCC	33,300	31,000	100%	31,000	100	\$6,000,000
Total Paper:		43,300	41,000		41,000	200	\$13,000,000
Plastic lumber manufacturer	HDPE	4,200	4,000	100%	4,000	55	\$3,000,000
HDPE product manufacturer	HDPE pellets	14,700	11,000	100%	11,000	230	\$41,000,000
HDPE sheet manufacturer	HDPE	2,000	2,000	100%	2,000	30	\$2,000,000
PET container manufacturer (a)	PET	18,000	9,000	100%	9,000	64	\$18,000,000
Total Plastic:		38,900	26,000		26,000	379	\$64,000,000
Glasphalt facility	glass	100,000	10,000	100%	10,000	10	\$3,000,000
Total Glass:		100,000	10,000		10,000	10	\$3,000,000
Steel product manufacturer	scrap steel	50,000	50,000	100%	50,000	50	\$150,000,000
Definning facility	ferrous cans	60,000	60,000	100%	60,000	40	\$12,000,000
Aluminum dross facility	aluminum dross	180,000	18,000	50%	9,000	20	\$2,500,000
Total Metal:		290,000	128,000		119,000	110	\$164,500,000
Battery recovery plant in Baltimore		(b)	(b)	10%	5,000	(b)	(b)
Total Miscellaneous:		0	0		5,000	0	\$0
Paving Material Recycler	asphalt roofing debris concrete	114,300	80,000	100%	80,000	20	\$4,000,000
Aggregate Recycler	aggregate building supplies	40,000	40,000	100%	40,000	10	\$320,000
Commodity Reuse Facility	supplies	15,000	15,000	100%	15,000	15	\$500,000
Total C&D:		169,300	135,000		135,000	45	\$4,820,000
Total Manufacturing (excludes C&D):		472,200	205,000		201,000	699	\$244,500,000

Key: C&D = construction and demolition debris, FTE = full-time equivalent employees, HDPE = high-density polyethylene, HGOP = high-grade office paper, MP = mixed waste paper, OCC = old corrugated cardboard, ONP = old newspaper, PET = polyethylene terephthalate, TPY = tons per year

Notes:

(a) Italicized numbers indicate estimates; actual figures were not available.

(b) Number was left blank to avoid double counting.

Sources: Institute for Local Self-Reliance, 1994; *Recycling Economic Development Through Scrap-Based Manufacturing*, Institute for Local Self-Reliance, 1994; *Recycling Economic Development: 25 Case Studies of Selected Manufacturers*, Institute for Local Self-Reliance, 1993 Draft; and Institute for Local Self-Reliance Scrap-Based Manufacturing Database.

Table A-8. Jobs at Manufacturing Facilities Handling Recycled Feedstock, Total and Recycling-Based, for Maximum Recycling 2005 Scenario

	Baltimore		DC Region		Richmond		Total	
	Recycling -Based	Total	Recycling -Based	Total	Recycling -Based	Total	Recycling -Based	Total
Paper	2,053	2,053	1,586	1,586	865	1,821	4,504	5,460
Plastic	404	404	679	679	379	379	1,462	1,462
Glass	185	185	90	90	10	10	285	285
Metal	1,737	5,707	110	110	212	212	2,109	6,029
Wood Pallets	40	40	70	70	141	141	251	251
Other	154	155	16	16	110	110	280	281
Total	4,623	8,544	2,551	2,551	1,717	2,673	8,891	13,768

Source: Institute for Local Self-Reliance, 1994.

Future Manufacturing Revenues

Under the current policy, the new pallet remanufacturing facility in the Washington, DC metropolitan area will be the only new source of manufacturing revenue in 2005. The increase in total manufacturing revenue generated by each metropolitan area's waste stream under the current policy 2005 scenario, depicted on the *Recycling Means Business* poster, is due to a new pallet manufacturer and existing manufacturers substituting locally recovered materials for imported materials.

We calculated total manufacturing revenues for the maximum recycling 2005 scenario by adding together the total revenues from existing facilities in each metropolitan area and the total revenues from the new facilities listed in Table A-8.

Future Disposal Jobs

Incineration and landfilling jobs for the 2005 scenarios are based on average jobs per ton at facilities currently operating in the Tri-City Region. Ratios of skilled jobs to entry-level jobs at currently operating facilities were used to determine the corresponding breakdowns in both future scenarios.

Future Disposal Revenues

Revenues for transfer stations, incinerators, and landfills reflect the per ton tipping fees these facilities receive. To calculate the 2005 scenario revenues for these operations, we multiplied current per ton revenue figures by the tonnage projected to be landfilled and incinerated under each future scenario.

Appendix B

Baltimore, Maryland Description of Recycling Activities

Baltimore, Maryland

Demographics

Jurisdiction:	City of Baltimore
Population:	736,014 in 1990
Area:	80.8 square miles
Total Households:	276,484 total households in 1990
Total Businesses and Institutions:	14,663 commercial and institutional establishments in 1994

Solid Waste Generation and Recovery (a)

Annual Tonnages (1993) (b)					
	Public Sector (c)	Private Sector (d)	Total MSW	Construction & Demolition	Total Waste
Recovered	33,092	123,660	156,752	NA	156,752
Recycled	26,221	113,315	139,536	NA	139,536
Composted	6,871	10,345	17,216	NA	17,216
Disposed	310,834	325,642	636,476	25,000	661,476
Incinerated	253,745	247,795	501,540	0	501,540
Landfilled	57,089	77,847	134,936	25,000	159,936
Generated	343,926	449,302	793,228	25,000	818,228

Percent by Weight Recovered					
Recovered	9.6%	27.5%	19.8%	NA	19.2%
Recycled	7.6%	25.2%	17.6%	NA	17.1%
Composted	2.0%	2.3%	2.2%	NA	2.1%

Key: MSW = municipal solid waste NA = not available

Notes:

(a) Recovered figures are from City of Baltimore Recycling Accounting Form, "Form B, Maryland Recycling Act Tonnage Reporting System." Disposal figures and construction & demolition debris figures are from "Solid Waste Management Plan," Baltimore City, Department of Public Works, Bureau of Solid Waste, October 1994.

(b) Tonnage figures represent calendar year.

(c) Public sector waste includes waste from businesses and institutions serviced by the City, Department of Public Works drop-off sites, City residential collection of municipal solid waste, and bulky or special wastes (automobiles, large appliances, furniture) collected by the City. Baltimore DPW services all housing units generating up to, but not exceeding, four 20-gallon containers of waste per collection day.

(d) Private sector wastes include residential waste collected from multi-unit buildings not serviced by the City, private business and institutional waste, privately collected bulky waste, and tires.

Solid Waste Disposal

Collection:

The City of Baltimore has five waste collection districts, which are subdivided into 21 boroughs or zones. City crews collect refuse twice a week from single-family households, apartment complexes, and various small businesses. In order to be served by the City's public waste collection system, apartment complexes and businesses cannot accumulate more than four 20-gallon containers of waste per collection day. The Bureau of Solid Waste, Department of Public Works, provides collection services. In fiscal year 1993, the City paid a total of \$35 million (\$110 per ton) to collect, dispose, and recycle 325,000 tons of solid waste.

Businesses, apartment complexes, and institutions such as hospitals and private schools that are not served by the City's collection system, contract out for waste collection services. Waste Management, Inc., Browning-Ferris Industries, Eastern Waste Industries, and many other independent haulers provide collection of solid waste to the private sector.

Transfer Stations:

The City of Baltimore owns and operates one transfer station, the Northwest Transfer Station. The Northwest Station handles waste collected from nine of the 21 waste collection boroughs in the City. These boroughs are located in the northeastern and northwestern sections of the city. Waste is transferred to tractor trailers, which deliver it to the BRESKO incinerator in south Baltimore. Waste Management operates a waste transfer station at BRESKO.

Incinerators:

Baltimore has two municipal solid waste incinerators operating within the city limits: the Baltimore Refuse Energy Systems Company (BRESKO) and the Pulaski Company Incinerator.

BRESKO, built in 1984, handles all City collected mixed refuse. This incinerator processes approximately 700,000 tons of waste a year: 196,000 tons of city collected waste, 249,000 tons of privately collected waste within Baltimore, 83,000 tons from Baltimore County, and 166,000 tons from non-local jurisdictions. The 1994 tipping fee at BRESKO is \$60 per ton.

The Pulaski Company Incinerator, first built in 1954 has been reconstructed and expanded three times since then. This incinerator, which burns only commercial solid waste, processed approximately 340,000 tons in 1993. Private haulers pay a tipping fee of \$50 per ton.

About 32 percent by weight of the waste burned at the Pulaski incinerator exits as ash requiring disposal (about 142,000 tons per year). At BRESKO, about 27 percent (190,000 tons per year) exits as ash.

Landfills:

Since 1985, Baltimore has been served by one sanitary landfill, the Quarantine Road Sanitary Landfill, which it owns and operates. Quarantine accepts very little mixed household refuse, only 3 percent of the total, and acts primarily as an end disposal site for incinerator ash from regional incinerators. This ash comprises 68 percent by weight of total tons accepted. Other wastes accepted at Quarantine include bulk waste collected from the City, private haulers, and nonprofits (16 percent) and dismantled automobile parts (6 percent)

Since Quarantine is owned by the City, its \$67 per ton tipping fee for private haulers raises revenue for the City's solid waste program. In fiscal year 1993, the City raised approximately \$9.1 million in revenue from private haulers disposing their waste at Quarantine.

In the greater Baltimore region, there are five construction and demolition debris landfills accepting approximately 800,000 tons of discarded building refuse per year. Data as to how much of this material comes from within Baltimore city are not available. Tipping fees at demolition landfills average between \$20 and \$40 per ton delivered.

Materials Recovery Overview

Goals and Legislative Requirements:

The Maryland Recycling Act of 1988 requires all jurisdictions with populations of more than 150,000, as well as the City of Baltimore, to reduce the amount of solid waste to be disposed by 20 percent by 1994. Under the Act, communities that use "waste-to-energy" incinerators receive a 5 percent credit towards this recycling goal. As a result, the City of Baltimore needs only to reduce disposal of its waste stream 15 percent by 1994.

In January 1993, the Mayor of Baltimore and the County Executives from five adjoining counties — Anne Arundel, Baltimore, Carroll, Harford, and Howard — formed a cooperative known as the Baltimore Regional Solid Waste Compact to address landfill, incineration, and recycling issues on a regional level. As of March 1994, the Compact's recycling goal is 38 percent of its waste by 1999. Baltimore City is targeted to recycle 24 percent of its waste, up 2 percent from the 1993 level.

Curbside recycling in Baltimore began in November 1990, through a pilot collection program in two of the City's recycling zones. The program targeted commingled aluminum cans, ferrous cans, glass bottles, and PET and HDPE plastics. The Department of Public Works initially contracted out collection to private haulers, but soon replaced them with Department crews in order to provide consistent service to city residents. The initial phase of the program served approximately 20,000 households, diverting 14 percent of their waste stream. In June 1991, the City added mixed paper, including advertising mail, magazines, newspaper, cardboard boxes, and computer paper, to its recycling collection service. In January 1992, the City added collection of commingled containers (bottles and cans) to its residential recycling collection service. The City's collection program has been rapidly expanding since then and now services 233,000 households.

Although recycling is not mandatory for commercial businesses in Baltimore, many do recycle. Private collection of recyclables represents a significant portion of the total tonnage recycled by the City of Baltimore and is critical to Baltimore's success in meeting state mandated recycling rates. Large apartment buildings and businesses contract for recyclables with Waste Management, Inc., Browning-Ferris Industries, Weyerhaeuser, Eastern Waste Industries, and many other smaller private haulers. In 1993, more than 75 percent of materials recovered in Baltimore were collected from the commercial sector.

A solid waste composting operation located in Baltimore, the FERST Company, diverts and composts approximately 2,600 tons of solid waste per week. Under contract with the company, Browning-Ferris Industries delivers commercial waste from the metropolitan Baltimore area to FERST for approximately \$50 per ton. FERST separates out all recyclables (cans, bottles, metals) from the waste stream. The remaining organic portion is shredded and cured in a 45- to 50-day process. FERST currently applies the finished product to farms in the greater Baltimore area.

Waste Prevention Activities

Education:	As part of its 1994 "Solid Waste Management Plan," Baltimore plans to develop public service ads and educational messages about waste prevention and reduction. The City will look to corporate sponsors to broadcast these messages as widely as possible.
Variable Rates:	Baltimore does not have a variable fee system for waste disposal.
Product/Material Bans:	There are no product or material bans within the City of Baltimore.

Recycling Activities

Public Sector Recycling

Curbside Program

Start-Up Date:	A pilot program collecting commingled containers in two selected areas of town started in November 1990. In June 1991, residential collection of mixed waste paper began. Citywide curbside recycling began in the second half of 1992.
Service Provider:	City of Baltimore Department of Public Works
Pick-Up Frequency:	Rotating two-week cycle. Mixed paper collected one week and commingled materials collected the next.
Same Day as Refuse:	No
Households Served:	233,000 single-family households and multi-unit apartment buildings that generate less than four 20-gallon containers of refuse per City collection day.
Mandatory:	No
Participation Rate:	The Department of Public Works estimates that depending on the collection area of the city, between 5 percent and 80 percent of households participate in recycling. The Department of Public Works does not track or measure participation rates.
Materials Collected:	Newspaper, mixed waste paper (magazines, cereal boxes, junk mail, paper tubes, paper egg cartons, computer and office paper, and phone books), glass jars and bottles, aluminum cans, steel cans, plastic soda bottles and plastic milk jugs, and corrugated cardboard. White goods are also collected and recycled on a call-in request basis.
Set-Out Method:	Materials are placed outside at the same spot where waste is collected. Newspapers are either put into paper bags or bundled. Mixed waste paper is put into bags. Cardboard can either be tied or left loose. Commingled materials such as bottles and cans are collected in blue bags.
Collection Method and Vehicles:	Three-person crews collect recyclables in single-hopper load packer trucks. The collection crew does no sorting on route.

Economic Incentives: None

Annual Tonnage: The City collected 15,542 tons of mixed paper, newspaper, and cardboard; 4,212 tons of commingled materials; and 1,213 tons of white goods in 1993.

Drop-Off Centers

In an effort to facilitate recycling for apartment building tenants and other residents who are not served by the City's recycling program, the Baltimore Department of Public Works operates six drop-off sites throughout the City. Residents can drop off steel cans, aluminum cans, plastic bottles, glass bottles, phone books, advertising mail, cardboard, newspapers, and magazines.

Government Building and School Recycling

The City of Baltimore, through its institutional recycling program, collects white paper from nine City office buildings and aluminum cans from 17 City office buildings. 17 City schools, that were part of a recycling pilot program in 1992, collect white paper for recycling. Recycling is being expanded to include all public schools in the City by 1996.

Private Sector Recycling

Apartment Building Collection

Apartment complexes that generate more than four 20-gallon containers of refuse twice a week, must provide for their own trash removal. Residents in apartment buildings who wish to recycle are encouraged to use the Department of Public Works public drop-off sites.

Commercial & Institutional Recycling

Although recycling is not mandatory for businesses and institutions in Baltimore, private recycling efforts are critical in meeting state-mandated waste reduction goals. Under the Maryland Recycling Act of 1988, jurisdictions in Maryland were urged to develop their recycling plans on a regional basis. Following these recommendations, the City of Baltimore and Baltimore County joined together to manage their recycling efforts; the Northeast Maryland Waste Disposal Authority coordinated these efforts. Currently the City and the County administer their own collection programs independently but work jointly to track all wastes collected by private haulers from the commercial sector. Large apartment buildings and businesses across the city contract for recyclables collection with Browning-Ferris Industries, Weyerhaeuser Paper, Waste Management Inc., Eastern Waste Industries, as well as many small private haulers. In 1993, commercial businesses in the City of Baltimore recycled 123,660 tons of waste.

Salvage/Reuse

The Loading Dock, located in Baltimore, is a successful salvage and reuse operation for household building and repair commodities. Manufacturers and building suppliers donate materials that would otherwise be landfilled at their own cost. Items include lumber, insulation, cabinets, doors, floor covering, and major appliances. Nonprofit and religious organizations, owners of low-income housing, and low-income individuals can purchase building supplies from the Loading Dock at approximately one-third the retail price for comparable items.

The program has expanded to include paint recycling and a nearby "landfill rescue project," through which reusable building supplies are collected monthly from several county landfills. Since the Loading Dock was founded in 1984, it has recycled more than 21,000 tons of reusable materials.

Processing and Marketing of Recyclables

The City delivers commingled recyclables to G&L Recycle in Baltimore, and mixed paper to the Chesapeake Paperboard Company. G&L Recycle, a minority-owned firm that employs 27 workers, sorts, bales, and markets approximately 8,500 tons of commingled materials a year. Minimal equipment is used to process recyclables. Metal cans are separated by magnets, baled, and sent to local manufacturers. Baled HDPE plastic is sent to the Polymer Resource Group, a plastic pelletizer in Baltimore. PET leaves the region for processing. Glass is transported from the region, as well, for markets in Pennsylvania or Virginia. In 1993, from the City recycling program alone, G&L processed 4,212 tons of materials. The City pays G&L \$32.19 per ton of materials accepted based on market indexing.

Chesapeake Paperboard, one of Baltimore's two regional papermills, accepts paper that has not been sorted or baled, making it possible for the City to collect a highly diverse stream of waste paper. Chesapeake uses all grades of paper in its manufacturing process, and produces a paperboard with eight layers. High-grade paper (such as computer printout and white ledger) accounts for approximately one-third of the feedstock, and forms the top layer of some boards. The bottom layer consists of old newspaper or old corrugated cardboard. The middle layers are low-grade mixed paper. In 1993, the City collected and delivered 15,542 tons of waste paper to Chesapeake's facility. Chesapeake's total consumption of waste paper averages around 70,000 tons per year. In May and June 1994, the Northeast Maryland Waste Disposal Authority issued a competitive bid request to companies for handling the City's mixed paper. Chesapeake Paperboard won the bid at \$5 per ton.

Baltimore has nine diversified recycling-based manufacturers, numerous scrap metal processors and paper processors, one plastic pelletizer, and four processors of durables and textiles. At least two companies in Baltimore, Emmanuel Tire Company and Klausmeyer Tire Inc., shred tires into crumb rubber or retread tires for use again on automobiles or trucks. Another company, Flex-A-Glass, uses old tires for the production of a rubber roofing and sealing material as well as in the production of playground surfacing for schools. Flex-A-Glass is a growing company that currently uses about 50,000 discarded tires per year. Nine scrap metal processors including United Iron and Metal, Baltimore Scrap, Cambridge Iron and Metal, and Hanover Metal Company provide scrap metal to two regional mills, AMG Resources and Bethlehem Steel. AMG Resources, primarily a detinner of ferrous scrap, processes and markets collected post-consumer steel food cans from G&L Recycle.

The Polymer Resource Group (PRG), a plastics pelletizer in Baltimore, handles much of the region's recovered #2 plastic waste stream. HDPE #2, collected in Baltimore's municipal program, goes to PRG once it has been baled at G&L Recycle. PRG's process involves separating the plastic, sorting it by color, and flaking it. After flaking, the plastic is washed and then heated to form small granular pellets, which are sold to area plastic blow molders for remanufacture into new plastic bottles. PRG pelletizes approximately 8,000 tons of plastic a year. Plant manager Eric Osterchrist states, "We are

very under capacity and have had difficulty getting enough plastic." PRG is working with area recycling collectors and material recovery facilities to find ways to procure an adequate supply of #2 HDPE.

Composting Activities

Backyard Composting

An existing ordinance in Baltimore (building code Article 32, Section 104.4.3) bans composting in residents' backyard areas.

Curbside Collection

Start-up Date:	The Baltimore Department of Public Works has been collecting leaves from City streets for over 40 years. Since 1991, the Office of Recycling has streamlined the existing leaf collection program, steadily increasing the tons of leaves collected per year.
Service Provider:	City of Baltimore Department of Public Works
Households Served:	All City streets and right-of-ways
Mandatory:	No
Materials Collected:	Autumn leaves
Set-Out Method:	Residents rake leaves to curb.
Collection Vehicles and Method:	Leaves are collected by vacuum and mechanical sweepers.
Collection Frequency:	One scheduled per community
Economic Incentives:	None
Annual Tonnage:	For the 1994 fall season, 8,618 tons of leaves were collected. This was an increase from 6,757 tons of leaves collected in 1993.

Composting Sites

Leaves are composted at Camp Small, a 4-acre site operated by the City Department of Recreation and Parks. After composting, the leaf mold is used in the Urban Gardens Program, a City horticultural program. There are no private composting sites in Baltimore.

Aside from fall leaf collection, the City of Baltimore does not offer its residents alley or curbside collection of organic material. Wood wastes and organic debris cleared from City streets and parks, are stored at Camp Small's 4-acre site. Since the Department of Parks lacks equipment and manpower to chip large logs, wood waste processing is usually contracted out to private companies.

In addressing the future composting needs and goals of the City, Baltimore is looking for larger composting sites, both in the City and outside. Tentative plans by the DPW include beginning curbside collection of yard waste for City households by 1997.

Amount and Breakdown of Materials Recovered ^(a)

Material	Public Sector (b) (Tons, 1993)	Private Sector (c) (Tons, 1993)	Total (Tons, 1993)
Newspaper	NA	10,899	10,899
Corrugated cardboard	NA	14,273	14,273
High-grade paper	NA	27,821	27,821
Other paper	15,542	29,879	45,421
Glass	2,660	525	3,185
Plastic	581	227	808
Aluminum cans	367	820	1,187
Ferrous cans	590	1,168	1,758
Appliances/white goods	1,214	3,864	5,078
Batteries	0	827	827
Other (d)	5,255	23,012	28,267
Subtotal: MSW Recycled	26,221	113,315	139,536
Leaves	6,757	0	6,757
Brush and wood waste	114	10,345	10,459
Subtotal: MSW Composted	6,871	10,345	17,216
Total MSW Recovered (e)	33,092	123,660	156,752

Key: MSW = municipal solid waste NA = not available

Notes:

(a) Tonnages above represent calendar year 1993 figures reported from Baltimore City Office of Recycling, "MRA Tonnage Reporting System County Recycling Accounting Form."

(b) Public Sector waste includes waste from businesses and institutions serviced by the City, DPW drop-off sites, City residential collection of MSW, and bulky or special wastes (automobiles, large appliances, furniture) collected by the City. The Baltimore DPW services all housing units generating up to, but not exceeding, four 20-gallon containers of waste per collection day.

(c) Private sector wastes include residential waste collected from multi-unit buildings not serviced by the City, private business and institutional waste, privately collected bulky waste, and tires.

(d) "Other" consists of metals recovered from BRESKO, tires, recovered food waste, and textiles/ cloth.

(e) Tonnage recovered does not include manure, compost, and solid waste composted at the FERST mixed waste composting plant.

Residential Materials Recovered through the Municipal Curbside Program

Material	Municipal Curbside Collection (Tons, FY 1992)	Municipal Curbside Collection (Tons, FY 1993)	Percent Change
Newspaper and Cardboard	13,468	15,542	15%
Commingled Bottles & Cans	3,997	4,198	5%
White Goods	451	1,214	169%
Leaves/Organics	6,609	6,871	4%
Total Recycled	24,525	27,825	13%
Number of Households Served	233,000 (a)	233,000	0%

Note: (a) Not all households received collection of commingled containers.

Source: *Solid Waste Management Plan*, Baltimore City Department of Public Works, Bureau of Solid Waste, October 1994.

Publicity and Education

The Baltimore Office of Recycling considers public involvement in recycling activities essential for increasing rates. The City has combined media campaigns with direct involvement projects to encourage recycling among residents. The slogan "Baltimore is Turning Blue into Gold" appears on City buses, in newspapers, on television, and on radio. This slogan is part of an intensive media campaign by the Department of Public Works to inform residents across the City of its commitment to recycling.

The "Recycling Block Captain" program is the City's primary education program promoting citizen participation in recycling. The Department of Public Works recruits volunteers to become Block Captains at community meetings. Block Captains educate residents about proper separation methods, collection schedules, drop-off centers, and the benefits of recycling. Each Block Captain receives an information kit, which includes bumper stickers, signs, and T-shirts. The City currently has 1,000 Block Captains participating in this program.

The City's education program also includes newsletters and workshops on recycling in City office buildings. An office paper orientation program provides 15-minute instructional workshops to City workers on a floor-by-floor basis. A quarterly newsletter called "Buy-Cycle," put out by the City Bureau of Purchases, features Baltimore's current activities in buying products that contain recycled content and shows how closing the recycling loop has translated into savings for the City.

Market Development Initiatives/Procurement

Recycling-Based Economic Development Initiatives: In the interest of promoting economic development through recycling, the Baltimore Development Corporation (BDC), the Baltimore Planning Commission, and the Office of Recycling work jointly to develop recycling business strategies for the city. In 1994, with help from the BDC and the Office of Recycling, the City managed to attract and develop a full-scale glass beneficiation plant that will process glass collected from curbside programs. This plant, Resource Recovery of Maryland, is scheduled to start operating in 1995.

Baltimore is pursuing the development of an ecological industrial park (EIP) — an industrial complex that would demonstrate environmentally sound industrial and manufacturing technologies, and would include recycling-based enterprises. The City hopes to set up this pilot project either through a federal Empowerment Zone application or independently with the help of consultants.

Grants/Loans to Recycling Businesses: In 1993, the City loaned \$50,000 to G&L Recycle, a minority-owned recycling business, that processes residential recyclables under contract with the City.

Recycled-Content Product Procurement: In fiscal year 1993, the Baltimore Bureau of Purchasing bought \$3.8 million of products with 20 percent to 100 percent recycled content — according to Richard Keller, Recycling Program Manager for the Northeast Maryland Waste Disposal Authority, more than any other municipality in the country. Items purchased included \$1.7 million in various metal products, \$650,000 in paper products, and \$300,000 in retreaded tires and rebuilt auto parts.

Future Solid Waste Management Plans

In October 1994, the City issued a Ten Year Solid Waste Plan that outlined several materials recovery initiatives. These included continuing to monitor markets for recovered materials, developing an ecological industrial park, and continuing to work with the Baltimore Development Corporation to attract and retain recycling business. Beginning in 1995 the City will collect bulk trash on a regular monthly schedule, changing from collection of bulk waste on an appointment basis only. The Plan also mentions the implementation of residential curbside yard waste collection by 1997.

Resource Recovery of Maryland is scheduled to open a 30,000 ton-per-year glass beneficiation plant in Baltimore in mid-1995. Resource Recovery's presence is expected to be a significant boost for area glass recyclers and substantially reduce the cost of handling and transporting collected glass in the greater Baltimore metro area.

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Appendix C

Washington, DC Description of Recycling Activities

Washington, D.C.

Demographics

Jurisdiction:	District of Columbia
Population:	607,000 in 1990
Area:	61.4 square miles
Total Households:	There are 103,626 households, with three or less units in Washington, D.C.
Total Businesses and Institutions:	There are approximately 23,000 businesses in Washington, D.C.

Solid Waste Generation and Recovery

Annual Tonnages (Fiscal Year 1992) (a)					
	Public (b) Sector	Private (c) Sector	Total MSW	Construction & Demolition	Total Waste
Recovered (d)	34,149	134,204	168,353	43,238	211,591
Recycled	24,149	126,822	150,971	43,238	194,209
Composted	10,000	7,382	17,382	0	17,382
Disposed	189,714	457,600	647,314	NA	647,314
Incinerated (e)	184,022	295,044	479,066	NA	NA
Landfilled	5,692	162,556	168,248	NA	NA
Generated	223,863	591,804	815,667	43,238	858,905

Percent by Weight Recovered					
Recovered	15.3%	22.7%	20.6%	NA	24.6%
Recycled	10.8%	21.4%	18.5%	NA	22.6%
Composted	4.5%	1.3%	2.1%	NA	2.0%

Key: FY = fiscal year MSW = municipal solid waste NA = not available

Notes:

(a) The fiscal year is from October 1991 to September 1992.

(b) Public sector tonnage includes condominium, cooperative, and public housing units serviced by City collection services, residential curbside pick-up, and District of Columbia Government buildings.

(c) Private sector tonnage includes condominium and cooperative housing not serviced by the City, federal agencies providing own collection service, and all commercial establishments.

(d) Total MSW recovered (168,353 tons) does not include 62,372 tons of composted sewage sludge. This figure is consequently not in Total Waste Generated.

(e) In fiscal year 1992, 97% of disposed public sector waste was incinerated at the Solid Waste Reduction Center or the Fairfax Energy Resource Recovery Facility. For both public and private sectors in 1992, 479,066 tons of waste were incinerated.

Source: Tonnage figures are from *District of Columbia Comprehensive Solid Waste Management Plan, Review Draft*, Gershman, Brickner & Bratton, Inc., Falls Church, Virginia, November 12, 1993, p. 3-9.

Solid Waste Disposal

Collection:

In Washington, D.C., the Department of Public Works (DPW) collects residential waste strictly from single-family homes and apartment buildings of three units or fewer. Private haulers collect from businesses and commercial establishments. Federal agencies provide for their own municipal solid waste hauling.

The City is divided into two waste collection districts to facilitate pick-up of refuse. The Brentwood district handles waste in wards 3, 4, and 5. The South Capitol Street district is responsible for waste collection in wards 1, 2, 6, 7, and 8. Waste is collected twice a week in inner-city areas and once a week in other areas of Washington, D.C.

Businesses, institutions such as hospitals, and apartment buildings with more than three units are responsible for their own waste collection and disposal. Private collection accounts for up to 75 percent of all municipal wastes collected within Washington, D.C.

Several federal and District agencies as well as government installations use their own trucks to dispose of trash. These include the National Park Service, the Department of the Navy, the Department of Commerce, and the District Department of Parks and Recreation.

Transfer Stations:

Washington, D.C. has two publicly operated transfer stations, Fort Totten and Benning Road, N.E. In 1993, between 60 and 70 percent of the waste collected by the DPW was transferred through Fort Totten. The rest was transferred at the Benning Road transfer station. All municipal waste, transferred in D.C. is taken to the I-95 Energy Resource Recovery Facility, an incinerator in Lorton, Virginia. In fiscal year 1994, approximately 143,000 tons of waste were transferred at Fort Totten and 67,000 tons at Benning Road.

In addition to the two public transfer facilities, there is an unconfirmed number of private transfer stations located throughout Washington, D.C. Neither one of the public transfer stations accepts commercial waste.

Incineration:

Washington, D.C. is currently served by one incinerator located in Lorton, Virginia. The Energy Resource Recovery Facility (ERRF) is a 3,000 ton-per-day mass-burn incinerator located on a 22.9-acre parcel of land at the I-95 complex. In 1992, 479,066 tons, or 56 percent of the District's total waste stream (858,905 tons), including all city collected municipal wastes, went to this facility.

The tipping fee at the incinerator for private haulers is \$64.39 per ton. This includes a surcharge of \$31.59 to fund the City's public recycling program. The City itself pays a tip fee of \$34 per ton.

Until March 1994, the Solid Waste Reduction Center #1 on Benning Road burned 7 percent of the District's municipal wastes per year. This facility is now closed and serves strictly as a transfer station.

Landfills:

The Lorton Landfill (or I-95 Landfill) in Lorton, Virginia, is on a 300-acre tract of U.S. Government land, of which the District is the beneficial owner. In 1992, the DPW reported that 97,815 tons, or 11 percent of D.C.'s waste stream, went to this facility. Wastes accepted at Lorton are primarily construction and demolition debris, bulky waste, and incinerator ash from the I-95 ERRF. No municipal wastes are accepted at the landfill. The landfill at Lorton is expected to permanently close in late 1995. A recently permitted ash monofill will continue to operate adjacent to the incinerator at Lorton, providing disposal capacity for ash from ERRF for an estimated 20 years.

The tipping fee at the landfill for private haulers is \$64.39 per ton. This includes a surcharge of \$31.59 to fund the City's public recycling program. The City itself only pays a tip fee of \$34 per ton.

Materials Recovery Overview

Goals and Legislative Requirements:

Recycling in Washington, D.C. officially began January 10, 1989, when the District of Columbia Solid Waste Management and Multi-Material Recycling Act of 1988 was signed into law. The law (D.C. Law 7-226) set materials recovery targets beginning with 10 percent of total commercial solid waste and growing to 35 percent of the total solid waste stream by October 1, 1993. The law establishes a recovery goal of 45 percent by the year 2000.

Recycling is mandatory in the District. Residents must separate their recyclable waste stream (newspapers, cardboard, glass, metal containers, and yard waste) from their household trash. Under the law, commercial property owners and businesses must also recycle; they must contact licensed haulers for regular recycling collection services.

The Recycling Act establishes, along with recovery targets, a hierarchy of activities for reducing the District's waste stream. They are (1) volume reduction at the source; (2) recycling, composting, and reuse; and (3) disposal in landfill facilities.

Washington, D.C.'s Department of Public Works provides collection of residential recyclables. Curbside collection in the District began in October 1989 with metal food and all beverage containers being added in August 1990. In 1991, recycling expanded again covering an increased number of residents. By March 1993, curbside recycling covered 100 percent of District residents receiving municipal waste collection services. This totaled more than 100,000 single-family households and apartment complexes with less than four units.

Residents receive 14-gallon plastic bins in which they place their newspaper, phone books, cardboard, and magazines. All paper is to be tied in separate bundles with string or placed in brown paper before placing in green bin. All other recyclable materials are tied in blue bags available for free from supermarkets in Washington, D.C. Washington, D.C.'s curbside recycling program currently includes collection of newspapers, magazines, telephone books, corrugated cardboard, plastic containers consisting of resin types #1 and #2, steel food and aerosol cans, and glass beverage and food containers. Under contract with the District, Eagle Maintenance Recycling, a Washington, D.C.-based business, processes all recyclables collected by DPW crews. Eagle charges the DPW a tip fee per ton of recyclables delivered and then returns a portion of the revenues for the sale of the materials back to the District. In fiscal year 1992, the District curbside program recovered approximately 17,000 tons of recyclable materials.

In addition to the common curbside items, the DPW provides seasonal collection of yard waste and leaves and collects bulk waste on a monthly basis. Bulk waste includes mattresses, furniture, tires, and white goods. In 1992, this program alone collected and recycled 2,540 tons of bulky waste and white goods. (White goods include appliances such as washing machines, refrigerators, water heaters, and stoves.) The DPW also accepts household hazardous wastes at designated sites on specified collection days throughout the year, contracting with a private firm to handle these wastes. In November 1994, the government of Washington, D.C., citing budgetary concerns, proposed and voted to cancel collecting all bulk waste items from District residents. As of the beginning of 1995, the program had not been officially cancelled.

Collection of materials from businesses and residences by the private sector accounts for a large share of District recovery rates. Commercial businesses, restaurants, private institutions, and private apartment

complexes must all contract for recycling services under District law, and present their recycling plans to the Office of Recycling. As of the beginning of 1994, approximately 75 independent haulers and recycling organizations, located throughout the region, service 6,285 District businesses.

Through a program of its own, Metro, the regional public transportation Authority, collects white paper, mixed paper, cans, bottles, and newspapers from its office buildings and newspapers from passengers on all subway platforms. The Washington Post provides containers for collection of newspapers. All materials, including motor oil from buses, are handled by local recyclers. Metro estimates that approximately 50,000 pounds (25 tons) of recyclable materials are recovered per month.

Waste Prevention Activities

The District's Recycling Act named source reduction as the highest priority of its solid waste management hierarchy. Source reduction activities reduce the toxicity and volume of the waste stream. Through literature on waste reduction, the District encourages consumers to purchase products and packages that will generate as little waste as possible. The District government itself has taken several steps to reduce the solid waste stream it generates. These include making double-sided photocopies, requiring vendors to submit two-sided reports and use recycled paper, using electronic mail, using scrap paper for notes, and using non-glossy facsimile paper that does not require copying.

Education:	"Earthtalk," the quarterly newsletter of the Office of Recycling, updates residents on the status of the District's recycling program as well as promoting waste prevention activities.
Variable Rates:	None
Waste Audits/Technical Assistance:	Staff members of the Office of Recycling provide technical assistance to firms interested in developing source reduction and recycling programs at their offices.
Product/Material Bans:	There are no product bans on any materials in Washington, D.C.

Recycling Activities

Public Sector Recycling

Curbside Program

Start-up Date:	Curbside pick-up of newspapers began October 1989. Curbside collection of all other materials began in June 1991.
Service Provider:	Department of Public Works (DPW)
Pick-Up Frequency:	Weekly
Same Day as Refuse:	Yes
Households Served:	103,626 single family households
Mandatory:	Yes

Participation Rate:	The Department of Public Works estimates that 70 percent to 90 percent of the households served by the program participate.
Materials Collected:	Newspapers, telephone books, corrugated cardboard, magazines, glass beverage and food jars, aluminum and steel cans, #1 and #2 plastic bottles, and steel aerosol cans.
Set-Out Method:	Materials are set out at curbside. Commingled materials (bottles and cans) are placed in blue bags. All newspapers, phone books, cardboard, and magazines must be tied in separate bundles with string and placed in the green 14-gallon plastic recycling bins.
Collection Method and Vehicles:	The Department of Public Works has twelve split-hopper trucks for recycling collection and it also utilizes compartmentalized trucks and packers. The crew size for collection trucks is three persons.
Economic Incentives:	None for households. Through a revenue-sharing agreement, the District receives back a portion of the revenue Eagle Maintenance Recycling earns from the sale of District recyclables.
Enforcement:	There are \$25 to \$1,000 fines for not complying with the District recycling law. Information on the amount of fines collected to date is not available.
Annual Tonnage:	Approximately 17,000 tons of curbside recyclables were collected in fiscal year 1992.

Self-Haul and Drop-Off Centers

Number and Type:	4 drop-off sites
Public or Private:	Public
Sectors Served:	Throughout the District
Materials Accepted:	Aluminum, steel, glass, and plastic
Annual Tonnage:	1,560 tons were collected in fiscal year 1992.

Department of Public Works drop-off areas are not permanent. Drop-off sites are open on Saturdays between 8 am and 12 noon. They are spread throughout the northeastern and northwestern quadrants of town. The DPW estimates that an average of 30 tons of materials per weekend were collected in 1992. Either DPW crews or Eagle Maintenance Recycling crews collect and sort materials on recycling trucks.

The DPW also accepts household hazardous wastes at three designated sites on specified collection days throughout the year. Through a contract with the DPW, a private firm is responsible for handling these wastes. They include, but are not limited to, old pesticides, cleaners, glues, paints, mothballs, and fertilizers.

Multi-Unit Collection

The Department of Public Works currently collects newspapers from 67 condominium and cooperative developments. In fiscal year 1992, the Department collected more than 63 tons from multi-family buildings participating in the program.

District Government Recycling

The Department of Public Works collects recyclables from 43 District of Columbia office buildings. Each of these buildings generates approximately 2.5 tons of recyclable materials weekly. Recycling collection services will be extended to all government buildings in 1995.

Private Sector Recycling

Multi-Unit Collection

Apartment buildings and all multi-unit buildings with more than three units are required under D.C. law to provide recycling services to tenants. Currently, many buildings do recycle; however, participation rates and tonnages recovered are not formally tracked.

Commercial & Institutional Recycling

Legislative Requirements:	All Commercial properties in Washington, D.C. must recycle pursuant to D.C. Law 7-226. Businesses are required to submit to the Office of Recycling plans that list the types of materials being collected, name of the hauler collecting the materials, and provide other information about their participation in recycling.
Service Providers:	Approximately 90 licensed private recycling haulers operate in Washington, D.C.
Number Served:	The number of businesses currently recycling in Washington, D.C. is unknown.
Type Served:	Restaurants, apartment buildings, office buildings, schools, hospitals
Materials Collected:	Mostly traditional recyclable materials such as office paper, aluminum cans, glass bottles, corrugated cardboard and yard waste
Pick-Up Frequency:	Varies
Set-Out and Collection Method:	Varies
Incentives:	Avoided disposal costs
Enforcement:	Yes. Enforcement is carried out by recycling inspectors. Inspectors visit commercial establishments on a door-to-door basis, informing businesses of their responsibility to recycle and advising them that the City will provide guidance in starting recycling programs. A program to issue citations to businesses that do not comply began in spring 1993.
Annual Tonnage:	Excluding 62,372 tons of composted sludge, the commercial sector recycled 177,442 tons in fiscal year 1992.

As a result of the District's recycling requirements for businesses and institutions, a plethora of recyclers and the beginnings of a recycling infrastructure have developed in Washington, D.C. and surrounding suburban areas. Presently, the Washington, D.C. region has about 90 haulers and collectors servicing the private sector, and approximately 30 facilities processing collected recyclables. Many of these are located in Maryland and northern Virginia.

Generally, private haulers collecting from businesses in Washington, D.C. deliver recyclables directly to area processors, or they own and use warehouse space to centralize collection. Some collectors also sort and separate on their own, but then ship materials to be baled. The largest companies that collect recyclables in Washington, D.C. — Browning-Ferris Industries, Waste Management, Inc., World Recycling, Universal Recycling, and ABC Recycling Services — have the capacity and equipment to process collected materials as well. A & H Garcias is also a significant collector of recyclables from Washington businesses but does not process any materials.

The Metro Re-Uz-It Company, based in Washington, D.C., has provided recycling collection to computer companies, universities, and general businesses for 12 years. Metro Re-Uz-It operates out of a warehouse in southwest Washington, D.C. and handles mostly waste paper. Collected paper is sorted into homogenous grades, and confidential documents are shredded upon request. Metro Re-Uz-It also collects and sorts aluminum cans. Since Metro Re-Uz-It does not have a baling operation, sorted materials are sent to area recycling facilities to be further prepared for secondary markets. Paper is processed at ABC Recycling Services, nearby.

PSI Associates, a mental health service organization located in Washington, D.C., collects office paper from approximately 150 office buildings in the District, and employs its mentally disabled clients to sort and bundle office paper to be delivered to a processor. Through this system, PSI collects an average of 50 tons of office paper a year, and employs 84 people. The revenues generated from the sale of the paper, are used to pay stipends to PSI workers.

Both Giant and Safeway supermarkets have initiated recycling and reuse programs in their stores. Giant stores in the Washington metro area have started a program to collect plastic bags and newspapers from the public and cardboard, white paper, cans, and motor oil from store operations. About 800 tons of plastic bags, 7,300 tons of cardboard, 275 tons of white paper, and 20,000 gallons of motor oil were collected areawide in FY 1992. Giant also provides a three-cent return for each bag a customer brings back to the store for reuse.

Safeway collects plastic bags from the public and delivers these to Mobile Chemical for recycling. Cardboard, office paper, and aluminum cans are collected from store operations; these go to Rock Tenn Company, World Recycling, and Atlas Metal, respectively.

Commercial Self-Haul and Drop-off Centers

Number and Type:	Mid-Atlantic Glass operates 12 collection sites, most of them located in church parking lots.
Public or Private:	Private
Locations Served:	Dupont Circle, Jerusalem Baptist Church, Emory United Methodist Church, EPA Early Environments Inc., First Rising Mount Zion Baptist Church, George Washington University, Prayer Temple Church of God, St. Mary's Baptist Church, Department of the Interior, Saint Augustine Church, Christ Episcopal Church, Duke Ellington School
Materials Accepted:	Glass bottles
Annual Tonnage:	In 1991, 600 tons of glass were picked up.

Salvage/Reuse

For four years, MAGIK, Movement and Acquisition of Gifts in Kind, operated as a clearinghouse for discarded household and office furniture items from the greater D.C. metropolitan area. MAGIK salvaged items such as beds, household furnishings and appliances, office furniture, and electronic equipment from disposal, stored them at a centralized distribution center, and diverted them to

community groups and housing projects for the homeless. MAGIK employed homeless and unemployed workers to collect and move materials. By the end of 1993 it had prevented approximately 2,700 tons of discards from ending up in landfills, and provided approximately \$8 million worth of materials to a total of 800 underfunded organizations. However, due to a lack of financing and warehouse space, MAGIK had to discontinue its operation in Washington, D.C., and as of the end of 1993 it moved temporarily to California. Efforts are in progress that will enable MAGIK to return to Washington, find warehouse space and secure support funding.

No other groups have formed to provide similar programs for recovery and reuse of bulky waste items. In November 1994, the District Government reviewed the possibility of canceling monthly collection of bulky goods and appliances from Washington residents as a cost-cutting measure. As of the beginning of 1995, the program had not been officially cancelled and bulk waste was still being collected.

Processing and Marketing Recyclables

There are three main processors of recyclable materials in Washington, D.C.: ABC Recycling Services, Super Salvage, and Eagle Management Recycling. Eagle Recycling is a minority-owned private company based in Washington, D.C.

Newspaper, cardboard, and commingled materials from the City's residential curbside recycling program are delivered under contract to Eagle Recycling's materials recovery facility in Capitol Heights, Maryland, immediately across the District border. Eagle either processes materials directly in Capitol Heights or subcontracts the work to another local company. All materials, once processed, go back to Eagle, which is responsible for marketing. In 1995, Eagle is planning to construct a new materials recovery facility in the District, in order to centralize its processing activities.

ABC Recycling Services (ABC), the only private waste paper processing company located in Washington, D.C., has been processing waste paper and recovering scrap nonferrous metals for more than 30 years. Operating near full capacity, ABC handles an estimated 100,000 tons of recyclable materials (90,000 tons of paper and 10,000 tons of nonferrous metals) per year at its facility in southeast Washington, D.C., and employs approximately 40 people. ABC accepts a wide variety of paper grades and receives primarily high-grade office paper, government catalogs, and newspaper. Workers sort materials by grade, partially removing contaminants. Books, catalogs, and bound publications are de-bound on a special machine. Once sorted, paper is baled and stored at a warehouse across the street until it is ready to be moved out. According to Les Ulanow, president and manager of ABC Recycling Services, baled paper often cannot be marketed locally but must be sent to markets across the county and overseas.

Super Salvage, the only scrap yard remaining in Washington, D.C., has been in business for over 40 years. Located in southwest Washington, D.C., Super Salvage currently handles approximately 6,000 tons of ferrous and nonferrous metals every year — much less than full capacity — and employs 13 persons. Plant manager Joel Kaplan attributes the decline of scrap metal in the District to decreasing building and demolition activity overall as well as to the proliferation of scrap yards in the suburbs, where more construction takes place. Metals are separated out into homogenous piles and, by use of large cranes with suspended magnets, are either baled or sold in loose pieces. Super Salvage accepts ferrous and nonferrous metals from construction and demolition projects as well as car engine parts, air conditioners, and white goods such as refrigerators.

Most other materials that are collected for recycling in Washington, D.C. are processed and marketed by materials recovery facilities in Virginia or Maryland. There are currently 15 to 20 companies that collect, process, and market the District's recyclables, including organic debris, construction and demolition debris (asphalt, brick, rubble), plastic foam, and carpet padding. Relatively small-scale recycling businesses operating in Washington, D.C. include Bonded Recycling, N&J Recycling, and Rodgers Brothers Custodial. Rodgers Brothers accepts mixed construction and demolition debris.

Composting Activities

Curbside Collection

Start-Up Date:	Collection of leaves and organic debris in Washington, D.C. started in 1984.
Service Provider:	Department of Public Works (DPW)
Households Served:	All households and buildings along tree-lined city streets are served.
Mandatory:	No
Materials Collected:	Fall leaves, grass clippings, plant trimmings, twigs and branches
Set-Out Method:	Residents either place leaves and other debris in bags or rake to curb.
Collection Vehicles and Method:	The District uses dump trucks, packers, and leaf-vacuum trucks for curbside collection of organic wastes.
Collection Frequency:	Leaves are collected during the fall season with each neighborhood receiving one pick-up during the season. All other organic debris is collected on a bi-weekly basis throughout the year.
Economic Incentives:	None
Annual Tonnage:	10,000 tons of organic material were composted by the District in fiscal year 1992. The total amount of organic debris collected by the District is unknown.

Composting Site

There is a composting site at Children's Island on Benning Road, NE that takes up to 10,000 tons of leaves and yard debris collected throughout the year. Materials are left to compost passively and are not processed by any staff members of the DPW. The District does not market the composted mulch, making it available free of charge to city residents. Collected yard waste and leaves that do not go to Children's Island are sent to the Lorton Landfill.

Amount and Breakdown of Materials Recovered

Material	Public Sector (a) (Tons, FY 1992)	Private Sector (b) (Tons, FY 1992)	Total (Tons, FY 1992)
Newspaper	13,034	45,655	58,689
Corrugated cardboard	25	14,879	14,904
High-grade paper	224	29,399	29,623
Telephone books	70	0	70
Magazines	45	1,268	1,313
Mixed paper	0	1,940	1,940
Glass	2,666	3,361	6,027
Plastic containers	223	997	1,220
Metal containers	301	2,727	3,028
Commingled containers	1,446	0	1,446
Ferrous/white goods	2,540	26,581	29,121
Autos	3,575	0	3,575
Tires	0	15	15
Subtotal: MSW Recycled	24,149	126,822	150,971
Leaves	10,000	0	10,000
Mixed yard waste	0	7,382	7,382
Subtotal: MSW Composted (c)	10,000	7,382	17,382
Total MSW Recovered	34,149	134,204	168,353
Total C&D Recovered	0	43,238	43,238
Total Waste Recovered	34,149	177,442	211,591

Key: C&D = construction and demolition debris MSW = municipal solid waste

Notes:

(a) Public sector tonnage includes condominium, cooperative, and public housing units receiving District collection services, residential curbside pick-up, and City of Washington, D.C. government buildings.

(b) Private sector tonnage includes condominium and cooperative housing not serviced by the District, federal agencies providing their own collection service, and all commercial establishments.

(c) The figures above do not include 62,372 tons of sludge composted by the District in fiscal year 1992.

Source: *District of Columbia Solid Waste Management Plan, Review Draft*, Gershman, Brickner & Bratton, Inc., Falls Church, Virginia, October 22, 1993, p. 3-9.

Tonnages Recovered, FY 1990 - FY 1992

Material	1990	1991	1992
Newspaper	22,773	54,415	58,689
Magazines and cardboard	2,018	694	16,217
High-grade paper	9,884	16,334	29,623
Telephone books	0	5	70
Mixed paper	0	0	1,940
Glass	3,317	1,889	6,027
Plastic containers	0	79	1,220
Metal containers	260	3,548	3,028
Commingled containers	0	1,079	1,446
Ferrous/white goods	0	0	29,121
Autos	3,477	3,505	3,575
Tires	0	3	15
Subtotal: MSW Recycled	41,729	81,551	150,971
Leaves and grass	8,500	10,000	17,382
Subtotal: MSW Composted	8,500	10,000	17,382
Total MSW Recovered	50,229	91,551	168,353
Total C&D Recovered	0	38,953	43,238
Total Waste Recovered	50,229	130,504	211,591

Note: Above tonnages represent material collected from both public and private sectors. Composted sewage sludge for 1990 through 1992 is not included in above figures.

Source: D.C. *Recycles*, 1992 Annual Report, District of Columbia Office of Recycling.

Publicity and Education

In 1991 the Mayor announced "Make it Green, Keep it Clean, Stop Trashing D.C.," a program to reclaim City streets by planting trees, cleaning up litter, and encouraging recycling. For several years, the D.C. Office of Recycling has been using radio, television, and newspapers to inform the public about the District's recycling program and encourage broad participation in recycling. Newspapers that put out the message include, but are not limited to, the *Washington Post*, *Washington Times*, *Capitol Spotlight*, and *City Paper* as well as two local spanish language papers, *Impacto* and *El Diario*. The *Washington Post* also provides over-the-phone information about recycling through its "Post Haste" 24-hour information service. Another public/private initiative, "Take the Challenge," was formed between Washington, D.C.'s Channel 7 (WMAL) and the U.S. Conference of Mayors and aims to increase recycling awareness through the television media. Additional publicity about recycling is made available at mass-transit bus and train shelters as well as in the District of Columbia Bell Atlantic White Pages.

The D.C. Office of Recycling has also formed partnerships with several public and private groups, to increase the recycling activities of the District. Activities included the establishment of recycling areas on the Mall through the National Park Service, a telephone book recycling campaign with Bell Atlantic and C&P Telephone, and a commercial recycling project with a local radio station. The Office

of Recycling also sends speakers to local schools and community group gatherings to discuss and provide information on recycling.

Market Development Initiatives/Procurement

Recycling Economic Development Initiatives:	None
Job Creation Initiatives:	None
Recycling Enterprise Development Initiatives:	None
Technical Assistance to Potential End Users:	In 1994, Washington, D.C. was awarded a Recycling Economic Development Advocate (REDA) grant, an Environmental Protection Agency grant. Under REDA, cities receive funding to create a two-year staff position that will focus on recycling market development as a job creation and economic development strategy.
Tax Breaks for Potential End Users:	None
Minimum-Recycled Content Laws:	Under the Solid Waste Management and Multi-Material Recycling Act of 1988 and its subsequent amendments, sellers or distributors of paper products in the District are to sell paper products manufactured with the highest percentage of recycled materials practical. Publishers of periodicals in Washington, D.C., with per issue circulation of at least 30,000 must use a "significant quantity" of recycled content in every issue. In the case of newspapers, "significant quantity" applies to papers with an annual weight of 500 tons or annual gross receipts of \$100,000. Cumulative goals were established for increasing recycled content in newsprint to 12 percent by 1993, and 40 percent by 1998. The law has never been implemented.
Grants/Loans to Potential End Users:	None
Closed-Loop Arrangements:	None
Recycled-Content Procurement:	<p>In 1992, the Department of Administrative Services established a price preference system of 10 percent for recycled paper products over virgin materials. Government contractors bidding on paper product procurements were required to offer materials with as much recycled content as possible at no more than 10 percent of the cost of virgin equivalents.</p> <p>No data are available about the results of these government requirements or about efforts to meet procurement guidelines.</p>
Buy-Recycled Campaigns:	The District currently has no buy-recycled campaign, but expects to undertake such an activity now that other recycling activities have been implemented.

Future Solid Waste Management Plans

Plans for constructing a materials recovery facility in Washington, D.C., that would process the City's recyclables are being negotiated. Construction is slated for 1995. The plans call for the new facility to take over processing activities at Eagle Maintenance Recycling's site in Capitol Heights, Maryland. It is expected that Eagle Maintenance Recycling will own and operate the new facility.

In mid-1995, the landfill at Lorton is scheduled to stop accepting any municipal solid wastes. Ash from the adjacent Lorton incinerator will still be landfilled at a newly permitted ash monofill at Lorton. According to the Fairfax County Division of Solid Waste, the new monofill is expected to have ash disposal capacity through 2010. The D.C. Department of Public Works is also negotiating with a company in Prince William County, Virginia to accept all of the District's collected compost materials. This facility would handle all the debris currently going to both the Children's Island facility and to the landfill at Lorton.

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Appendix D

Richmond, Virginia Description of Recycling Activities

Richmond, Virginia

Demographics

Jurisdiction:	Central Virginia Waste Management Authority (CVWMA) service area, including the City of Richmond
Population:	858,800 in the CVWMA's service area in 1990. (The 1993 population of the City of Richmond is 212,600.)
Area:	The CVWMA's service area is 2,442 square miles. The City of Richmond is 60.1 square miles.
Total Households:	As of 1990, there were 324,252 single-family households in the CVWMA service area.
Total Businesses and Institutions:	As of 1990, there were 23,277 businesses and institutions in the CVWMA service area.
Brief Description:	Richmond is the capital of Virginia and lies on the James River, a tributary of the Chesapeake Bay. Richmond is part of the Central Virginia Waste Management Authority (CVWMA), a solid waste authority of 13 cities and counties in central Virginia. These jurisdictions include the cities of Richmond, Petersburg, Colonial Heights, Hopewell, Town of Ashland, and the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan, and Prince George. Richmond serves as the central site of the CVWMA. Most of the CVWMA's offices are located in Richmond.

Solid Waste Generation and Recovery (CVWMA)

Annual Tonnages (January 1, 1993 to December 31, 1993)

	Public (a) Sector	Private (b) Sector	Total MSW	Construction & Demolition (c)	Total Waste
Recovered	114,570	237,181	351,751	26,650	378,401
Recycled (d)	31,676	236,688	268,364	26,650	295,014
Composted	82,953	493	83,446	0	83,446
Disposed	414,777	244,361	659,138	224,522	883,660
Incinerated	0	0	0	0	0
Landfilled	414,777	244,361	659,138	224,522	883,660
Generated	529,347	481,542	1,010,948	251,172	1,262,120

Percent by Weight Recovered

	Public (a)	Private (b)	Total MSW	Construction & Demolition (c)	Total Waste
Recovered	21.6%	49.3%	34.8%	10.6%	30.0%
Recycled	6.0%	49.2%	26.5%	10.6%	23.4%
Composted	14.5%	0.001%	8.3%	0%	6.6%

Key: CVWMA = Central Virginia Waste Management Authority C&D = construction and demolition debris MSW = municipal solid waste

Notes:

(a) Public sector tonnage includes material from single-family households, and drop-off sites, and a small amount from CVWMA area businesses and apartment complexes.

(b) Private sector tonnage includes residential waste from apartment complexes not served by the CVWMA, and commercial and institutional waste. Private Sector recovered figures include 49,512 tons of industrial recycled ferrous metal.

(c) Figures for recovered C&D debris represent total yearly tonnage from one C&D recycling operation in the CVWMA service area.

(d) The CVWMA reports an additional 40,090 tons of auto bodies recovered from the residential sector in 1993.

Source: Tonnage figures are from Virginia Department of Environmental Quality Waste Division, "Recycling Rate Calculation Reporting Form for Local Governments," June 6, 1994.

The city of Richmond is part of the Central Virginia Waste Management Authority (CVWMA), a regional solid waste service area that includes 12 surrounding counties and cities. The CVWMA was formed in 1990, to help jurisdictions in central Virginia gain economic benefits through an integrated regional approach to recycling and solid waste management. The Authority serves the cities of Richmond, Petersburg, Colonial Heights, Hopewell, Town of Ashland, and the counties of Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan, and Prince George.

Throughout this report, all figures represent the entire CVWMA region, not just the City of Richmond, unless otherwise noted.

Solid Waste Disposal

Collection: Residents of Richmond, Petersburg, and a small portion of Henrico County receive public waste collection, for which they pay a small household fee. Ashland, Colonial Heights, and Hopewell have private collection through CVWMA contracts. Private haulers are available to serve other jurisdictions in the CVWMA service area. Where collection services are not available, residents must either transport their waste to "green box" collection sites, transfer stations, or the local landfill, or contract individually with private firms for collection.

Within the City of Richmond, collection is provided once a week in alley ways to approximately 63,500 single-family households, to 16,500 multifamily units, and to small businesses that dispose of less than four trash cans, or 360 gallons, a week. Collected refuse is tipped by the City with Chambers Waste Systems for \$51 per ton. Private waste collection serves the larger scale commercial businesses and the remaining 21,500 multifamily units. Richmond residents pay a mandatory monthly fee of \$10 per household for public refuse collection.

Transfer Stations: Transfer stations or "green boxes" are located in eight of the 13 CVWMA jurisdictions. Green boxes are locally operated drop-off areas for the public, located in regions where full-scale transfer stations do not exist. Access to green boxes is available free of charge to everyone, including non-county residents. There are approximately 27 green boxes throughout the CVWMA area. Within the City of Richmond, there is a five dollar gate fee for citizens to take waste to one of the City's full scale waste transfer stations.

Incineration: No municipal solid waste incinerators operate in the central Virginia region.

Landfills: All waste collected for disposal from the CVWMA service area is landfilled in one of five private or three public landfills. In 1993, the private landfills received 77 percent of the waste disposed. As recently as 1990, most landfill operations in the CVWMA were publicly operated.

Because landfill space in central Virginia is plentiful, tipping fees are comparatively low, averaging between \$18 and \$30 per ton. Since new landfills are still being proposed for the region, and several existing ones recently began operation, landfill capacity for the CVWMA is estimated to last well into the middle of the next century.

Materials Recovery Overview

Goals and Legislative Requirements:

Legislation passed by the Virginia General Assembly in May 1990, required local governments to take a formal look at solid waste management and recycling. Regional planning districts were required to develop solid waste management plans that included a complete analysis of the waste stream, and established methods for achieving recycling rates of 10 percent by 1991, 15 percent by 1993, and 25 percent by 1995. Regional planning districts must also submit a yearly report on their progress.

Although state law requires solid waste management plans, residential or commercial recycling is not mandatory, and participation may remain voluntary as long as recycling goals are met. However, all state agencies and universities are required to establish collection programs for recyclables, including aluminum, glass, office paper, used motor oil, and corrugated paper.

In order to meet the 1990 General Assembly legislative requirements and develop a regional solid waste management plan, the Central Virginia Waste Management Authority (CVWMA), incorporating 13 local jurisdictions in central Virginia, was formed in December 1990. Richmond is the largest city within the CVWMA's service area, and has led the way for the region in developing recycling programs.

In January 1990, the City of Richmond implemented the area's first municipal curbside collection of household recyclable materials. Collection service was made available to 325 homes and included glass, aluminum, newspaper, and plastic. With the formation of the Central Virginia Waste Management Authority, recycling became an established approach to managing solid waste in central Virginia. In April 1991, the CVWMA implemented a pilot curbside program for approximately 19,700 households in the service area, collecting newspaper, aluminum cans, steel and bi-metal cans, #1 and #2 plastic bottles, and glass containers. Aluminum foil was added in fall 1991 and by October 1991 the CVWMA curbside program had expanded to serve a total of 56,670 households. By fall 1994, it served 106,000 households.

The CVWMA has contracted with private companies for both curbside collection of recyclables and recycling drop-off centers. The Recycle America division of Waste Management of Richmond currently holds a five-year contract for curbside pick-up throughout the CVWMA service area and is responsible for processing and marketing materials once they are collected. Residents with curbside recycling receive 18-gallon plastic recycling bins in which they can place all colors of glass containers, aluminum items (foil, cans, and pans), steel cans, aseptic/polycoated paperboard, and narrow-neck PET and HDPE bottles. Newspaper and mixed paper (telephone books, junk mail, magazines, office paper, corrugated boxes, and boxboard) are placed in separate paper bags for collection. Mixed paper was added to the CVWMA collection program in 1994. In that year, monthly collection for newspaper averaged about 500 tons and monthly collection for mixed paper averaged about 200 tons. Since fiscal year 1992 (July/June), the tons of recyclables collected at curbside by the CVWMA have increased from 6,410 in 1992 to 10,702 tons collected in fiscal year 1994.

Recycle America estimates that household participation in curbside recycling averages 40 percent, with some areas reaching as high as 80 percent participation. The current regional average cost of Recycle America's service is \$80 to \$90 per ton; some communities pay as little as \$60 per ton. The City of Richmond has imposed a mandatory fee of \$1.30 per month for collection of recyclables. This fee is collected from all municipal water customers, including commercial businesses and multifamily properties not receiving the service. In 1994, revenues generated by the sale of collected recyclables

helped contain program costs. Prices for newspaper averaged \$40 per ton; mixed paper prices averaged \$60 per ton.

Through a contract with Chambers Waste Systems, which subcontracts with Southeast Recycling Corporation, the CVWMA provides approximately 50 stationary recycling sites throughout its jurisdictions to supplement existing curbside service. These drop-off sites, which are generally located in the low-density and high-density population areas of the CVWMA region, accept the same materials as the curbside program except for aseptic containers and mixed paper. For October 1994, the net cost for the drop-off program was approximately \$46.51 per ton.

Waste Prevention Activities

Education:	As stated in the Central Virginia Solid Waste Management Plan, the CVWMA relies on assistance from the Department of Environmental Quality, the Virginia Cooperative Extension Service, recycling organizations, and volunteer groups to promote source reduction. Currently, litter control groups and recycling committees in the service area are distributing literature promoting source reduction, reuse, and recycling to schools and municipal offices.
Variable Rates:	No jurisdictions within the CVWMA have a variable fee system for waste disposal.
Product Procurement:	No programs exist to procure products that are reusable or that minimize waste generation and packaging.
Industry Agreements/Challenges:	<p>The Du Pont Spruance Plant, located within the CVWMA, recently modified its Kevlar production process, so that millions of pounds of this material can be recycled or reused. Hazardous waste generation has been reduced by more than 80 percent, and organic emissions have been reduced by 70 percent over a three-year period. Waste oil is now reused.</p> <p>Additional waste reduction programs include Ukrop's Supermarkets, Inc.'s program to reuse kraft paper grocery bags and sell canvas bags for reuse. The Puritan Cleaners and Launderers reuse a major chemical in the cleaning process and have a program to reuse and recycle metal clothes hangers.</p>
Product/Material Bans:	There are no product or material bans within the CVWMA region.

Recycling Activities

Public Sector Recycling

Curbside Program

Start-up Date:	A 325-household pilot program began in Richmond in January 1990. In April 1991 the CVWMA began providing curbside recycling for approximately 19,700 households in the newly formed service area. By April 1994 curbside recycling served 106,000 households in the CVWMA service area.
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Service Provider:	Recycle America division of Waste Management of Richmond
Pick-Up Frequency:	Weekly in some CVWMA areas, bi-weekly in others. Richmond City has bi-weekly collection.
Same Day as Refuse:	In some cases
Households Served:	106,000 single-family households and duplex dwellings within the CVWMA service area. In Richmond, 57,220 households receive curbside service.
Mandatory:	No. Residential participation in recycling is voluntary.
Participation Rate:	Between 40 percent and 80 percent of households with curbside service in the CVWMA participate in recycling.
Materials Collected:	Light blue, brown, green, and clear glass; aluminum foil, cans, and containers; steel cans; aseptic/polycoated paperboard; mixed paper (phone books, magazines, cereal and dry food boxes, corrugated boxes, junk mail); old newspaper, and narrow neck PET and HDPE plastic bottles.
Set-Out Method:	Materials are set out at the curb. Newspaper is bundled or put into paper bags. Mixed paper (phone books, cereal and dry food boxes, corrugated boxes, magazines, junk mail) is put into separate paper bags. Commingled materials (cans and bottles) are placed in 18-gallon plastic bins provided by the hauler.
Collection Method and Vehicles:	Recycle America (WMI) uses Dempster side-loading recycling trucks. Paper and commingled materials are placed into separate compartments. Aside from the driver, each truck has only one crew member.
Economic Incentives:	Richmond households pay a mandatory user fee of \$1.30 per month for recyclables collection. Other households in the service area pay no fee. CVWMA pays Recycle America a contract fee of \$0.80 per home.
Annual Tonnage:	In fiscal year 1994, Recycle America collected 10,702 tons of recyclables from homes in the CVWMA service area. Approximately 6,410 tons were collected in fiscal year 1992.

Salvage/Reuse

In the past, the CVWMA has provided a semi-annual curbside collection program for used clothing, small appliances, and used books. In cooperation with Goodwill and the Salvation Army, materials are collected twice a year and go to needy families in the area or are sold to help fund the organizations' charity programs. The May and November 1993 collection drives resulted in the collection of more than 12 tons of reusable goods from approximately 22,000 homes. These programs operate on approximately 50 percent of the curbside routes.

Government Building and School Recycling

Schools in the CVWMA region recycle independently. The CVWMA is working with various schools in the region to set up pilot recycling programs in hopes that other schools will duplicate the efforts and benefit from the project as well. Information about recycling efforts in schools and government buildings is not tracked by the CVWMA. Within Richmond, three schools are conducting recycling pilot programs, and all government buildings collect aluminum cans, office waste paper, and old newspaper.

Private Sector Recycling

Apartment Building Collection

Apartment complexes that generate more than 360 gallons, or four "supercans" of refuse a week, must provide for their own collection of recyclables. Residents in apartment buildings who wish to recycle have complete access to the approximately 50 stationary recycling sites throughout the CVWMA service area.

Self Haul and Drop-Off Centers

- Number and Type:** Approximately 50 roll-off containers at 50 sites.
- Public or Private:** Through a private contract with Chambers Waste Systems, which sub-contracts to Southeast Recycling Corporation, the CVWMA provides approximately 50 stationary recycling sites throughout the region. Ukrop's, a private local supermarket chain, in cooperation with Goodwill Industries, has begun accepting donations of newspaper, glass, aluminum, clothing, and household items at seven grocery locations throughout the CVWMA region.
- Sectors Served:** Drop-off sites are located in rural and high-density population areas within the CVWMA service area.
- Materials Accepted:** Light blue, brown, green, and clear glass; aluminum foil, cans, and containers; steel cans; old newspapers; and narrow-neck PET and HDPE plastic containers. These sites collect the same materials as the curbside program with the exception of aseptic containers and mixed paper. It is anticipated that in mid-February 1995, the collection of plastic bottles will cease and be replaced with mixed paper.
- Annual Tonnage:** 3,628 tons were collected in fiscal year 1994.

Commercial & Institutional Recycling

Although the CVWMA does not provide recycling services to the commercial sector, this sector recycled over 290,000 tons of metals, paper, and commingled materials in 1993. Recycling is not mandatory for businesses in CVWMA jurisdictions. Chambers Waste Systems, Waste Management, Inc., and Browning-Ferris Industries are the principal companies that collect recyclables from businesses. Numerous smaller haulers also collect recyclables within the CVWMA service area.

The CVWMA does not track recycling activities by businesses in the area. Initiatives by individual companies in the region to recycle and reduce waste have received attention.

Processing and Marketing Recyclables

The CVWMA has established contracts with private companies for the processing and marketing of recyclables collected through its curbside and drop-off programs. These contractors are responsible for locating markets. Purchasers may vary from month to month. In 1993, roughly half of the recyclables collected throughout the CVWMA region were used locally.

Initial processing of collected recyclables is handled primarily by two materials recovery facilities (MRF'S): Recycle America and Southeast Recycling Corporation. Southeast Recycling is Virginia's largest consumer of old newspapers; its central Virginia facility collects newspaper feedstock for its parent company in Georgia. Recycle America handles approximately 45,000 tons per year. These materials go to local markets when possible or leave the region for secondary processing.

Market strength in the CVWMA region varies depending on the material collected. Paper markets in the central Virginia region are quite strong, with major end users consuming over 100,000 tons per year of locally collected paper. One manufacturer is Bear Island Paper Company in Ashland, which consumes 70,000 tons per year of newspapers and magazines in the production of recycled-content newspaper. Chesapeake Corporation in West Point and Sonoco Products Company in Richmond use old corrugated containers as feedstock in the production of paperboard. Stone Container Corp. in Hopewell, and Richmond Paperboard in Richmond represent other local markets buying waste paper. Weyerhaeuser, Halifax Paperboard, and Southeast Paper all collect and process paper locally, but then ship it to the parent company or to other markets out of the region for remanufacture into paper products.

Glass, processed at one of the two MRF's, goes just south of Richmond to Cycle Systems, the only glass beneficiation facility in the state of Virginia. Here, waste glass is cleaned and reduced to three-quarter-inch cullet and sold to glass manufacturers.

Several problems have hindered the CVWMA's efforts to develop a strong plastic recycling network. Plastic that is deposited at recycling drop-off sites is usually heavily contaminated, and plastic collection and processing costs are quite high. Enviroplast Company and Spectrum Recycling, two processors in the region that pelletize and flake recovered plastic, currently obtain all their feedstock from outside the CVWMA region.

A well-developed processing infrastructure for scrap metals and metal containers exists in central Virginia. Most of the ferrous metal and automobile scrap generated in the region is processed by companies such as HIMCO in Hopewell, Smith Iron and Metal in Richmond, Ramsey Iron and Metal in Petersburg, and Peck Recycling in Richmond. Nonferrous metal processors include Cycle Systems, Dominion Salvage, and Frank H. Nott, Inc. Reynolds Aluminum Company, based in Williamsburg, Virginia, is the largest purchaser of used beverage cans from the central Virginia area. Reynolds traditionally buys most of its cans directly from processing facilities, but obtains additional supplies from its mobile buy-back trailers and two drop-off sites in Richmond.

Composting Activities

Curbside Collection

- Start-Up Dates:** The Agricultural Leaf Composting Program, through which farmers in the CVWMA region accept municipally collected leaves, began in 1992. The Centralized Yard Waste Composting Program, which diverts brush and yard debris at landfills, began in fiscal year 1993.
- Service Provider:** Local governments within the CVWMA region
- Sectors Served:** The jurisdictions participating in these two programs are the Cities of Colonial Heights and Petersburg, Town of Ashland, Goochland County, Henrico County, Prince George County, City of Hopewell, Richmond City, Chesterfield County, Hanover County, and Powhatan County.
- Mandatory:** No
- Set-Out Method:** Residents set out leaves according to jurisdiction specifications. This includes either raking leaves to the curb or placing leaves in plastic bags.
- Materials Collected:** Grass clippings, brush, tree prunings, and fall leaves
- Collection Vehicles and Method:** Dump trucks and leaf-mulching machines
- Economic Incentives:** CVWMA and municipal jurisdictions offer no direct economic incentives to residents to participate in yard debris collection programs. Local governments, on the other hand, pay tipping fees of \$6 to \$10 per ton at compost sites as opposed to \$35 at landfills.
- Annual Tonnage:** In fiscal year 1994, 26,000 tons of yard debris were collected through the Centralized Yard Waste Composting Program and 2,067 tons through the Agricultural Leaf Composting Program. For fiscal year 1993, the City of Richmond alone collected between 12,000 and 13,000 tons of leaves.

Composting Sites

Composting takes place in the CVWMA service area through two different programs. In both programs, participating municipalities collect compostable materials and deliver them to a centralized landfill composting site or a local farm.

Through the Agricultural Leaf Composting Program, 11 area farms accept fall leaves from nine CVWMA government jurisdictions. In fiscal year 1994, a total of 2,067 tons of leaves were delivered to these farms. Participating local governments pay \$6 to \$7 per ton to deliver material to the farms. Farmers are encouraged to compost the material in windrows and to use the finished compost product as a soil enhancer. The nine jurisdictions participating in this program are Colonial Heights, Petersburg, Ashland, Goochland, Henrico, Prince George, Hopewell, Hanover, and the City of Richmond.

Through the Yard Waste Composting Program, Chesterfield County, Henrico County, and the City of Richmond collect yard debris at centralized debris landfills. As of fall 1993, three area debris landfills have contracts to accept and compost materials from these jurisdictions. Landfills accept the yard waste for a flat rate of \$10 per ton and market the finished compost. At least 26,000 tons of yard waste were accepted through this program in fiscal year 1994.

Amount and Breakdown of Materials Recovered (CVWMA)

Material	Public Sector (a) (Tons, FY 1993)	Private Sector (b) (Tons, FY 1993)	Total (Tons, FY 1993)
Newspaper	18,025	4,782	22,807
Corrugated cardboard	0	91,813	91,813
High-grade paper	0	13,446	13,446
Other paper	0	84,551	84,551
Glass	4,048	0	4,048
HDPE, PET plastics	905	864	1,769
Aluminum cans	3,493	1,149	4,642
Ferrous cans	661	0	661
Scrap metal	1,769	0	1,769
Food waste	0	1,120	1,120
Tires	0	1,818	1,818
Batteries	0	3,244	3,244
Pallets		37,537	37,537
Motor oil	2,775	0	2,775
Subtotal: MSW Recycled	31,676	236,688	268,364
Leaves	43,054	0	43,054
Brush/ Mixed Yard waste	39,899	0	39,899
Landscapers' Waste	0	493	493
Subtotal: MSW Composted	82,953	493	83,446
Total MSW Recovered	114,629	237,181	351,810
Total C&D Recovered	0	26,650	26,650
Total Materials Recycled	31,676	263,338	295,014
Total Materials Composted	82,953	493	83,446
Total Materials Recovered	114,629	263,831	378,460

Key: C&D = construction and demolition debris HDPE = high-density polyethylene MSW = municipal solid waste PET = polyethylene terephthalate

Notes:

(a) Public sector tonnage includes material from single-family households and drop-off sites, and a small amount from CVWMA area businesses and apartment complexes.

(b) Private sector tonnage includes residential waste from apartment complexes not served by the CVWMA, and commercial and institutional waste.

Source: Virginia Department of Environmental Quality Waste Division, "Recycling Rate Calculation Reporting Form for Local Governments," June 6, 1994.

Publicity and Education

Newspapers and local television and radio stations cover recycling within the CVWMA region. The Richmond Times-Dispatch, publishes an annual supplement entitled "Recycle Richmond," which includes information about area environmental programs, curbside recycling, and drop-off programs. In the fall, CVWMA staff work with the Richmond Times-Dispatch to produce supplemental articles about leaf and yard debris composting entitled "Yard and Home." The CVWMA campaign to "Recycle Right" features a masked character, "Recycle Ranger," in its bi-annual curbside newsletter, which is a portion of the Sunday comics each spring and fall in the Richmond Times-Dispatch

Local recycling organizations, volunteer groups, and government agencies also educate the public, including the commercial sector, about recycling. One active organization, the Recycling Association of Central Virginia, has conducted recycling seminars, sponsored tours, and developed recycling guides to assist area businesses in developing recycling programs. This organization has persuaded more than 30 area businesses to enroll in the National Office Paper Recycling Project and/or the Buy Recycled Business Alliance.

Market Development Initiatives/Procurement

Job Creation Initiatives: None

Recycling Enterprise Development Initiatives: None

Technical Assistance to Potential End Users: None

Tax Breaks for Potential End Users: In 1993, to encourage the development of recycling systems in Virginia, the Virginia General Assembly enacted an amendment (HB 1865) that granted a 10 percent tax credit for businesses that purchase "recycling machinery equipment." Recycling machinery equipment includes tub grinders, glass breakers, compactors, can sorters, balers, can densifiers, plastics grinders, and shredders. Equipment excluded from receiving the tax credit include trucks, trailers, forklifts, storage or collection units, and other auxiliary non-processing equipment.

Minimum-Recycled Content Laws: None

Closed-Loop Arrangements: None

Recycled Content Product Procurement: Virginia House Bill 822, passed in 1990, requires State agencies to apply a 10 percent cost preference for recycled paper and products. According to Virginia HJR 155 and 244, the State must report on its procurement of recycled products and must investigate how the increased use of recycled products can contribute to reaching the goals of 15 percent recycling by 1993 and 25 percent by 1995.

**Buy-Recycled
Campaigns:**

The Recycling Association of Central Virginia (RACV) is the most active group within the CVWMA region encouraging businesses to buy recycled products. The RACV has been instrumental in enrolling 30 CVWMA businesses in the National Office Paper Recycling Project and the Close The Loop Campaign. Both campaigns are part of nationwide efforts to increase office recycling rates and encourage businesses to buy recycled. The Recycling Association of Central Virginia is a non-profit, volunteer organization.

Future Solid Waste Management Plans

In September 1994, the County of Henrico Board of Supervisors voted to implement curbside collection of recyclables, adding up to 60,000 households to the CVWMA curbside recycling program by May 1995.

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Appendix E

List of Recycling-Related Operations in the Tri-City Region

Recycling-Related Operations, by Region and Material

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
Washington, DC Region Processors/Compost Sites								
Paper								
ABC Recycling Services	65 N St., SE	Washington	DC	20003	Les Ulanow	(202) 488-7850	HGOP, MP, ONP, non-ferrous metals	
Capitol Fiber, Inc.	6610 Electronic Drive	Springfield	VA	22151	Jack Mauthe	(703) 658-0200	MP, OCC, ONP	
PSI Associates, Inc.	1000 Vermont Avenue, NW, Suite 300	Washington	DC	20005	Steve Mason	(202) 842-2790	HGOP, MP	
Metals								
A. J. Recycling	15103 Old Marlborough Pike	Upper Marlborough	MD	20772		(301) 627-1910	scrap ferrous and non-ferrous metals	
Clinton Metal Company	7605 Ogden Drive	Clinton	MD	20735		(301) 297-4696	non-ferrous metals	
G&L Metals	2945 Eskridge Rd.	Merrifield	VA	22116		(703) 560-8488	scrap ferrous & non-ferrous metals	
Montgomery Scrap	15000 South Lawn Lane	Rockville	MD	20850	David Caffé	(301) 424-3000	scrap ferrous & non-ferrous metals	
Super Salvage	1711 First St., SW	Washington	DC	20024	Joel Kaplan	(202) 488-7157	scrap ferrous, non-ferrous metal	
Mixed Materials								
Bonded Recycling	P.O. Box 70739	Washington	DC	20204	Richard Hamilton	(202) 479-2889	HDPE, PET, MP, mixed glass	
Browning-Ferris (The Recyclery)	8397 Terminal Road	Lorton	VA	22079	Greg Petit	(703) 550-2421	ONP, OCC, UBC, PET, HDPE, mixed glass, bi-metal cans	
CRINC / Montgomery County	16105 Frederick Rd.	Durwood	MD	20855	Rick Katter	(301) 417-1433	HDPE, PET, ONP, UBC, mixed glass, bi-metal cans	
CRINC / Prince George's County	1000 Richie Road	Capitol Heights	MD	20743	Greg Grant	(301) 499-1707	HDPE, PET, ONP, UBC, mixed glass, bi-metal cans	
Eagle Maintenance Recycling	6130 N. Capital, NW	Washington	DC	20011	Dick Tynes	(202) 291-0200	ONP, OCC, UBC, HDPE, PET, mixed glass, bi-metal cans	
Environmental Conservation Organization (ECO)	Univ of MD, Room 1211-N STAMP	College Park	MD	20742	Hye Yeong	(301) 314-8345	UBC, MP, OMG, mixed glass,	
Environmental Recycling	621 S. Pickett St.	Alexandria	VA	22304	Mike Pollard	(703) 370-3325	UBC, MP	
Georgetown Paper Stock Co., Inc.	4501 46th St., P.O. Box 406	Bladensburg	MD	20710	Richard Abraham	(301) 864-1200	glass	
Laidlaw Waste Systems	9020 Edgeworth Drive	Capitol Heights	MD	20743	Ron Pugh	(301) 336-5932 (202) 863-1924	MP, HGOP, UBC, HDPE, PET, mixed glass, bi-metal cans	
Metro Re-Uz-It Company	68 N St., SE	Washington	DC	20003	Larry Guren	(301) 916-1258	UBC, MP, OCC, ONP, mixed glass	
Metro Recyclers	2801 Dorr Ave.	Fairfax	VA	22031	Jim Murphy	(703) 207-9104	ONP, HGOP, PET, HDPE, C&D debris, mixed glass	
Southeast Recycling	801 S. Pickett St.	Alexandria	VA	22304	Jeff Kibler	(301) 370-8004	ONP, OCC, OMG, UBC, HDPE, PET, mixed glass	
Southeast Recycling Corp.	9001 Brookville Road	Silver Spring	MD	20910	Rob Barnwell	(301) 589-4002	ONP, OCC, HGOP, MP, UBC, HDPE, PET, mixed glass, bi-metal cans	
Universal Recycling	5300 Tuxedo Rd.	Hyattsville	MD	20781	Frank Sciacca	(301) 322-4200	HGOP, ONP, HDPE, PET, mixed glass	
Waste Not Recycling	4106 Brickell Drive, Suite 102	Fairfax	VA	22033	Jack Hope	(703) 866-7134	UBC, MP	
World Recycling Company	5600 Columbia Pike Rd.	Cheverly	MD	20785	Jeff Miller	(301) 386-3010	glass	
Organics								
Lorton Wood Recycling	10001 Furnace Road	Lorton	VA	22079		(703) 690-8194	wood waste, tree stumps	
O.M. Scott and Sons	8667 Sudley Rd # 281	Manassas	VA	22110	Mike Truman	(703) 791-2649	organic debris which is composted	
Travilah Trading Company	14215 Travilah Road	Rockville	MD	20850	Bill Mossburg III	(301) 762-1500	wood waste which is composted	
Miscellaneous								
D.C. Foam Recycling Center	8107 Cryden Way	Forrestville	MD	20747	Lewis Renbaum	(301) 736-4751	carpet pad, furniture foam, bedding foam, new carpet remnants	
Global Resource Recyclers	162 Lafayette Ave.	Laurel	MD	20707	Harold Green	(301) 953-2852	asphalt, concrete	
Joseph Smith and Sons	20001 Kenilworth Ave.	Washington	DC	20029		(301) 775-1266	C&D debris	

Recycling-Related Operations, by Region and Material

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
The Recycling Center	14852 Old Gunpowder Rd.	Laurel	MD	20707	Eric Seline	(301) 953-1424	C&D debris	
Rodgers Brothers Custodial	2200 Lawrence Ave. NE	Washington	DC	20018	George Rodgers	(202) 526-0274	C&D debris	
Washington, DC Region Recycling-Based Manufacturers								
C&R Industries Antifreeze Recyclers, Inc.	5555 Branchville Road	College Park	MD	20740	Chris Ellis	(301) 441-4824	used antifreeze	antifreeze
Laser Recharge	P.O. Box 906	Silver Spring	MD	20910	Marcus Webster	(202) 291-7820	old toner & laser cartridges	new laser cartridges
Baltimore Region Processors/Compost Sites								
Paper								
Baltimore Recycling	725 Pittman Road (Hawkins Point)	Baltimore	MD	21226	Greg Issac	(410) 789-9440	OCC, HGOP	
Canusa Corp.	1616 Shakespeare St.	Baltimore	MD	21231	Ben Hoen	(410) 522-0110	MP, OCC, HGOP	
G & S Recycling Corporation	1006 Haverhill Road	Baltimore	MD	21229	Tim Shifflett	(410) 644-7756	MP, HGOP, CPO	
Mid-Atlantic Recycling Center	2000 S. Clinton St.	Baltimore	MD	21224	Rich Ginns	(410) 276-0590	ONP, OCC, HGOP	
Vangel Paper	50 Alco Place	Baltimore	MD	21227	Valerie Androtoutsopoulos	(410) 536-4353	HGOP	
Weyerhaeuser Company	7270 Park Circle Drive	Doresy	MD	21076	Drew Andrews	(410) 712-6990	OCC, HGOP, MP	
Metals								
Baltimore Scrap	1600 Carbon Ave.	Baltimore	MD	21226	Joe Simon	(410) 355-4455	ferrous & non-ferrous metals, auto scrap	
Bayer & Sons	3500 Washington Blvd	Baltimore	MD	21227		(410) 242-5941	scrap metals	
Cambridge Iron & Metal	901 South Kresson St.	Baltimore	MD	21205	Sandy Shapiro	(410) 327-7867	non-ferrous scrap, ferrous metal, white goods, lead-acid batteries	
Decker Brothers Recycling	5618 Furnace Ave.	Elk Ridge	MD	21227	Cecil Decker	(410) 796-0760	metals, auto parts	
Hanover Metal Company, Inc.	20 West Cross St.	Baltimore	MD	21230	Steve Epstein	(410) 539-1338	scrap non-ferrous metal	
Maryland Recycling, Inc.	68th & Pulaski Highway	Baltimore	MD	21237	Ron Vogt	(410) 760-9088	used batteries, scrap metals	
Titus Recycling Co.	5921 Moravia Park Drive	Baltimore	MD	21206	Brian Dashhoff	(410) 485-5433	UBC, non-ferrous scrap	
United Iron & Metal Co.	2545 Wilkens Ave.	Baltimore	MD	21223	David Workum	(410) 947-8000	non-ferrous scrap, ferrous metal, lead-acid batteries, trucks/autos, freon	
Plastic								
Polymer Resource Group, Inc.	8933 Yellow Brick Road	Baltimore	MD	21237	Eric Osterchrist	(410) 686-9232	HDPE bottles	
Mixed Materials								
Browning-Ferris Industries /The Recyclery	7531 Cemetery Lane	Elkridge	MD	21227	Linda Birtell	(410) 799-7822	MP, OCC, HGOP, UBC, PET, HDPE, mixed glass, bi-metal cans, printers' waste	
Felco Packaging	4001 E. Baltimore	Baltimore	MD	21224	Jeff Feldman	(410) 675-2664	OCC, scrap burlap bagging	
G&L Recycle	222 N. Calverton Road	Baltimore	MD	21223	Gene Johnson	(410) 233-1197	UBC, HDPE, PET, mixed glass, bi-metal cans	
Modern Junk and Salvage	1423 N. Fremont Ave.	Baltimore	MD	21217	Joe Brightman	(410) 669-8290	HGOP, UBC, non-ferrous metals, auto batteries	
Owl Corporation	1936 Rettman Lane	Dundalk	MD	21222	Ben Bays	(410) 282-0066	ONP, HGOP, OCC, UBC, non-ferrous scrap, mixed glass	
Second Chance	526 W. University Pkwy, P.O. Box 5665	Baltimore	MD	21210	Dennis Potts	(410) 235-8446	MP, HGOP, UBC, OCC	
Organics								
Edrich Lumber, Inc.	9700 Old Court Road	Baltimore	MD	21244	Richard Stanfield	(410) 922-5959	used wood pallets, wood scrap, yard waste, log stumps	
Hollins Organic Products, Inc.	6247 Falls Rd.	Mt. Washington	MD	21209	Doug Hollins	(410) 828-0210	yard debris which is composted	
Valleywood Industries, Inc.	6600 Landay Ave.	Baltimore	MD	21237	Charles Wolcott	(410) 488-5500	used wood pallets	

Recycling-Related Operations, by Region and Material

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
Durables / Textiles								
International Furniture & Bedding	2201 Garret Ave.	Baltimore	MD	21218	Mike Fannon	(410) 377-0214	waste bedding, mattresses	
Loading Dock, The	2523 Gwynns Falls Parkway	Baltimore	MD	21216	Leslie Kirkland	(410) 728-3625	building materials	
Row Clothing	P.O. Box 7020	Baltimore	MD	21216	Reuven Block	(410) 523-5340	cloth fibers	
Miscellaneous								
Baltimore Foam Recycling Center, Inc.	6712 Whitestone Road	Baltimore	MD	21207	Lewis Renbaum	(301) 736-4751	polyurethane foam, carpet pad, furniture foam, bedding foam	
Dext Co. of Maryland	3220 Sun St.	Baltimore	MD	21226	Tina Lawrence	(410) 354 1417	bakery / food waste	
Emanuel Tire Co.	1300 Moreland Ave.	Baltimore	MD	21216	Norman Emanuel	(410) 947-0660	tires, synthetic rubber scrap	
F & E Resources Technology, Inc. (FERST)	5800 Chemical Road	Baltimore	MD	21226	Judy Purman	(410) 354-3000	mixed MSW which is composted	
Klausmeyer Tire, Inc.	1900 E. Patapsco Ave.	Baltimore	MD	21226	Joe Lynch	(410) 355-0350	truck tires which are retread	
Potts & Callahan	500 West 29th	Baltimore	MD	21211	Ronald Bender	(410) 235-9400	C&D debris	
Recycling & Rehandling Corp. of MD	803 Glen Eagles Court, Suite 500	Baltimore	MD	21204	Joe Frock	(410) 821-3490	concrete	roadbed material
Baltimore Region Recycling-Based Manufacturers								
Paper								
ABC Box Company	1135 Leadenhall St.	Baltimore	MD	21230	Robert Fink	(410) 752-4535	discarded shipping boxes	transport/ shipping gaylords
Chesapeake Paperboard	Fort Avenue & Woodall St.	Baltimore	MD	21230	Murrell Smith, Jr.	(410) 752-1842	all paper grades	uncoated boxboard
Simkins Industries	201 River Road	Catonsville	MD	21228	Jeffery Lester	(410) 747-5100	MP, OCC, ONP	uncoated boxboard
Metals								
A.M.G Resources Corp.	2415 Grays Road	Baltimore	MD	21222	David McSweeney	(410) 477-0300	steel and bi-metal cans	de-tinned scrap metal
Abbey Drum Company	1900 Benhill Ave.	Baltimore	MD	21226	Johnathan Newman	(410) 355-3121	steel and plastic 55-gallon drums	reconditioned drums
Alcoa Recycling	6770 Oak Hall Lane, Suite 707	Columbia	MD	21045	Selina Dixon	(410) 381-0050	UBC	aluminum cans
Bethlehem Steel	5111 N. Point Blvd	Sparrows Point	MD	21219	Ted Baldwin	(410) 388-6077	scrap steel	steel products
Plastic								
Polystyrene Products	8875 Kelso Drive	Baltimore	MD	21221	John Girard	(410) 574-0680	white expanded polystyrene	soil aerator, packaging peanuts
Rubber								
Flex-A-Glass	1101 S. Dukeland St.	Baltimore	MD	21223	Ethan Grove	(410) 233-8200	tires	rubberized roofing material, playground mats
Richmond Region Processor / Compost Site								
Paper								
Halifax Recycling	711 Hospital St.	Richmond	VA	23224	Cindy Buruss, Sr.	(804) 225-0855	OCC, ONP, HGOP, MP	
Manchester Paper	200 Orleans St.	Richmond	VA	23231	Thomas J. Harris	(804) 226-4404	MP, OCC	
Metals								
Domlnion Salvage, Inc.	130 Echo Ave.	Richmond	VA	23223		(804) 231-7964	scrap ferrous and non-ferrous metals	
Frank H. Nott, Inc.	900 Brook Road	Richmond	VA	23220	Bob Salsitz	(804) 644-8501	scrap non-ferrous metals	
HIMCO	213 S 6th Ave.	Hopewell	VA	23860	Mike Fratarcangelo	(804) 458-8514	scrap metals	
Peck Metal Recycling	3220 Deep Water Trm	Richmond	VA	23234	Dan Peck	(804) 232-5601	scrap ferrous and non-ferrous metals	
Pocket Money Recycling	701 Hull St.	Richmond	VA	23234	Tom Evans	(804) 233-7252	UBC, batteries, scrap metals	

Recycling-Related Operations, by Region and Material

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
Smith Iron & Metal	3000 Bells Road	Richmond	VA	23234	Charles Smith	(804) 271-1239	scrap ferrous and non-ferrous metals	
Plastic								
Enviroplast, Inc.	1071 Merchants Lane	Oilville	VA	23129	Marc Broich	(804) 784-4056	HDPE, PET	
Mixed								
Cycle Systems	14500 Jefferson Davis Highway	Chester	VA	23831	Steve Coe	(804) 796-9000	UBC, OCC, mixed glass	
Fort Lee Recycling	P.O. Box 5070	Fort Lee	VA	23801		(804) 734-5539	ONP, HGOP, UBC, mixed glass, bi-metal cans	
Goodwill Industries	2520 East Broad St.	Richmond	VA	23223	Charles Layman	(804) 643-6734	UBC, ONP, mixed glass, durable goods	
Recycle America (WMI)	1405 Gordon Ave.	Richmond	VA	23224	Mike Bilthius	(804) 233-5052	UBC, OCC, ONP, MP, HDPE, mixed glass	
Richmond Recycling	5600 Lewis Road	Sandston	VA	23150	Ed Bunting	(804) 226-0383	UBC, OCC, mixed glass	
Southeast Recycling	1350 N. Myers St.	Richmond	VA	23230	Wanda McGee	(804) 359-1080	UBC, ONP, OCC, HDPE, PET	
Organics								
Allied Pallet Co.	P.O.Box 367	Providence Forge	VA	23140	William Newman	(804) 966-5597	used pallets	
B.C.Wood Products	394 Airpark Road	Ashland	VA	23005	Raymond Williams	(804) 798-9154	used pallets	
Direct Wood Products	18501 Eltham	West Point	VA	23181	John Britt	(804) 843-4642	used pallets	
Interstate Pallet	3703 Nine Mile Road	Richmond	VA	23227	Gerald Hughes	(804) 226-8310	wood pallets	
Leafman	3411 Kings Land Rd.	Richmond	VA	23237	Seth Richardson	(804) 275-8919	yard waste	
Pioneer Pallets, Inc.	P.O. Box 6022	Ashland	VA	23005	Barry Britt	(804) 798-3977	used pallets	
Pruitt, Inc.	2415 Grenoble Rd.	Richmond	VA	23294	Jim Patterson	(804) 672-6487	yard waste	
Recycled Pallets	500 Erie Rd.	Hanover	VA	23069		(804) 730-421	used pallets	
Simons Hauling	4510 Oakleys Lane	Richmond	VA	23231	J. Simons	(804) 222-6222	used pallets	
TDM Pallets & Wood Products	1820 Osborne Road	Richmond	VA	23224	Dana Boyce	(804) 748-7282	used pallets	
Tires								
Tire Recyclers Inc.	710 N. Hamilton St.	Richmond	VA	23221	Cliff Hursey	(804) 358-1303	tires	
Richmond Region Recycling-Based Manufacturers								
Paper								
Bear Island Paper Company	P.O. Box 2119	Ashland	VA	23005	Mark Worten	(804) 227-3394	ONP	newsprint
Richmond Paperboard	111 Hull St.	Richmond	VA	23224	Larry Franklin	(804) 233-1274	HGOP, MP	boxboard
Sonoco Products Co.	1850 Commerce Road	Richmond	VA	23224	Harris Bacon	(804) 233-5411	OCC, ONP	paperboard
Stone Container Corporation	910 Industrial Drive	Hopewell	VA	23860	Dave Elliotte	(804) 541-9676	OCC	paperboard
Metals								
Reynolds Aluminum Recycling	6705 Janway Road	Richmond	VA	23228		(804) 264-5991	UBC, aluminum materials	aluminum deoxidizers for steel industry
Miscellaneous								
Open Plan Systems	4229 Carolina Ave., Bldg. C	Richmond	VA	23222	Elizabeth Connolly	(800) 728-0781	old paneling, office partitions	remanufactured modular office furniture
Saftey-Kleen	P.O. Box 1098	Chester	VA	23831	Chuck Lampart	(804) 748-3767	petroleum, paint waste, dry cleaning solvents, oil filters, HW solvents	
Spectrum Recycling	406 S. Ledbetter Rd.	Ashland	VA	23005	Maria Carpenter	(804) 550-3038	HDPE	plastic piping
Note: Companies with no end products are either a processing facility or a composting facility								
KEY:								
C&D = Construction and demolition debris							HDPE = High-Density Polyethylene	PET = Polyethylene terephthalate
CPO = Computer Print-Out							HGOP = High-Grade Office Paper	
OCC = Old Corrugated Cardboard							HW = Hazardous Waste	
ONP = Old Newspaper							MP = Mixed Paper	
OMG = Old Magazines							MSW = Municipal Solid Waste	

Recycling-Related Operations, Alphabetical by Name

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
A. J. Recycling	15103 Old Marlborough Pike	Upper Marlborough	MD	20772		(301) 627-1910	scrap ferrous and non-ferrous metals	
A.M.G Resources Corp.	2415 Grays Road	Baltimore	MD	21222	David McSweeney	(410) 477-0300	steel and bi-metal cans	de-tinned scrap metal
Abbey Drum Company	1900 Benhill Ave.	Baltimore	MD	21226	Johnathan Newman	(410) 355-3121	steel and plastic 55-gallon drums	reconditioned drums
ABC Box Company	1135 Leadenhall St.	Baltimore	MD	21230	Robert Fink	(410) 752-4535	discarded shipping boxes	transport/ shipping gaylords
ABC Recycling Services	65 N St., SE	Washington	DC	20003	Les Ulanow	(202) 488-7850	HGOP, MP, ONP, non-ferrous metals	
Alcoa Recycling	6770 Oak Hall Lane, Suite 707	Columbia	MD	21045	Selina Dixon	(410) 381-0050	UBC	aluminum cans
Allied Pallet Co.	P.O.Box 367	Providence Forge	VA	23140	William Newman	(804) 966-5597	used pallets	
B.C.Wood Products	394 Airpark Road	Ashland	VA	23005	Raymond Williams	(804) 798-9154	used pallets	
Baltimore Foam Recycling Center, Inc.	6712 Whitestone Road	Baltimore	MD	21207	Lewis Renbaum	(301) 736-4751	polyurethane foam, carpet pad, furniture foam, bedding foam	
Baltimore Recycling	725 Pittman Road (Hawkins Point)	Baltimore	MD	21226	Greg Issac	(410) 789-9440	OCC, HGOP	
Baltimore Scrap	1600 Carbon Ave.	Baltimore	MD	21226	Joe Simon	(410) 355-4455	ferrous & non-ferrous metals, auto scrap	
Bayer & Sons	3500 Washington Blvd	Baltimore	MD	21227		(410) 242-5941	scrap metals	
Bear Island Paper Company	P.O. Box 2119	Ashland	VA	23005	Mark Worten	(804) 227-3394	ONP	newsprint
Bethlehem Steel	5111 N. Point Blvd	Sparrows Point	MD	21219	Ted Baldwin	(410) 388-6077	scrap steel	steel products
Bonded Recycling	P.O. Box 70739	Washington	DC	20204	Richard Hamilton	(202) 479-2889	HDPE, PET, MP, mixed glass	
Browning-Ferris (The Recyclery)	8397 Terminal Road	Lorton	VA	22079	Greg Petit	(703) 550-2421	ONP, OCC, UBC, PET, HDPE, mixed glass, bi-metal cans	
Browning-Ferris Industries /The Recyclery	7531 Cemetery Lane	Elkridge	MD	21227	Linda Birtell	(410) 799-7822	MP, OCC, HGOP, UBC, PET, HDPE, mixed glass, bi-metal cans, printers' waste	
C&R Industries Antifreeze Recyclers, Inc.	5555 Branchville Road	College Park	MD	20740	Chris Ellis	(301) 441-4824	used antifreeze	antifreeze
Cambridge Iron & Metal	901 South Kresson St.	Baltimore	MD	21205	Sandy Shapiro	(410) 327-7867	non-ferrous scrap, ferrous metal, white goods, lead-acid batteries	
Canusa Corp.	1616 Shakespeare St.	Baltimore	MD	21231	Ben Hoen	(410) 522-0110	MP, OCC, HGOP	
Capitol Fiber, Inc.	6610 Electronic Drive	Springfield	VA	22151	Jack Mauthe	(703) 658-0200	MP, OCC, ONP	
Chesapeake Paperboard	Fort Avenue & Woodall St.	Baltimore	MD	21230	Murrell Smith, Jr.	(410) 752-1842	all paper grades	uncoated boxboard
Clinton Metal Company	7605 Ogden Drive	Clinton	MD	20735		(301) 297-4696	non-ferrous metals	
CRINC / Montgomery County	16105 Frederick Rd.	Durwood	MD	20855	Rick Katter	(301) 417-1433	HDPE, PET, ONP, UBC, mixed glass, bi-metal cans	
CRINC / Prince George's County	1000 Richie Road	Capitol Heights	MD	20743	Greg Grant	(301) 499-1707	HDPE, PET, ONP, UBC, mixed glass, bi-metal cans	
Cycle Systems	14500 Jefferson Davis Highway	Chester	VA	23831	Steve Coe	(804) 796-9000	UBC, OCC, mixed glass	
D.C. Foam Recycling Center	8107 Cryden Way	Forrestville	MD	20747	Lewis Renbaum	(301) 736-4751	carpet pad, furniture foam, bedding foam, new carpet remnants	
Decker Brothers Recycling	5618 Furnace Ave.	Elk Ridge	MD	21227	Cecil Decker	(410) 796-0760	metals, auto parts	
Dext Co. of Maryland	3220 Sun St.	Baltimore	MD	21226	Tina Lawrence	(410) 354 1417	bakery / food waste	
Direct Wood Products	18501 Eltham	West Point	VA	23181	John Britt	(804) 843-4642	used pallets	
Dominion Salvage, Inc.	130 Echo Ave.	Richmond	VA	23223		(804) 231-7964	scrap ferrous and non-ferrous metals	
Eagle Maintenance Recycling	6130 N. Capital, NW	Washington	DC	20011	Dick Tynes	(202) 291-0200	ONP, OCC, UBC, HDPE, PET, mixed glass, bi-metal cans	
Edrich Lumber, Inc.	9700 Old Court Road	Baltimore	MD	21244	Richard Stanfield	(410) 922-5959	used wood pallets, wood scrap, yard waste, log stumps	
Emanuel Tire Co.	1300 Moreland Ave.	Baltimore	MD	21216	Norman Emanuel	(410) 947-0660	tires, synthetic rubber scrap	

Recycling-Related Operations, Alphabetical by Name

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
Environmental Conservation Organization (ECO)	Univ of MD, Room 1211-N STAMP	College Park	MD	20742	Hye Yeong	(301) 314-8345	UBC, MP, OMG, mixed glass,	
Environmental Recycling	621 S. Pickett St.	Alexandria	VA	22304	Mike Pollard	(703) 370-3325	UBC, MP	
Enviroplast, Inc.	1071 Merchants Lane	Oilville	VA	23129	Marc Broich	(804) 784-4056	HDPE, PET	
F & E Resources Technology, Inc. (FERST)	5800 Chemical Road	Baltimore	MD	21226	Judy Purman	(410) 354-3000	mixed MSW which is composted	
Felco Packaging	4001 E. Baltimore	Baltimore	MD	21224	Jeff Feldman	(410) 675-2664	OCC, scrap burlap bagging	
Flex-A-Glass	1101 S. Dukeland St.	Baltimore	MD	21223	Ethan Grove	(410) 233-8200	tires	rubberized roofing material, playground mats
Fort Lee Recycling	P.O. Box 5070	Fort Lee	VA	23801		(804) 734-5539	ONP, HGOP, UBC, mixed glass, bi-metal cans	
Frank H. Nott, Inc.	900 Brook Road	Richmond	VA	23220	Bob Salsitz	(804) 644-8501	scrap non-ferrous metals	
G & S Recycling Corporation	1006 Haverhill Road	Baltimore	MD	21229	Tim Shifflett	(410) 644-7756	MP, HGOP, CPO	
G&L Metals	2945 Eskridge Rd.	Merrifield	VA	22116		(703) 560-8488	scrap ferrous & non-ferrous metals	
G&L Recycle	222 N. Calverton Road	Baltimore	MD	21223	Gene Johnson	(410) 233-1197	UBC, HDPE, PET, mixed glass, bi-metal cans	
Georgetown Paper Stock Co., Inc.	4501 46th St., P.O. Box 406	Bladensburg	MD	20710	Richard Abraham	(301) 864-1200	glass	
Global Resource Recyclers	162 Lafayette Ave.	Laurel	MD	20707	Harold Green	(301) 953-2852	asphalt, concrete	
Goodwill Industries	2520 East Broad St.	Richmond	VA	23223	Charles Layman	(804) 643-6734	UBC, ONP, mixed glass, durable goods	
Halifax Recycling	711 Hospital St.	Richmond	VA	23224	Cindy Burruss, Sr.	(804) 225-0855	OCC, ONP, HGOP, MP	
Hanover Metal Company, Inc.	20 West Cross St.	Baltimore	MD	21230	Steve Epstein	(410) 539-1338	scrap non-ferrous metal	
HIMCO	213 S 6th Ave.	Hopewell	VA	23860	Mike Fratarcangelo	(804) 458-8514	scrap metals	
Hollins Organic Products, Inc.	6247 Falls Rd.	Mt. Washington	MD	21209	Doug Hollins	(410) 828-0210	yard debris which is composted	
International Furniture & Bedding	2201 Garret Ave.	Baltimore	MD	21218	Mike Fannon	(410) 377-0214	waste bedding, mattresses	
Interstate Pallet	3703 Nine Mile Road	Richmond	VA	23227	Gerald Hughes	(804) 226-8310	wood pallets	
Joseph Smith and Sons	20001 Kenilworth Ave.	Washington	DC	20029		(301) 775-1266	C&D debris	
Klausmeyer Tire, Inc.	1900 E. Patapsco Ave.	Baltimore	MD	21226	Joe Lynch	(410) 355-0350	truck tires which are retread	
Laidlaw Waste Systems	9020 Edgeworth Drive	Capitol Heights	MD	20743	Ron Pugh	(301) 336-5932	MP, HGOP, UBC, HDPE, PET, mixed glass, bi-metal cans	
Laser Recharge	P.O. Box 906	Silver Spring	MD	20910	Marcus Webster	(202) 291-7820	old toner & laser cartridges	new laser cartridges
Leafman	3411 Kings Land Rd.	Richmond	VA	23237	Seth Richardson	(804) 275-8919	yard waste	
Loading Dock, The	2523 Gwynns Falls Parkway	Baltimore	MD	21216	Leslie Kirkland	(410) 728-3625	building materials	
Lorton Wood Recycling	10001 Furnace Road	Lorton	VA	22079		(703) 690-8194	wood waste, tree stumps	
Manchester Paper	200 Orleans St.	Richmond	VA	23231	Thomas J. Harris	(804) 226-4404	MP, OCC	
Maryland Recycling, Inc.	68th & Pulaski Highway	Baltimore	MD	21237	Ron Vogt	(410) 760-9088 (202) 863-1924	used batteries, scrap metals	
Metro Re-Uz-It Company	68 N St., SE	Washington	DC	20003	Larry Guren	(301) 916-1258	UBC, MP, OCC, ONP, mixed glass	
Metro Recyclers	2801 Dorr Ave.	Fairfax	VA	22031	Jim Murphy	(703) 207-9104	ONP, HGOP, PET, HDPE, C&D debris, mixed glass	
Mid-Atlantic Recycling Center	2000 S. Clinton St.	Baltimore	MD	21224	Rich Ginns	(410) 276-0590	ONP, OCC, HGOP	
Modern Junk and Salvage	1423 N. Freemont Ave.	Baltimore	MD	21217	Joe Brightman	(410) 669-8290	HGOP, UBC, non-ferrous metals, auto batteries	
Montgomery Scrap	15000 South Lawn Lane	Rockville	MD	20850	David Caffé	(301) 424-3000	scrap ferrous & non-ferrous metals	
O.M. Scott and Sons	8667 Sudley Rd # 281	Manassas	VA	22110	Mike Truman	(703) 791-2649	organic debris which is composted	
Open Plan Systems	4229 Carolina Ave., Bldg. C	Richmond	VA	23222	Elizabeth Connolly	(800) 728-0781	old paneling, office partitions	remanufactured modular office furniture
Owl Corporation	1936 Rettman Lane	Dundalk	MD	21222	Ben Bays	(410) 282-0066	ONP, HGOP, OCC, UBC, non-ferrous scrap, mixed glass	

Recycling-Related Operations, Alphabetical by Name

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
Peck Metal Recycling	3220 Deep Water Trm	Richmond	VA	23234	Dan Peck	(804) 232-5601	scrap ferrous and non-ferrous metals	
Pioneer Pallets, Inc.	P.O. Box 6022	Ashland	VA	23005	Barry Britt	(804) 798-3977	used pallets	
Pocket Money Recycling	701 Hull St.	Richmond	VA	23234	Tom Evans	(804) 233-7252	UBC, batteries, scrap metals	
Polymer Resource Group, Inc.	8933 Yellow Brick Road	Baltimore	MD	21237	Eric Osterchrist	(410) 686-9232	HDPE bottles	
Polystyrene Products	8875 Kelso Drive	Baltimore	MD	21221	John Girard	(410) 574-0680	white expanded polystyrene	soil aerator, packaging peanuts
Potts & Callahan	500 West 29th	Baltimore	MD	21211	Ronald Bender	(410) 235-9400	C&D debris	
Pruitt, Inc.	2415 Grenoble Rd.	Richmond	VA	23294	Jim Patterson	(804) 672-6487	yard waste	
PSI Associates, Inc.	1000 Vermont Avenue, NW, Suite 300	Washington	DC	20005	Steve Mason	(202) 842-2790	HGOP, MP	
Recycle America (WMI)	1405 Gordon Ave.	Richmond	VA	23224	Mike Bilthuis	(804) 233-5052	UBC, OCC, ONP, MP, HDPE, mixed glass	
Recycled Pallets	500 Erie Rd.	Hanover	VA	23069		(804) 730-421	used pallets	
Recycling & Rehandling Corp. of MD	803 Glen Eagles Court, Suite 500	Baltimore	MD	21204	Joe Frock	(410) 821-3490	concrete	roadbed material
Reynolds Aluminum Recycling	6705 Janway Road	Richmond	VA	23228		(804) 264-5991	UBC, aluminum materials	aluminum deoxidizers for steel industry
Richmond Paperboard	111 Hull St.	Richmond	VA	23224	Larry Franklin	(804) 233-1274	HGOP, MP	boxboard
Richmond Recycling	5600 Lewis Road	Sandston	VA	23150	Ed Bunting	(804) 226-0383	UBC, OCC, mixed glass	
Rodgers Brothers Custodial	2200 Lawrence Ave. NE	Washington	DC	20018	George Rodgers	(202) 526-0274	C&D debris	
Row Clothing	P.O. Box 7020	Baltimore	MD	21216	Reuven Block	(410) 523-5340	cloth fibers	
Saftey-Kleen	P.O. Box 1098	Chester	VA	23831	Chuck Lampart	(804) 748-3767	petroleum, paint waste, dry cleaning solvents, oil filters, HW solvents	
Second Chance	526 W. University Pkwy, P.O. Box 5665	Baltimore	MD	21210	Dennis Potts	(410) 235-8446	MP, HGOP, UBC, OCC	
Simkins Industries	201 River Road	Catonsville	MD	21228	Jeffery Lester	(410) 747-5100	MP, OCC, ONP	uncoated boxboard
Simons Hauling	4510 Oakleys Lane	Richmond	VA	23231	J. Simons	(804) 222-6222	used pallets	
Smith Iron & Metal	3000 Bells Road	Richmond	VA	23234	Charles Smith	(804) 271-1239	scrap ferrous and non-ferrous metals	
Sonoco Products Co.	1850 Commerce Road	Richmond	VA	23224	Harris Bacon	(804) 233-5411	OCC, ONP	paperboard
Southeast Recycling	801 S. Pickett St.	Alexandria	VA	22304	Jeff Kibler	(301) 370-8004	ONP, OCC, OMG, UBC, HDPE, PET, mixed glass	
Southeast Recycling	1350 N. Myers St.	Richmond	VA	23230	Wanda McGee	(804) 359-1080	UBC, ONP, OCC, HDPE, PET	
Southeast Recycling Corp.	9001 Brookville Road	Silver Spring	MD	20910	Rob Bamwell	(301) 589-4002	ONP, OCC, HGOP, MP, UBC, HDPE, PET, mixed glass, bi-metal cans	
Spectrum Recycling	406 S. Ledbetter Rd.	Ashland	VA	23005	Marla Carpenter	(804) 550-3038	HDPE	plastic piping
Stone Container Corporation	910 Industrial Drive	Hopewell	VA	23860	Dave Elliotte	(804) 541-9676	OCC	paperboard
Super Salvage	1711 First St., SW	Washington	DC	20024	Joel Kaplan	(202) 488-7157	scrap ferrous, non-ferrous metal	
TDM Pallets & Wood Products	1820 Osborne Road	Richmond	VA	23224	Dana Boyce	(804) 748-7282	used pallets	
The Recycling Center	14852 Old Gunpowder Rd.	Laurel	MD	20707	Eric Seline	(301) 953-1424	C&D debris	
Tire Recyclers Inc.	710 N. Hamilton St.	Richmond	VA	23221	Cliff Hursey	(804) 358-1303	tires	
Titus Recycling Co.	5921 Moravia Park Drive	Baltimore	MD	21206	Brian Dashhoff	(410) 485-5433	UBC, non-ferrous scrap	
Travilah Trading Company	14215 Travilah Road	Rockville	MD	20850	Bill Mossburg III	(301) 762-1500	wood waste which is composted	
United Iron & Metal Co.	2545 Wilkens Ave.	Baltimore	MD	21223	David Workum	(410) 947-8000	non-ferrous scrap, ferrous metal, lead-acid batteries, trucks/autos, freon	
Universal Recycling	5300 Tuxedo Rd.	Hyattsville	MD	20781	Frank Sciacca	(301) 322-4200	HGOP, ONP, HDPE, PET, mixed glass	
Valleywood Industries, Inc.	6600 Landay Ave.	Baltimore	MD	21237	Charles Wolcott	(410) 488-5500	used wood pallets	
Vangel Paper	50 Alco Place	Baltimore	MD	21227	Valerie Androutsopoulos	(410) 536-4353	HGOP	
Waste Not Recycling	4106 Brickell Drive, Suite 102	Fairfax	VA	22033	Jack Hope	(703) 866-7134	UBC, MP	
Weyerhaeuser Company	7270 Park Circle Drive	Doresy	MD	21076	Draw Andrews	(410) 712-6990	OCC, HGOP, MP	

Recycling-Related Operations, Alphabetical by Name

BUSINESS	ADDRESS	CITY	STATE	ZIP	CONTACT	PHONE	MATERIAL RECOVERED	END PRODUCTS
World Recycling Company	5600 Columbia Pike Rd.	Cheverly	MD	20785	Jeff Miller	(301) 386-3010	glass	
Note: Companies with no end products are either a processing facility or a composting facility								
KEY:								
C&D = Construction and Demolition Debris		MP = Mixed Paper			PET = Polyethylene Terephthalate			
CPO = Computer Print-Out		MSW = Municipal Solid Waste						
HDPE = High-Density Polyethylene		OCC = Old Corrugated Cardboard						
HGOP = High-Grade Office Paper		OMG = Old Magazines						
HW = Hazardous Waste		ONP = Old Newspaper						