In-Depth Studies of

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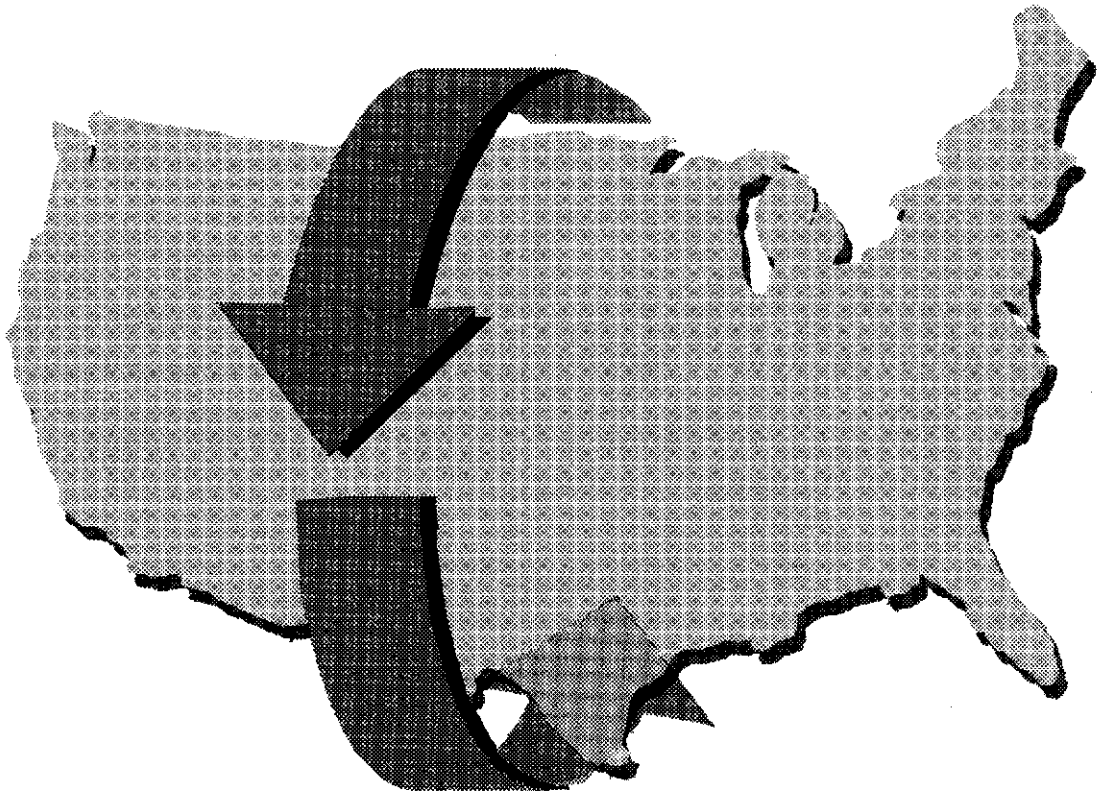

Designs, Costs, Results

Volume II: Suburbs and Small Cities

INSTITUTE FOR LOCAL SELF-RELIANCE

In-Depth Studies of Recycling and Composting Programs:

Designs, Costs, Results

Volume II: Suburbs and Small Cities

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The Institute for Local Self-Reliance (ILSR) is a nonprofit research and educational organization, providing technical information and assistance to city and state government, citizen and neighborhood organizations, and industry.

Since 1974, ILSR has been fostering self-reliant communities by investigating examples of closed-loop manufacturing, materials policy, materials recovery, energy efficiency, and small-scale production. It teaches cities to consider solid waste and the by-products of any one process as the feedstock for another. The Institute stresses a formula that stimulates local employment, provides skills training and adds to the local tax base.

The Institute presents a vision of self-reliant cities and provides the hard numbers to help bring that vision into reality. By providing the tools and information to solve problems in ways that are both economically sound and environmentally sustainable, the ILSR seeks to support an active citizenry, which is the foundation of a strong democracy.

In-Depth Studies of Recycling and Composting Programs: Designs, Costs, Results; Volume I - Rural Communities, Volume II - Suburbs and Small Cities, and Volume III - Urban Areas is part of an ongoing series of technical reports prepared by the ILSR staff. For more information on the Institute's philosophy, publications, and practice, write:

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Although most information for the report came from municipal recycling coordinators and Superintendents of Public Works, we also made calls to local landfills, private refuse haulers, processing centers, composting facilities, county and state solid waste officials, and local political leaders to fill in our knowledge about various communities' recycling and composting programs. We are grateful to these contacts for their helpful information.

In addition to the contacts listed in the case studies included in this report, people in the following communities provided information on their materials recovery programs: San Diego, California; Longmont, Colorado; Hartford and Manchester, Connecticut; Dade County and Orlando, Florida; Barrington, Princeton, Urbana, and Woodstock, Illinois; Chelmsford, Hilltown Cooperative, Longmeadow, and Springfield, Massachusetts; Ann Arbor, Michigan; Lexington, Durham and Wilmington, North Carolina; Haddonfield, Park Ridge, Cherry Hill, and Woodbury, New Jersey; Hamburg, Ithaca, and Ulster County, New York; Barrington, Rhode Island; and Burlington, Vermont.

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Abbreviations

ANJR— Association of New Jersey Recyclers
BFI — Browning Ferris Industries
CCA — Container Corporation of America
C&D — construction and demolition
C-E — Combustion Engineering
CEI — Citizens for Environmental Improvement
CFC's — chlorofluorocarbons
CMCMUA — Cape May County Municipal Utilities Authority
comm — commercial
CRC — Community Rehabilitation Center
CSWMB — California Solid Waste Management Board
CSWMP — Comprehensive Solid Waste Management Plan
cy— cubic yard
DEM — Department of Environmental Management
DEQ — Department of Environmental Quality
DO — drop-off
DPW — Department of Public Works
EDF — Environmental Defense Fund
ENCORE — Environmental Container Reuse
EPA — Environmental Protection Agency
F — Fahrenheit
FCR — Fairfield County Recycling
FY — fiscal year
HDPE — high density polyethylene
ILSR — Institute for Local Self-Reliance
instit/inst — institutional
IPC — intermediate processing center
IPF — intermediate processing facility
lb — pound
LDPE — low density polyethylene
MARC — Monroe Area Recycling Committee
MRF — materials recovery facility
MSW — municipal solid waste
NARC — Naperville Area Recycling Center
NA — not available
NHRRA — New Hampshire Resource Recovery Association
NoCAL — Northern California
O&M — operating and maintenance
PCB — polychlorinated biphenyl
PET — polyethylene terephthalate
PP —polypropylene
PS — polystyrene

PSE&G — Public Service Electric and Gas
PVC — polyvinyl chloride
RCC — Recyclables Collection Center
REA — Richmond Environmental Action
RFP — request for proposal
RMR — Recycle Minnesota R esources
RRT — Resource Recycling Technologies
SRMG — Sound Resource Management Group
SWA — Solid Waste Authority
SWAC — Solid Waste Advisory Commission
SWMA — Solid Waste Management Authority
SWMP — Solid Waste Management Plan
TURF — Total Urban Recycling Facility
UC — University of California
WMI — Waste Management, Inc.

Sample Conversion Factors

Waste generation rates used in this report are based on tonnage figures provided by recycling coordinators and other local officials, who may have estimated the data or relied on other sources, such as private haulers. In a few instances, ILSR staff obtained tonnage data directly from the private sector. Communities, in several cases, measure materials in cubic yards and use conversion factors to calculate tonnage figures. When local conversion factors were unavailable, ILSR staff estimated tonnage recovered using commonly accepted conversions factors. Sample conversion factors utilized in this report are listed below.

MIXED MSW (compacted)

Conversions Used By Communities:

785 lbs/cy (0.39 tons/cy) or 2.55 cy/ton
Source: *Solid Waste Management Plan Revision*, Sonoma Co., CA, May 1990.

667 lbs/cy (0.33 ton/cy)
Source: Naperville, IL

Conversions Found in the Literature:

500 - 700 lbs/cy (0.25 - 0.35 tons/cy) or 2.8 - 4 cy/ton
Source: *Solid Waste Data: A Compilation of Statistics on Solid Waste Management Within the United States*, US EPA, August, 1981.

600 lbs/cy (0.3 tons/cy) or 3.3 cy/ton
Source: *Association of New Jersey Recyclers (ANJR), Directory*, 1987.

MIXED MSW (uncompacted)

200 lbs/cy
Source: *Solid Waste Data: A Compilation of Statistics on Solid Waste Management Within the United States*, US EPA, August 1981.

MIXED YARD WASTE (average compaction)

Conversions Found in the Literature:

600 lbs/cy
Source: *Yard Waste Composting*, US EPA, April 1989.

Conversions Used By Communities:

620 lbs/cy
Source: Recycled Wood Products, Berkeley, CA

650-750 lbs/cy
Source: Portland, OR

660 lbs/cy
Source: West Palm Beach, FL

MIXED YARD WASTE (loose)

200-250 lbs/cy or 9 cy/ton
Source: Portland, OR

LEAVES (average compaction)

500 lbs/cy (320 - 500 lbs/cy)
Source: *Yard Waste Composting -- A Study of Eight Programs*, US EPA, April 1989.

450 lbs/cy
Source: *ANJR Directory*, 1987.

1,000 lbs/cy
Source: New Jersey Department of Environmental Protection

LEAVES (vacuumed)

700 lbs
Source: New Jersey Department of Environmental Protection

LEAVES (loose)

250 - 350 lbs/cy
Source: *ANJR Directory*, 1987.

CHIPPED BRUSH

500 lbs/cy
Source: National Recycling Coalition, 1989

COMPOST (finished)

1,500 lbs/cy
Source: *Yard Waste Composting*, US EPA, April, 1989.

CHRISTMAS TREES

20 lbs/tree
Source: *Summary of County-Wide Christmas Tree Recycling Project 1990-1991*, Garbage Reincarnation, Inc., Sonoma Co., CA.

15.1 lbs/tree
Source: Dakota County, MN

FOOD WASTE

500 lbs/cy (residential)
800 - 1000 lbs/cy (commercial)
Source: Suhr, J.L., Higgins, A.J. and Derr, D.A., *Feasibility of Food Waste Recycling in New Jersey: Fourth Quarterly Report to the Office of Recycling*, 1984.

900 lbs/cy (commercial)
Source: *Asheville/Buncombe County Solid Waste Alternatives: Planning Workbook*, ILSR, March 1985.

WATER

8.345 lbs/gal
Source: Lindeburg, Michael R., *Engineering Unit Conversions, 2nd ed.*, 1990.

USED MOTOR OIL

7 lbs/gal (6.5 - 7.5 lbs/gal)
Source: *ANJR Directory*, 1987. Range was arrived at by converting API gravity for 25-50% crude oil to specific gravity (*Perry's Chemical Engineers' Handbook, 6th ed.*).

CONCRETE/ASPHALT (broken)

1.5 tons/cy
Source: American Rock and Asphalt, Richmond, CA.

Introduction

As the performance of established recycling and composting programs improves, and as newer programs benefit from their experience, the country's learning curve on materials recovery is accelerating. Nevertheless, communities continue to need detailed information about the quantities of waste they generate, how much of this they can recover, and the costs this entails. Such data are useful not only to evaluate one's own performance and progress, but also as a way to compare oneself to others.

The Institute for Local Self-Reliance (ILSR) has been working to fill this information gap. Our reports *Beyond 25 Percent: Materials Recovery Comes of Age* (1989) and *Beyond 40 Percent: Record-Setting Recycling and Composting Programs* (1990) detail how 24 communities are recovering between 24 and 57 percent of their waste streams. We produced these reports for two reasons: (1) to share the experience of the pioneers with those just starting up programs, and (2) to encourage communities to refine our methodology and improve their own data gathering. This report, *In-Depth Studies of Recycling and Composting Programs: Designs, Costs, Results*, continues to meet these objectives, while expanding our data base of outstanding recycling programs.

The Institute prepared this report of 30 U.S. recycling and composting programs under a grant from the U.S. Environmental Protection Agency (U.S. EPA). Under Phase I of this project, the ILSR gathered data on source-separation recycling and composting programs of 30 communities. This included program characteristics, waste generation and recovery tonnages, materials recovery rates, and equipment and operating and maintenance costs.

During fall 1990, Institute staff surveyed hundreds of recycling coordinators and solid waste managers by telephone and mailed nearly 100 written questionnaires. Based on the responses we received, the ILSR and EPA staff selected 26 municipalities and 4 counties to document for this study. Seven of these localities had been included in *Beyond 40 Percent*.

Almost half of the communities in this compendium were chosen because of their high recovery levels (either in the residential, commercial, or construction and demolition debris sector). Other communities were selected on the basis of location, population density, or model program characteristics such as source reduction initiatives, food waste recovery, or salvage/reuse operations. To facilitate comparisons and discussion of the factors that have led to successful programs, we also included several communities whose recovery levels had remained low over a number of years . Communities selected for study represent a balance of program characteristics: public and private collection, segregated and

commingled set-out, sorting en route and sorting at an intermediate processing center, curbside and drop-off, bottle bill locales, mandatory and voluntary participation, volume-based and flat refuse rates.

The table on the following page lists the 30 communities documented in this report, their populations, and their residential, commercial/institutional, municipal solid waste, and total waste recovery levels. We gathered and documented data using a uniform methodology so as to facilitate comparison and make the information accessible. (See section on Data Definitions and Case Study Format.) This report presents detailed data in case study format in three volumes: *I: Rural Communities; II: Suburbs and Small Cities;* and *III: Urban Areas.*

Volume I: Rural Communities details the characteristics of eight rural recycling and composting programs, including one county program. It presents information for planning and evaluating rural programs such as descriptions of model drop-off centers, salvage/re-use operations, co-collection (collecting refuse and recyclables together), small-scale/low technology processing centers, food waste recovery programs, and collective marketing techniques.

Volume II: Suburbs and Small Cities documents 12 programs in suburbs and cities with populations under 100,000, including two county programs. It describes successful residential curbside recycling programs, comprehensive composting programs (including backyard composting), commercial and institutional recycling initiatives, and multi-unit collection programs.

Volume III: Urban Areas covers 10 urban locales, including one county program. It provides information for designing successful recycling and composting programs in high-density urban areas. These include residential curbside collection programs that target multi-unit and apartment buildings, commercial and institutional recycling and composting, food waste collection, construction and demolition debris recovery, and materials processing and marketing.

Under Phase II of this project, the ILSR is producing a report summarizing and analyzing the data gathered and documented under Phase I. This accompanying report will detail how communities can maximize recovery rates by integrating the best features of the best programs.

Selected Recycling and Composting Programs

Community	Population	Year Data Collected	Residential Recovery Rate	Commercial Recovery Rate	MSW Recovery Rate	Total Recovery Rate
Volume I: Rural Communities						
Bowdoinham, ME	2,189	FY90	NA	NA	54%	53%
Fennimore, WI	2,378	1990	51%	25%	38%	NA
La Crescent, MN	4,305	1990	41%	9%	29%	41%
Monroe, WI	10,220	1989	32%	27%	28%	50%
Peterborough, NH	5,239	1990	42%	4%	19%	18%
Sonoma County, CA	388,222	1990	15%	10%	11%	11%
Upper Township, NJ	10,861	1990	50% *	34% †	NA	43%
Wapakoneta, OH	9,214	9/89-8/90	NA	NA	20%	NA
Volume II: Suburbs/Small Cities						
Berlin Twnshp, NJ	5,620	1990	56%	61%	57%	NA
Boulder, CO	88,000	1990	33%	12%	22%	16%
Columbia, MO	69,101	FY90	11%	NA	NA	13%
Dakota County, MN	274,016	1990	29%	24%	28%	NA
King County, WA	991,060	1990	19%	36%	30%	NA
Lafayette, LA	90,000	FY90	13%	8%	11%	NA
Lincoln Park, NJ	10,978	1990	49%	70%	62%	NA
Naperville, IL	85,351	1990	32%	NA	NA	NA
Perkasie, PA	7,878	1990	52%	NA	NA	NA
Takoma Park, MD	16,900	1990	36%	NA	NA	NA
West Linn, OR	16,557	1990	NA	NA	50%	46%
West Palm Beach, FL	62,530	4/90-3/91	22%	0%	13%	12%
Volume III: Urban Areas						
Austin, TX	465,622	FY89	7%	NA	NA	15%
Berkeley, CA	102,724	FY91	NA	NA	22%	38%
Lincoln, NE	191,972	1990	3%	25%	12%	52% ‡
Mecklenburg Co., NC	511,433	1990	7%	22%	16%	NA
Newark, NJ	275,221	1989	10%*	46% †	NA	30%
Philadelphia, PA	1,633,826	FY90	6% *	16% †	12%	11%
Portland, OR	440,000	1990	NA	NA	33%	NA
Providence, RI	160,728	1990	10%	13%	11%	NA
San Francisco, CA	723,959	1990	37%	18%	26%	27%
Seattle, WA	516,259	1990	45%	40%	40%	NA

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

Notes: Total waste is the sum of municipal solid waste and construction and demolition (C&D) debris. Recovery rate include material recycled and composted. MSW Recovery Rate may take into account tonnages that cannot be broken down into commercial and residential, such as bottle bill tonnages or landscapers' waste. All recovery rates represent proportions by weight.

* Publicly collected waste.

† Privately collected waste.

‡ Based on 133,167 tons of C&D utilized as landfill cover. If this tonnage is excluded from waste recovered and disposed, recovery rate drops to 30%.

Case Study Format and Data Definitions

Each case study in this report is divided into several parts: Demographics, Solid Waste Generation and Recovery, Materials Recovery Overview, Recycling Activities, Composting Activities, Amount and Breakdown of Materials Recovered, Education and Publicity, Economics, and Future Solid Waste Management Plans. While tonnage and economic data are generally based on 1990, descriptions of program characteristics may reflect changes made since. This section's figures explain the data that we have gathered and documented, and how we define certain terms. The first part of this section defines terms used throughout these case studies. These definitions apply to this report only. The second part of this section explains what information is contained in each section of the case studies.

Data Definitions

Collection Capital Costs — costs of acquiring equipment used to collect recyclable or compostable materials.

Commercial/Institutional Waste Recovered, Disposed, and Generated — the annual tonnage of waste recovered, disposed, and generated by the commercial and institutional sectors (excluding medical wastes). The commercial sector includes theaters, retail establishments, hotels, and restaurants. The institutional sector includes hospitals and schools.

Composted Waste — discarded organic materials processed into a soil amendment, fertilizer, and/or mulch.

Composting — recovering discarded organic materials for processing into a soil amendment, fertilizer, and/or mulch.

Construction and Demolition (C&D) Debris Recovered, Disposed, and Generated — the annual tonnage of waste recovered, disposed, and generated as a result of construction and demolition activities. This waste may include concrete, asphalt, tree stumps and other wood wastes, metal, and bricks. (While C&D waste often burdens municipal solid waste collection and disposal systems, the U.S. EPA, the National Recycling Coalition, and this study exclude C&D debris from the definition of municipal solid waste.)

Deposit Containers Recycled — the annual tonnage of beverage containers recycled as a result of state or local bottle bills.

Disposed Waste — waste landfilled or incinerated.

Generated Waste — sum of waste recovered and waste disposed.

Intermediate Processing — preparing collected recyclable materials for end-use manufacturing. Processing typically includes sorting, contaminant removal, and crushing or baling.

Mandatory — whether citizens are required to source-separate materials for recycling. In several communities, citizens may be required to set out certain materials at curbside for recycling. In others it may simply be illegal to set these out with refuse. Not all materials collected are designated as mandatory.

Municipal Solid Waste (MSW) Recovered, Disposed, and Generated — sum of residential and commercial/institutional wastes recovered, disposed, and generated. In some cases, MSW also includes deposit containers recovered, yard waste composted from landscapers, and waste self-hauled to disposal and recovery facilities. MSW excludes construction and demolition debris.

Participation Rate (%) — the portion of households served that take part in the curbside collection program for recyclable materials. Refer to the case studies for an explanation of the specific method of calculation.

Private Sector Waste — waste collected by private haulers independent of the public sector.

Processing Capital Costs (Composting) — costs of acquiring equipment used to process—compost, chip, or mulch—organic materials. Processing or composting equipment typically includes shredders or chippers and front-end loaders.

Processing Capital Costs (Recycling) — costs of acquiring equipment used to process recyclable materials in preparation for marketing to end users. Processing typically includes sorting, contaminant removal, and crushing or baling.

Public Sector Waste — waste collected by public crews or by private haulers under public contract.

Recovered Waste — sum of waste recycled and waste composted.

Recycled Waste — discarded products and packaging materials recovered for reuse and/or processing into new products.

Recycling — recovering discarded products and packaging materials for reuse and/or processing into new products. In this report, recycling does not include composting.

Refuse — waste destined for disposal facilities (incinerators or landfills).

Residential Waste Recovered, Disposed, and Generated — the annual tonnage of waste recovered, disposed, and generated from single-family and multi-unit residences and their yards. The definition of residential waste generated differs for Perkasie, Lincoln Park, and Takoma Park. In Perkasie, the tonnage of waste generated excludes waste from condominiums and apartments with more than four units, which is collected by private haulers and is not tracked. Takoma Park is similar, but waste excluded is from buildings with more than 12 units. In Lincoln Park, the tonnage of waste generated from condominiums is excluded from residential waste, but a small amount of recyclables brought to the drop-off by businesses is included. In King County residential waste excludes any residential waste self-hauled to recycling, composting, or disposal facilities, since the tonnage of self-hauled waste includes commercial waste.

Self-hauled Waste — waste brought to recovery or disposal sites by residents or business/institutional establishments. This waste cannot be divided into residential and commercial/institutional.

Source Reduction — waste prevention; that is, avoiding waste generation.

Source Separation — segregation of recyclable materials or yard waste from mixed waste to facilitate recycling and composting of these materials.

Tipping Fees — the fees charged to haulers for delivering materials at recovery or disposal facilities.

Total Waste Recovered, Disposed, and Generated — the sum of MSW and C&D recovered, disposed, and generated.

Information in Case Studies

Demographics

The first page of each case study contains basic demographic information on the community: 1990 population, area, number of households, and number of businesses and institutions. Also included is a brief description of each community detailing, when information is available, its location; whether it is urban, rural, or suburban; per capita income; median household income; and major industries.

Solid Waste Generation and Recovery

This section provides tonnage data on waste recycled, waste composted, and waste generated; tipping fees at disposal facilities; and a description of how waste destined for disposal (refuse) is collected and disposed, and the costs of doing so.

Tonnage data, reported in table format, generally represent 1990 annual figures, unless noted otherwise, and are usually broken down into three sectors: residential, commercial/institutional, and construction and demolition (C&D) debris. In some cases, tonnage figures cannot be broken down by these sectors, and data are presented in a modified format.

In West Linn municipal solid waste is presented as a single sum because it cannot be broken down into residential and commercial.

In Columbia, Missouri C&D cannot be divided from commercial/institutional waste, and MSW figures cannot be reported separately.

In King County, San Francisco, Seattle, and Sonoma County, waste self-hauled to disposal or recovery facilities is listed separately from residential and commercial wastes, since this tonnage cannot be broken down by sector. In several case studies, deposit containers recovered as a result of bottle bills and landscapers' waste composted are listed separately, since these wastes cannot be divided into residential and commercial tonnages.

C&D tonnage figures are not tracked and thus not available in Berlin Township, Lafayette, Naperville, and Dakota County.

Footnotes accompanying tables clarify how numbers are calculated or estimated, where applicable, what numbers represent, and what, if any, waste may be excluded. Tonnage figures for waste recycled and composted are based on those reported in the Amount and Breakdown of Materials Recovered section.

Materials Recovery Overview

This section provides an overview of the community's recycling and composting activities, including history and development of programs, and state and local legislative requirements.

Recycling Activities

This section details curbside and drop-off collection programs for recyclable materials for both the residential and commercial/institutional sectors, and details how these materials are set out, processed, and marketed. Where applicable, information on salvage/reuse activities, construction and demolition debris recovery, market development, and recycled product procurement initiatives are also included.

Composting Activities

This section details curbside and drop-off collection programs for yard waste and other organic materials, and how these collected materials are composted, chipped, mulched, or otherwise processed into a soil amendment. Where applicable, information on backyard composting programs is also included.

Amount and Breakdown of Materials Recovered

This section lists, in table format, a tonnage breakdown of residential, commercial/institutional, and construction and demolition materials recycled and composted by type. The tables list subtotals for MSW recycled and composted, totals for MSW recovered and C&D debris recovered, and finally total materials recycled, composted, and recovered. Where available, several years' worth of data are provided.

Footnotes accompanying tables clarify, where applicable, how numbers are calculated or estimated, what numbers represent, and what, if any, waste may be excluded.

Source Reduction Activities

This section describes, where applicable, any initiatives undertaken to reduce the amount of waste generated. Generally, initiatives include volume-based refuse rates, "environmental shopping" programs, and backyard composting.

Publicity and Education

This section details what programs are in place to educate citizens and/or commercial/institutional establishments about recycling services—how and where to recycle—and to motivate them to do so.

Economics

This section primarily provides information on capital equipment and operating and maintenance costs. The **Costs Cover** subsection explains what costs are provided, who incurs these costs, and the programs and tonnages these costs cover. Materials revenues, source of funding, and the number of full- and part-time employees working on recycling and composting activities are also detailed.

Capital costs are generally listed in two tables: one lists equipment used for collection, and the other lists equipment used for processing. (Processing recyclables typically includes sorting, contaminant removal, and crushing or baling. Processing yard waste and other organic materials consists of composting, chipping, or mulching; equipment for this purpose typically includes shredders or chippers and front-end loaders.) Both these tables indicate the year equipment costs were incurred and the purpose for which equipment is used—whether recycling or composting. If equipment is used for several purposes, an estimated percentage of its time spent on recycling or composting is indicated; costs listed represent the total cost of this equipment. Footnotes accompanying tables clarify who owns equipment, whether equipment has been paid off, whether it was amortized, and/or whether it was owned prior to implementation of recovery programs.

Operating and maintenance (O&M) costs represent annual costs as provided by each community and are broken down into recycling costs and composting costs. These costs generally represent the costs incurred by the local government of the community documented, and do not always reflect all the costs spent for recycling and composting activities. Additional costs are often listed in table footnotes. In some of the county case studies, we cannot calculate per ton costs for recycling or composting because these counties incur costs only for certain aspects of the program, such as planning and education/publicity.

Communities were asked to provide total O&M costs for their recycling and composting operations, including collection, processing, administration and overhead, all labor, and education and publicity

costs. Where available, these breakdowns are provided. In many instances, curbside collection costs are separated from drop-off costs, so these two can be compared. The costs for curbside collection, drop-off collection, and processing often cover different tonnages. The tons covered by the costs are listed in the operating and maintenance cost table, and are used to calculate per ton O&M costs. Because costs for different activities cover different tonnages, the provided breakdowns of per ton costs cannot necessarily be added together. Footnotes accompanying O&M cost tables clarify who incurs costs, on what cost figures are based, what costs, if any, are excluded, and, where applicable, how costs are calculated.

Future Solid Waste Management Plans

This section describes solid waste management initiatives that each community plans to undertake in the future.

Contacts, References, and Endnotes

The names, titles, organizations, addresses, and phone/fax numbers are listed for those people who were the primary sources of information on the community's recycling and composting activities. Under References, we list any written materials that we used as general sources of information. Endnotes give sources of information or clarifications for a particular statement.

Berlin Township New Jersey

Demographics

Jurisdiction:	Township of Berlin
Population:	5,620 in 1990
Area:	3.5 square miles
Total Households:	1,800 (1,652 single-family homes, 48 duplexes, and 100 units in two large apartment complexes)
Total Businesses and Institutions:	280
Brief Description:	Berlin Township is a residential community in southern Camden County. Located directly across the Delaware River from Philadelphia, the Township is part of the Philadelphia metropolitan area. The 1987 per capita income was $11,420.

Solid Waste Generation and Recovery

	Annual Tonnages (1990)				
	Residential	**Commercial/ Institutional**	**Total MSW**	**Construction & Demolition**	**Total Waste**
Recovered	**3,392**	**1,124**	**4,516**	**738**	**5,254**
Recycled	1,053	1,124	2,177	100	2,277
Composted	2,339	0	2,339	638	2,977
Disposed*	**2,643**	**729**	**3,372**	**NA**	**NA**
Incinerated	0	0	0	NA	NA
Landfilled	2,643	729	3,372	NA	NA
Generated	**6,035**	**1,853**	**7,888**	**NA**	**NA**
	Percent by Weight Recovered				
Recovered†	**56%**	**61%**	**57%**	**NA**	**NA**
Recycled	17%	61%	28%	NA	NA
Composted	39%	0%	30%	NA	NA

Notes: Residential waste includes refuse collected from 20 small businesses in the Township's residential zone. Commercial waste includes recyclable materials and refuse collected by private haulers, and recyclables collected by the Township. Tonnages of construction and demolition debris (C&D) disposed are not available; thus, C&D and "total waste" recovery rates cannot be calculated. Of the C&D recovered, 428 tons were publicly collected.

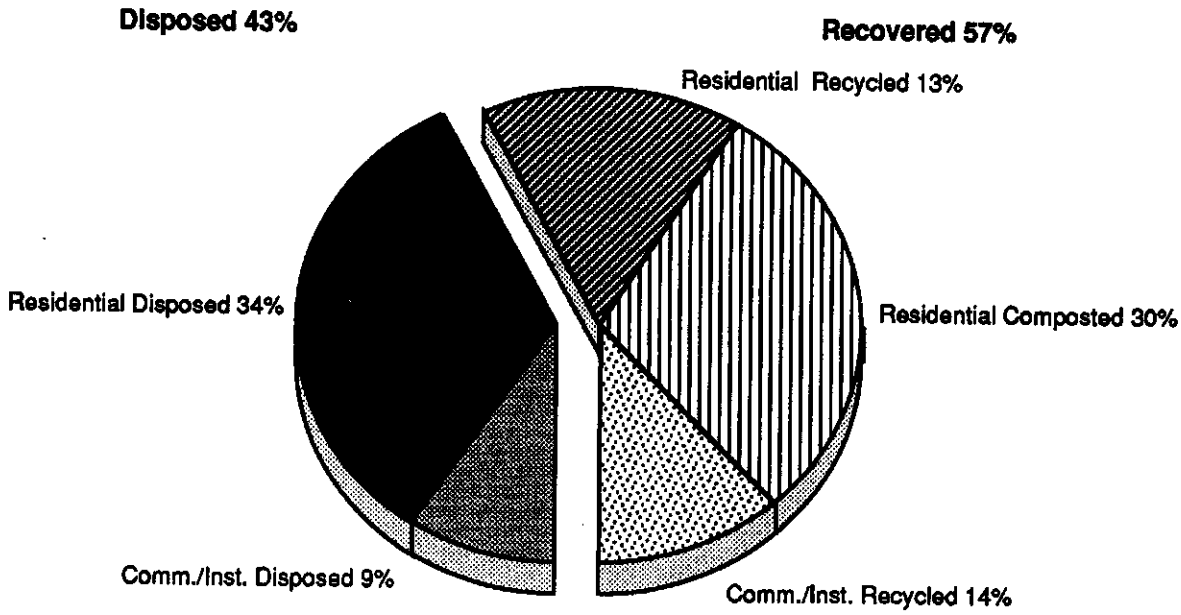
*Figures for waste handled by private haulers are not available. The tonnage of waste collected privately has been estimated by using a per capita waste generation figure of 0.6 tons per year to calculate total residential and commercial waste disposed. (This per capita figure for Berlin Township was developed by the consulting firm O'Brien-Kreitzberg & Associates, Inc., and based on actual waste samplings at the landfill.) The tonnage of publicly collected waste, which is known, is subtracted from this total, leaving privately collected commercial waste disposed. Privately collected waste generated is then calculated by adding the known 1990 tonnage of publicly and privately collected recyclables.

†Percent recycled and percent composted may not add up to percent recovered due to rounding.

Transfer Station/Landfill Tipping Fees: $42.11 in 1989 for the Winslow Landfill; January-August 1990, $65.00 at the Winslow Landfill, from August-December 1990, $65.00 at the Winslow Transfer Station; $68.75 in 1991 at the Camden County Incinerator

Refuse Collection and Disposal: In 1990 the Department of Public Works (DPW) collected refuse once a week from residents and about 20 small bars, restaurants, and other businesses located in residential areas. Beginning in 1991, Berlin contracted with Frank Kull, a private hauler, to collect refuse from the Township. According to local ordinance, the private hauler may collect refuse from businesses located in commercial zones, but must collect from businesses in residential zones if they request service from the DPW. The Township may not charge these businesses for collection. The remainder of the businesses contract with other private haulers. Before August 1990, refuse was taken to the Winslow Landfill. Commercial and industrial refuse was banned from the landfill in June 1988. The landfill had to close because it was full. Between August 1990 and July 1991, refuse was taken

Municipal Solid Waste Recovered and Disposed (Percent by Weight, 1990)



Note: Due to rounding, numbers may not add to 100%

Refuse Collection and Disposal (cont'd):

to the Winslow Transfer Station and shipped out of state. Residential and commercial refuse collected by Frank Kull, and commercial refuse hauled privately from Berlin Township, is now taken to the Camden County Incinerator, 10 miles away. The DPW spent $113,638 for the collection of 2,642 tons of refuse from the residential zone in 1990, and another $171,792 in tipping fees. The total cost for waste disposal, including tipping fees, was $108 per ton in 1990.

Materials Recovery Overview

Goals and Legislative Requirements:

In April of 1987, New Jersey passed a state law mandating that each municipality recycle 15 percent of the municipal solid waste stream in the first year of their recycling program and 25 percent thereafter. Recycling of a minimum of three materials is required. In 1991 the State revised its goal requiring a 60 percent recycling rate by 1995.

In 1981 Berlin Township adopted its "Garbage, Rubbish, and Refuse" ordinance, requiring residents to separate glass and mixed paper (including newspaper, junk mail, envelopes, and computer paper) for recycling. In November 1984, Camden County required that each municipality institute

Goals and Legislative Requirements (cont'd):

collection programs for the recycling of newspaper, aluminum cans, used oil, and scrap metal. The County Solid Waste Management (SWM) Plan mandates that all whole trees, tree trunks, tree stumps, leaves, and branches be disposed at facilities approved by the New Jersey Department of Environmental Protection, or mulched for use as a ground cover. As of February 1, 1986, amendments to the County SWM Plan require all county municipalities to include metal food and beverage containers in their curbside recycling programs. The Pinelands Commission, which governs the Pinelands in which Berlin Township is located, does not currently allow the composting of grass clippings in Berlin Township.

Berlin Township has been developing its recovery program for the past decade. In 1980 the Township began operating both a curbside program for glass and a drop-off center for glass and appliances in the public works yard. Town refuse haulers separated glass bottles from refuse at curbside, placing them in burlap bags attached to the trucks. The full bags were left along the road, and the Superintendent of the Public Works Department would pick them up the same day. In 1982, the first year that tonnages were recorded, the Township collected 237 tons of glass, which were sold to Recycling Enterprises.

In 1981, 6 years before recycling became mandatory throughout the State, Berlin Township adopted its "Garbage, Rubbish, and Refuse" ordinance, requiring residents to separate glass and mixed paper (including newspaper, junk mail, envelopes, and computer paper) for recycling. The curbside collection program, serving 1,600 households, became one of the first in the State to supply buckets to residents when a local glass manufacturer donated 3,000 5-gallon white buckets for storing glass. A local bank donated stickers for each of the buckets. The glass was color separated on the truck by the collection crew, and then unloaded into a Eager Beaver trailer at the public works yard prior to being sold.

In November 1984, Camden County adopted a new Solid Waste Management Plan, requiring (1) that each municipality institute collection programs for the recycling of newspaper, aluminum cans, used oil, and scrap metal; and (2) that all whole trees, tree trunks, tree stumps, leaves, and branches be disposed at facilities approved by the New Jersey Department of Environmental Protection, or mulched for use as a ground cover. The plan called for construction of an intermediate processing center (IPC) by the spring of 1986 to expand the recycling of materials and provide for a stable market for glass and non-aluminum cans. The Camden County Recycling Facility (CCRF), which began operation in April 1986, processes glass, all types of metal cans, and PET and HDPE containers.

In February 1988, Rutgers University provided the Township with 2,000 yellow 20-gallon buckets for a pilot study on plastics collection. The round buckets with molded handles, which are used to store plastic, glass, and aluminum and other metal cans, allow residents to store a greater volume of materials than the 5-gallon buckets. During 1986 and 1987, the Township collected an annual average of 181 tons of commingled glass, aluminum, and other metal containers. In 1988 the Township collected 27 tons of plastics, and the overall tonnage of commingled recyclables increased to 296 tons with the distribution of the larger buckets. The Township collected 300 tons of commingled containers in 1989, and 380 tons in 1990—an increase of 60 percent since 1986. According to Mike McGee, the Township's Recycling Coordinator, this increase was due to the new containers. The participation rate was 65 percent in the month before the containers were distributed. It jumped to 95 percent after the containers were passed out. In 1991 Berlin Township began collecting household batteries.

Berlin Township had tried several different storage containers before deciding to stay with the 20-gallon buckets donated by Rutgers University. In 1984 the Township received 100 blue rectangular recycling boxes for demonstration purposes. The boxes, which were distributed to residents, were popular for storage of record albums or tools, and disappeared quickly, according to Mike McGee. The collection crew has found that, overall, the 20-gallon buckets are sturdier than the square boxes or the old 5-gallon buckets and easier to empty. Residents find the 5-gallon buckets convenient for short-term storage of recyclable materials before they are dumped into the 20-gallon container left outside, or for

storage of extra materials that do not fit in the 20-gallon containers. Participation rates also increased as a result of the new containers.

The Township still runs the drop-off center at its public works yard, which is open 24 hours a day, 7 days a week. (Previously the center was open only Monday through Friday from 6:00 a.m. until 2:30 p.m.) Because the center is not staffed, residents are required to separate all materials into the proper bins themselves. Glass, plastic, aluminum, and ferrous cans are stored in an Eager Beaver trailer on the site. Waste paper (including newspaper, paperboard, high-grade paper, and corrugated cardboard) is stockpiled in one corner of the yard. Oil delivered in sealed containers can be left at the center, as can car batteries and tires. Scrap metal and aluminum are stored in 55-gallon drums and bins made from tires, both of which have been recovered from the waste stream. Resident Mike McGee was honored as *Camden County's Recycler of the Year*. In the same year, the program was recognized as one of the best recycling programs in the State at the New Jersey State Recycling Awards Presentation, and the Coordinator was honored as one of the two top recyclers in the State. In November 1989, Berlin won the *Best Curbside Recycling Program* award from the National Recycling Congress. In February 1990, the Township won the *Highest Recovery Rate* and the *Best Overall Program in a Suburban Community* awards in the *Record Setting Recycling Contest 1989*, sponsored by the Institute for Local Self-Reliance. And in April 1990, Berlin won the *Source Reduction and Recycling Award* in Renew America's *Searching for Success Contest*.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	September 1980 (mandatory as of June 1981)
Service Provider:	Department of Public Works
Pick-up Frequency:	Weekly
Same Day as Refuse:	Yes
Households Served:	1,700 (1,652 single-family homes and 48 duplexes)
Mandatory:	Yes (all materials with the exception of white goods)
Participation Rate:	97 percent of the households served (based on a monthly set-out rate)
Materials Collected:	Glass and newspaper collection began in 1980. In 1982 aluminum cans were added, and in 1985 ferrous cans were added to the list of commingled materials. Car batteries, scrap metal, corrugated cardboard, and paperboard (including cereal boxes but not milk cartons) were also cited for collection in 1985. Pick-up of clean lumber began in June 1988. Plastic PET soda bottles were first collected in 1984 for 2 months, but this program was discontinued. An expanded program collecting PET and HDPE plastic beverage and other containers (including detergent and shampoo bottles, but not oil, window-washing, or antifreeze bottles) began in February 1988. Residents may also place tires, white goods, and motor oil at the curbside for collection. In 1990 Berlin began to pick up household batteries.

Set-out Method: Glass, aluminum, plastic, and ferrous food and beverage containers are stored commingled in a 20-gallon plastic container supplied by the Township. Corrugated cardboard and paperboard must be crushed and bundled. Newspaper and other paper can be mixed, but must be bundled separately from the cardboard. Tires, white goods, and car batteries are placed loose at the curbside. Used motor oil must be contained and clearly identified. All types of household batteries are to be placed in a plastic bag and hung on the side of the 20-gallon container. Recyclable materials must be placed 5 feet away from refuse.

Collection Method and Vehicles: An Eager Beaver compartmentalized truck with the compartments removed is used to collect commingled recyclable materials. The Township collects crushed cardboard in a 10-ton dump truck along with paperboard. Afterwards, the same truck collects scrap metal. A dump truck is used to collect newspaper and mixed paper. A 1/2-ton pick-up truck is used to collect white goods and then tires, batteries, and motor oil. Finally, a truck is sent through the streets with one worker after other trucks have gone through to clean up streets and collect any materials that may have been left behind. A total of 8 workers collect refuse, recyclables, and yard waste in Berlin Township.

Economic Incentives: First-time offenders are fined $25, second-time offenders are fined $50; each subsequent violation carries a fine of $100.

Enforcement: Residents and businesses that do not separate recyclable materials run the risk of not having their refuse collected. The Township reserves the right to further enforce source separation of mandated materials with a series of fines. No fines have been given out but several warnings have been issued. A Public Works staff member makes periodic inspections.

Annual Tonnage: Although actual tonnage is not available, Mike McGee estimates that about 90 percent (1,135 tons) of recyclables collected by the Township are picked up at curbside. Of this, an estimated 208 tons were collected from the commercial sector leaving 927 tons collected from the residential sector.

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements: Businesses must choose one material for separation from a list of materials including glass, aluminum and tin cans, newspaper, corrugated cardboard, scrap metal, and plastic HDPE and PET containers. Businesses that do not take advantage of the Township's recycling service are required by State law to contract out with private haulers and submit an annual recycled tonnage report to the municipality's recycling coordinator by June 1 of the following fiscal year. Berlin Township reviews businesses' recycling plans prior to issuing or renewing the mercantile license necessary for all commercial establishments in the Township. In 1990 the Township officially made this issuing and renewal process contingent upon submission of a recycling plan.

The State and Town ordinances are explained to businesses when they request collection of recyclables by the Township.

	Public Collection	Private Collection
Service Provider:	Department of Public Works	Private haulers
Number Served:	200 businesses	80 businesses
Type Served:	Bars, restaurants, schools, offices, gas stations, and grocery stores	Bars, restaurants, and offices
Materials Collected:	Aluminum and tin cans, glass, corrugated cardboard, HDPE and PET plastic, newspaper, scrap metal	Primarily corrugated cardboard, high-grade paper, and mixed paper
Pick-up Frequency:	Weekly	Weekly
Set-out and Collection Method:	55-gallon drums and 20-gallon containers for setting out glass; 20-gallon drums for setting out aluminum and tin cans, and HDPE and PET plastic	Some businesses have their own compactors to bale cardboard. Others bundle it and put it on their loading docks.
Incentives:	Mercantile license and free service	Mercantile license
Annual Tonnage:	An estimated 208 tons in 1990	916 tons reported in 1990

Berlin Township provides collection of recyclable materials for 200 of its 280 businesses. In 1989 there were two different collection days for businesses. Small businesses located in residential neighborhoods were serviced on the same day as residential households, and a special Friday pick-up was provided for bars and restaurants. This collection service is offered to businesses at no charge, creating an incentive for businesses to recycle. This service has been provided since 1981, when the Town adopted its "Garbage, Rubbish, and Refuse" ordinance. In January 1990, the Township began Friday collection from all of the businesses it services.

Bars and restaurants are provided with 55-gallon drums for storage of glass. Other businesses may request a 20-gallon container for the storage of glass, aluminum and tin cans, and plastic HDPE and PET containers. The Township will also collect newspaper, corrugated cardboard, and scrap metal from businesses. In addition, businesses have the option of bringing their recyclable materials to the drop-off site at the public works yard. The Township provides commercial establishments with a list of local vendors for materials that are not collected by Berlin Township.

Drop-off Centers

Number and Type:	One 24-hour drop-off center opened in 1980
Public or Private:	Public
Sectors Served:	Residential and commercial and institutional sectors
Materials Accepted:	Glass, plastic, aluminum and ferrous cans, newspaper, paperboard, corrugated cardboard, high-grade paper, scrap metal, and oil
Annual Tonnage:	126 tons (estimated as 10 percent of the publicly collected tonnage recycled)

Processing and Marketing of Recyclables

The Camden County Recycling Facility (CCRF), located 10 miles from Berlin Township, has processed the Township's commingled recyclables since the facility became operational in April 1986. The 80-ton-per-day facility processes mixed aluminum, glass, and ferrous beverage and food containers, as well as HDPE and PET containers from some towns, including Berlin Township. In 1989, 16,858 tons of materials were processed; in 1990 this increased to 17,881 tons (71.5 tons per day).

Camden County established this regional processing facility in order to enable its 37 municipalities to comply with the countywide mandatory recycling ordinance. Resource Recovery Systems, Inc., of Groton, Connecticut designed and built the CCRF for $753,172 (adjusted for 1989). Costs were covered by a $200,000 grant from the New Jersey Office of Recycling, $90,000 allocated from the County general funds, and a bond issue of about $400,000. While the County owns the facility, it is managed and operated by Resource Recovery Systems, Inc. It operates 5 days a week, 250 days a year. Twenty people are employed at the facility working 8 hours a day. According to Mike McGee, the IPC will start paying Berlin Township for its recyclable materials if its tonnage exceeds a set amount. This amount is determined by a profit/loss formula. The County pays to operate the facility and whatever is left over after the sale of the material is split up among the towns according to how much each town has brought to the facility in that year. Berlin Township received $674 from the facility in 1989, but nothing in 1990. The Township delivered 380 tons of commingled aluminum and tin cans, PET and HDPE plastic containers, and green, brown, and clear glass to the Camden County Recycling Facility for processing in 1990. Private and municipal haulers are not charged for tipping at the processing plant.

Materials brought to the Camden County Recycling Facility are placed on conveyor belts. Magnets separate the steel and bimetal cans while automatic air blowers remove aluminum cans. Workers remove the glass from a conveyor and throw it into glass-crushing machines. Aluminum cans are flattened and blown into a trailer. Steel cans and clear, green, and brown glass are crushed and then conveyed into separate bins. Plastic, bottle caps, and labels are removed before the cans and glass are crushed. The plastic bottles are sorted by type (HDPE and PET) and then baled. Local glass manufacturers buy the furnace-ready glass. Reynolds Aluminum purchases the aluminum cans. AMG Resources Corporation in Baltimore and Pittsburgh purchases the steel cans. In 1990, 2,793 tons of material were rejected as nonrecyclable from the facility, representing 15.6 percent of the average 17,881 tons processed. Approximately 78 percent of this residue represents glass. The New Jersey Department of Transportation recently issued specs for using glass aggregate in road construction. As a result, the County expects to begin marketing its glass residue as glass aggregate to a firm in Pennsauken.

Newspaper and mixed paper are brought to Ponte & Sons in Camden. Ponte & Sons charges Berlin $10 per ton to recycle these items. Berlin delivers its corrugated cardboard straight from the pick-up route to Ponte & Sons with no money changing hands. Safety Kleen, located in Pennsylvania, charged the Township 50 cents per gallon of oil in 1988, 10 cents per gallon in 1989, and nothing in 1990. Wade Salvage of Atco, New Jersey collects scrap metal and car and household batteries. Berlin receives 25 cents for 100 lbs. of scrap metal and $1.00 for each car battery. Residents of Berlin remove the doors from white goods. Public Works employees separate heavy scrap metals from aluminum and separate the tires, motor oil, and batteries from each other. Their labor cost the Township $9,360 in 1989 and approximately $1,500 in 1990. (This labor cost is just for loading recyclables and shipment to markets. Loading time dramatically decreased between 1989 and 1990 as a result of avoiding double handling.) Tires are sent to tire recycling facilities where they are shredded.

Composting/Mulching Activities

Berlin Township has implemented a comprehensive yard trimmings collection program partly in response to State legislation. The New Jersey Statewide Mandatory Source Separation and Recycling Act prohibits landfilling of leaves. The Pinelands Commission, a State-run board with jurisdiction over a protected area that encompasses part of Berlin Township, banned the landfilling of grass clippings, and has not yet provided Berlin Townhsip authorization to compost grass clippings in the Township. Accordingly, Berlin Township collects grass clippings, mixes these with garden trimmings, and hauls them to HGA Associates' mulching facility in Winslow, where they are mixed with brush and then ground. The tipping fee at the facility is $7 per cubic yard. Mike McGee estimates that fewer than 1 percent of the residents in Berlin Township compost in their backyards even though they are encouraged to do so. The total tonnage of brush and leaves collected for composting through curbside and drop-off programs has increased 1,077 tons from 1989 to 1990. Mike McGee claims that this increase is due to the fact that fewer people are going on vacation, and more time is spent raking and tending to their yards. Berlin Township's high composting rate can be attributed to its spacious yards, mature deciduous trees, and frequent collection of a wide range of organic materials.

Curbside Collection

Start-up Date:	1976
Service Provider:	Department of Public Works
Households Served:	All
Mandatory:	Yes
Materials Collected:	Collection of leaves began in 1976, of brush in 1977, and of grass clippings in 1990. Stumps, tree trunks, clean lumber, and Christmas trees are also collected.
Set-out Method:	Leaves are collected loose in April, November, and December. Workers will pick up the leaves only if they are raked to the curb and separated from other yard waste. Prior to 1989, loose leaves were collected once a month. Collection now averages twice a month. According to Mike McGee, frequency of collection depends on the amount of leaves that accumulate at the curbside, the weather conditions, and the amount of debris mixed in the leaf piles. The Department of Public Works collects bagged leaves and other yard waste separately throughout the rest of the year in the course of refuse collection.
Collection Vehicles & Method:	The Township has two trucks on the road every day during the loose leaf collection months. One packer truck with two workers or a dump truck with a vacuum with three workers is used to collect leaves. Although the Township purchased two vacuums for leaf collection in 1985, it has since designed its own scoop, which is faster than the vacuums. The scoop, really a 2-cubic-yard container with the end cut out, is attached to the trash truck, and leaves are scooped into it with a front-end loader. The Recycling Coordinator claims that this design enables the crew to complete in one day a route that would take a day and a half with the vacuum. Grass clippings and other yard waste are set out in trash cans or bags and then collected in one of two 1-ton dump trucks with one worker. Four dump trucks collect brush. One person operates each of these trucks.

Collection Frequency:	Weekly, year-round. Additional collection of leaves during months of heavy leaf generation.
Economic Incentives:	None
Tonnage:	Most of the 2,339 tons of yard waste composted in 1990 were collected at curbside.

Composting Site

In 1989 Berlin's DPW cleared a 2-acre composting site in the public works yard, which cost the Township $15,000. In 1990 the Township expanded the composting site from 2 1/2 to 4 acres at a cost of $800, turning it into a regional facility owned and operated by Berlin. The Township incurs all the operation and maintenance costs. The work performed at the facility is absorbed by the Berlin Township's Public Works Department. One part-time employee works at the site. Six surrounding towns bring their yard waste to this site to be composted free of charge. Landscapers can also bring their yard waste to this site.

Yard waste is placed in large windrows. A SCAT Windrow Composter, purchased for Berlin Township by Camden County from state taxes in 1990, is used to turn the windrows once per month, for 12 hours each time. (Berlin Township is installing a water supply line and hydrant so that windrows can be watered.) A final product is produced in 6 months, and the finished compost is given away free; whatever is not taken, is given to farmers living in various parts of New Jersey. No material is rejected as noncompostable, and the facility has had no problems with odor.

Berlin Township residents may bring their yard waste to the public works yard. The Township asks that leaves brought to the public works yard not be put into plastic bags. An estimated 2,339 tons of yard waste were recovered through collection and drop-off in 1990. The total amount of yard waste composted at the facility is not tracked or known. Brush, tree stumps, and clean lumber are chipped on a small area of the DPW yard with a Chipmore chipper, purchased in 1987.

Amount and Breakdown of Materials Recovered

Material	Total (Tons, 1985)	Total (Tons, 1986)	Total (Tons, 1987)	Total (Tons, 1988)
Newspaper	240	345	489	258
Corrugated	89	106	128	184
Other Paper	–	–	–	1,466
Glass	199	237	*	*
Commingled	–	–	200	296
Aluminum	–	9	*	*
Ferrous Scrap	136	155	185	123
Ferrous Cans	–	4	*	*
Non-ferrous Scrap	–	25	–	–
Motor Oil	3	3	13	9
Appliances	–	–	–	22
Batteries	–	–	–	5
Subtotal Recycled	**667**	**884**	**1,015**	**2,363**
Yard Waste†	789	612	711	686
Clean Lumber		273	314	665
Subtotal Composted	**789**	**885**	**1,025**	**1,351**
Total Recovered	**1,456**	**1,769**	**2,040**	**3,714**

*Included with commingled
†Includes leaves and brush

Material	Public Collection (Tons, 1989)	Private Collection (Tons, 1989)	Total (Tons, 1989)
Newspaper	*	21.3	21.3
Corrugated	166	30.6	196.6
Other Paper†	300	1,466.2†	1,766.2
Commingled	300	36.3	336.3
Aluminum	2	–	2
Ferrous Scrap	100	13.9	113.9
Motor Oil	5.3	–	5.3
Tires	3	–	3
Appliances	52	–	52
Batteries	3.7	1	4.7
Subtotal Recycled	**932**	**1,569.3**	**2,501.3**
Leaves	683.9	0	683.9
Brush	493.1	0	493.1
Clean Lumber	658.4	65.1	723.5
Subtotal Composted	**1,835.4**	**65.1**	**1,900.5**
Total Recovered	**2,767.4**	**1,634.4**	**4,401.8**

*Included with other paper
†1988 tons reported by private haulers

Material	Residential (Tons, 1990)	Commercial (Tons, 1990)	Other (Tons, 1990)	Total (Tons, 1990)
Mixed Paper*	311.25	397.73	-	708.98
Corrugated Cardboard	137.85	650.77	-	788.62
Glass†	239.56	37.96	-	277.52
PET and HDPE Plastic†	16.41	2.6	-	19.01
Aluminum Cans†	16.41	2.6	-	19.01
Ferrous Cans†	55.79	8.84	-	64.63
Ferrous Scrap	218.27	0	-	218.27
Other Metal	4.75	0	-	4.75
Tires	38.90	0	-	38.90
Motor Oil	8.75	23.84	-	32.59
Auto Batteries	4.96	0	-	4.96
Subtotal MSW Recycled	**1,052.90**	**1,124.34**	-	**2,177.24**
Leaves†	1,377.80	-	-	1,377.80
Brush and Christmas Trees‡	939.47	-	-	939.47
Grass Clippings§	22.22	-	-	22.22
Subtotal MSW Composted	**2,339.49**	-	-	**2,339.49**
Total MSW Recovered	**3,392.39**	**1,124.34**	-	**4,516.73**
Concrete	-	-	100	100.00
Stumps and Logs	-	-	295.06	295.06
Wood Waste‡	-	-	342.54	342.54
Total C&D Recycled	-	-	**100**	**100.00**
Total C&D Composted	-	-	**637.60**	**637.60**
Total C&D Recovered	-	-	**737.60**	**737.60**
Total Materials Recycled	**1,052.90**	**1,124.34**	**100**	**2,277.24**
Total Materials Composted	**2,339.49**	**0**	**637.60**	**2,977.09**
Total Materials Recovered	**3,392.39**	**1,124.34**	**737.60**	**5,254.33**

Note: Commercial tonnages include material recycled through public and private sector operations. The Township estimates that it collected 208 tons of recyclable materials from businesses. The tonnages reported recovered in 1990 were verified by Camden County and the State of New Jersey.

*Includes newspaper

† Berlin does not track the breakdown of publicly collected commingled recyclables. It divided tonnages of commingled material into the catagories of glass, plastic, aluminum and ferrous containers using County estimates.

†The tonnage of leaves composted is based on a 1990 New Jersey Department of Environmental Protection conversion factor of 2 cubic yards per ton for compacted leaves and 2.86 cubic yards per ton for vacuumed leaves.

‡Berlin estimates the tonnage of wood waste and brush by using conversion factors of 5.5 cubic yards/ton for wood waste and 8.0 cubic yards/ton for brush.

§The tonnage of grass clippings mulched is based on a conversion factor of 2.7 cubic yards per uncompacted ton.

Publicity and Education

The Township publishes a quarterly newsletter for its residents. This newsletter serves as a community calendar, informing readers of important dates and events. It also contains information about the recycling and composting programs. For instance, the newsletter tells citizens how to prepare materials for collection, and publishes the Township's recovery rates. The quarterly is circulated by the Department of Public Works at no extra cost to the recycling program.

DPW prints an annual recycling calendar specifying the collection days for the Township's three routes, and distributes it to all residents who receive curbside collection. The 1989 calendar cost the Department $300. The DPW also spends about $200 a year on occasional fliers and mailings for the recycling and composting programs.

Berlin Township schools incorporate the New Jersey State Recycling Curriculum. In addition, the fifth and sixth grade classes produced a short film on recycling in 1989.

Economics

Costs Cover: Operating and maintenance costs given below cover (1) curbside collection and processing of 1,135 tons of residential and commercial recyclables, (2) curbside collection and processing of 428 tons of C&D debris, (3) collection and processing of 126 tons of recyclables delivered to the drop-off site, (4) curbside collection and local composting of 2,317 tons of yard waste, and (5) curbside collection and mulching of 22 tons of grass clippings (mulched at site outside of Berlin Township).

Capital costs given below cover the DPW's curbside recycling and yard waste collection programs, its drop-off site, and its composting site.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
Eager Beaver Trailer	$12,000	Recycling	1981
2 Leaf Loaders @ $4,500	9,000	Composting	1982
Loader @ 5% recycling use and 95% DPW use	14,000	Recycling/DPW	1985
1-ton Dump Truck @ 20% recycling use and 80% composting use	6,000	Recycling/ Composting	1986
Ford 555 Backhoe Loader @ 35% recycling use, 15% composting use, and 50% DPW use	30,000	Recycling/ Composting/DPW	1986
Dump Truck @ 35% recycling use, 15% composting use, and 50% DPW use	10,000	Recycling/ Composting/DPW	1987

Capital Costs: Collection (cont'd)

Item	Cost	Use	Year Incurred
Ford F800 Dump Truck @ 35% recycling use, 15% composting use, and 50% DPW use	$44,000	Recycling/ Composting/DPW	1988
3/4-ton Dump Truck @ 50% recycling use and 50% DPW use	6,000	Recycling/DPW	1988
Stake Body Dump Truck @ 50% recycling use and 50% DPW use	8,400	Recycling/DPW	1989
Eager Beaver Truck	35,000	Recycling	1989

Note: All equipment has been paid off.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
Chipmore Chipper	$12,000	Composting	1987
SCAT Windrow Turner*	65,000	Composting	1990

Note: All equipment has been paid off.
*Purchased by the County.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$90,184**	**1,689**	**$53**
Collection	$72,684	1,689	$43
Curbside Collection	65,916	1,563	42
Drop-Off Collection	6,768	126	54
Processing	17,500	1,689	10
Administration*	NA	1,689	NA
Education/Publicity*	NA	1,689	NA
Composting Subtotal	**$21,020**	**2,339**	**$9**
Collection	$16,216	2,339	$7
Processing	4,804	2,339	2
Administration*	NA	2,339	NA
Education/Publicity*	NA	2,339	NA
Recycling & Composting Total	**$114,704**	**4,028**	**$28**
Collection	$88,900	4,028	$22
Processing	22,304	4,028	6
Administration	3,000	4,028	1
Education/Publicity	500	4,028	†

Note: Berlin Township attributes the low per ton cost of its materials recovery programs to the large quantity of material recovered per household, its small land area (3.5 square miles), and the shifting of crews between different public works activities.
*Administration and education/publicity costs cannot be broken into the amount spent for recycling and the amount spent for composting.
† Less than $1.

Materials Revenues: $8,123 in 1990; $5,159 in 1989; $7,818 in 1988

Source of Funding: Residents' general taxes pay for recycling and composting activities. In 1990 Berlin Township received a $14,607.87 State Tonnage Grant from the Office of Recycling, New Jersey Department of Environmental Protection. In 1990 the County gave Berlin Township $800 to expand the composting site from 2 1/2 to 4 acres.

Full-time Employees: 5 in 1990

Part-time Employees: 2 in 1990 (the Recycling Coordinator and Supervisor)

Future Solid Waste Management Plans

Berlin Township is continually looking for ways to improve its materials recovery programs. For example, in order to increase collection efficiency, newspaper, corrugated cardboard, and mixed paper are currently collected in one vehicle instead of two. The Township is hoping to get approval from the Pinelands Commission to compost brush and grass clippings at its own compost site, and thus avoid payment of the $7 per cubic yard tipping fee at the Winslow facility. It is currently testing tub grinders.

Contact

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Phone (609) 767-5052
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References

Governmental Advisory Associates, Inc. *Materials Recovery and Recycling Yearbook for 1990-91.* New York City, 1990.

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Boulder, Colorado

Demographics

Jurisdiction:	City of Boulder
Population:	88,000 in 1990
Area:	23 square miles
Total Households:	Approximately 35,000 (22,500 single-family residences and 12,500 households in multi-unit buildings)
Total Businesses and Institutions:	6,000 businesses and institutions (estimate)
Brief Description:	The City of Boulder, located in the Rocky Mountain region, is home to the University of Colorado and major industries, including computer and high tech, aerospace, and health care firms. Median annual per capita income is $21,740.

Solid Waste Generation and Recovery

Annual Tonnages (1990)

	Residential	Commercial/ Institutional	Total MSW	Construction & Demolition	Total Waste
Recovered	**9,565**	**4,162**	**13,727**	**342**	**14,069**
Recycled	7,265	4,137	11,402	342	11,744
Composted	2,300	25	2,325	0	2,325
Disposed*	**19,639**	**29,443**	**49,082**	**26,424**	**75,506**
Incinerated	10	0	10	0	10
Landfilled	19,629	29,443	49,072	26,424	75,496
Generated	**29,204**	**33,605**	**62,809**	**26,766**	**89,575**

Percent by Weight Recovered

Recovered	**33%**	**12%**	**22%**	**1%**	**16%**
Recycled	25%	12%	18%	1%	13%
Composted	8%	†	4%	0%	3%

Note: Some tonnage collected at supermarkets for recycling is not tracked and therefore is not included in tonnage recovered and generated.

*Boulder does not track actual tonnages of waste disposed. Based on City recycling tax receipts, Western Disposal handles 80% of MSW disposed in the City. Western estimates that it disposes 80% of the C&D debris in Boulder. In 1990 Western Disposal disposed 60,396 tons of Boulder's waste through its transfer station (15,703 tons of residential waste, 23,554 tons of commercial waste, and 21,139 tons of construction and demolition debris).

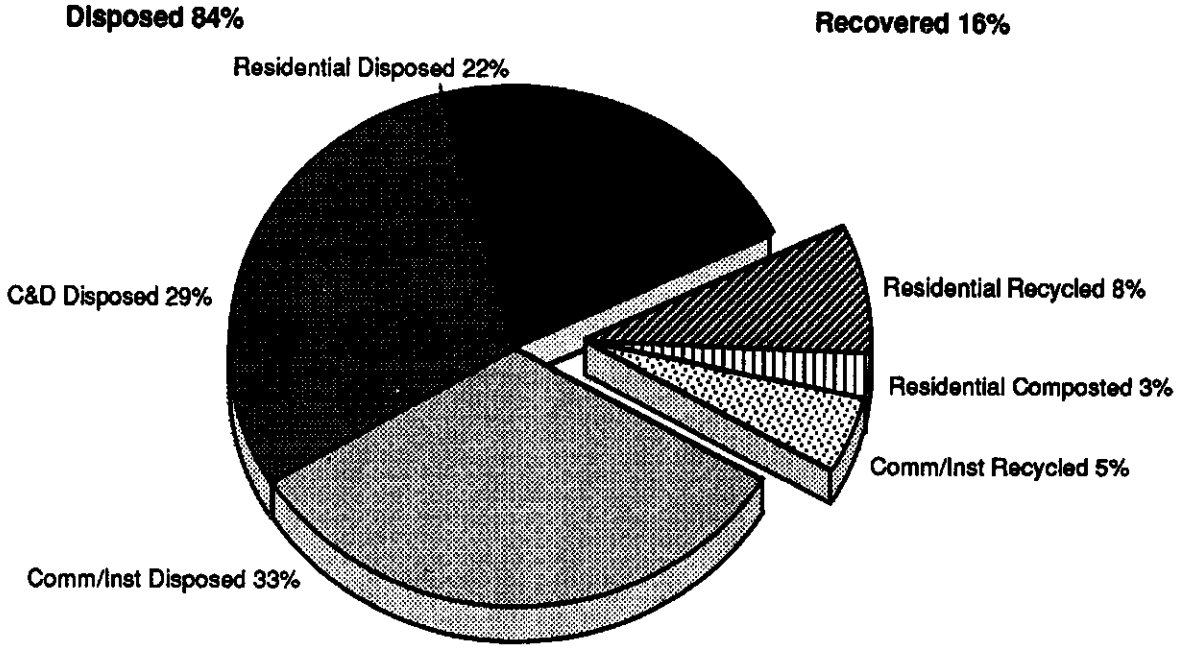
†Less than 1%.

Landfill Tipping Fee: In 1989 tipping fees (based on cubic yard fees) ranged from $8 to $12 per ton. In 1990 fees ranged between $10 and $12 per ton.

Refuse Collection and Disposal: Four private waste haulers—Western Disposal, Sunshine, BFI, and Gerbitz—service both the commercial and the residential sectors. Western Disposal, Gerbitz, and BFI also handle construction and demolition debris. Waste is brought to Erie Landfill in Weld County or to Marshall Landfill, Boulder County's only landfill, which is due to close in December 1991. When this occurs, trash will be disposed either at the Erie Landfill or the Jefferson County landfill. In 1991, Western Disposal bought out Sunshine.

In January 1991, Boulder instituted a volume-based recycling tax on residential and commercial refuse. All city refuse haulers must charge residents an additional 40¢ per month for one can, 75¢ for two cans, and $1.10 for unlimited service. Commercial establishments are charged an additional 20¢ per cubic yard. All tax revenues collected are returned to the City's general funds.

Total Waste Recovered and Disposed (Percent by Weight, 1990)



Materials Recovery Overview

Goals and Legislative Requirements: None

In 1976 Eco-Cycle, a nonprofit organization with a strong core of volunteers, initiated recycling in Boulder. Using renovated school buses, workers collected recyclables from single-family households on the first Saturday of each month. Eco-Cycle also established a recycling drop-off center within the City. In 1984 the group implemented an office paper recycling program in County offices; in 1988 it assumed coordination of the District-wide school recycling program. Eco-Cycle encourages participation in these programs through a block leader program, which was developed in response to proposed cuts in Eco-Cycle's funding in 1979. At that time, block leaders organized their neighbors into a "Save Eco-Cycle" rally against the cuts. Block leaders currently educate their neighbors on recycling and distribute information on Eco-Cycle's programs.

In 1987 the City Council decided to establish weekly curbside collection of recyclables, which would replace Eco-Cycle's curbside collection program. Boulder signed a 5-year contract in 1988 with Western Disposal, a local waste hauler, and with Eco-Cycle. Under the terms of the contract, Western Disposal collects newspaper, glass, aluminum, and ferrous cans, and delivers them to Eco-Cycle. Eco-Cycle processes the materials and conducts educational and promotional programs. Revenues from materials sales are split between Western Disposal and Eco-Cycle. In 1988 Boulder allotted $140,000

from the City's general funds for the recycling program. The following year, program funding increased to $270,000 to cover market price declines for recyclables and the costs of expanding programs for apartment building recycling and resident education. A recycling tax enacted by the City in early 1991 provides continued funding for recycling programs and for expansion of commercial recycling, yard waste, and waste minimization programs.

The volume of yard waste generated in the sparse foothills of the Rocky Mountains is limited. Nevertheless, the City of Boulder has implemented a few composting projects. Brush is collected and chipped during the City's annual Spring Clean-up; the mulch is available free of charge to city residents. Boulder is testing a variety of yard waste composting programs with funding from a U.S. EPA grant.

Boulder's programs have won several awards. In 1990 the City's Precycle program won the "Boulder County Energy Conservation Award"; in 1991 The National Recycling Coalition (NRC) awarded Eco-Cycle the "Tim McClure Outstanding Environmental and Community Leadership Award;" and Colorado Recycles awarded the nonprofit the "Best Recycling Education Award in Colorado."

Recycling Activities

Residential Curbside Recycling

Start-up Date:	October 1988 for municipal program (nonprofit program began in 1976)
Service Provider:	Western Disposal under contract with the City
Pick-up Frequency:	Weekly
Same Day as Refuse:	Yes, for Western Disposal refuse customers. Refuse collection day varies for other private haulers and may not coincide with pick-up of recyclables.
Households Served:	22,500 single-family homes, 3,000 households in multi-unit buildings. As of 1991, approximately 75 apartment buildings with more than 8 units each, the largest with 336 units, were being served.
Mandatory:	No
Participation Rate:	60 percent in 1990 (The City calculates participation based on the total count of set-outs per month divided by 2.2, the national average of set-outs per household per month.)[1]
Materials Collected:	Newspaper, glass, aluminum cans, and ferrous cans.
Set-out Method:	Boulder provides each household with a 14-gallon stackable recycling bin; additional bins can be purchased for $3.50 each. Residents are required to separate recyclables into three segregations: newspaper, glass, and commingled aluminum and ferrous cans. Apartment buildings of eight units or more are serviced with newspaper dumpsters and 32-gallon polycarts for glass and cans.
Collection Method and Vehicles:	Western Disposal uses redesigned packer trucks to collect recyclables. A two-person crew loads newspapers into the rear compartment and commingled glass and cans into the two side compartments.
Economic Incentives:	In 1991 Boulder instituted a volume-based tax on waste disposed.

Enforcement: From September 1990 through June 1991, Boulder employed a part-time staff member for a curbside "feedback" program to target an increasing number of residents who were not properly sorting materials at curbside. Before materials were collected by Western Disposal, this individual randomly inspected materials set out for recycling. Residents who set out materials incorrectly received an orange tag with a description of the problem. Their recyclables were not picked up. Western Disposal is now responsible for this feedback program.

In 1991 Eco-Cycle implemented a feedback program in apartment buildings to help minimize contamination problems. If the group received contaminated loads from apartment buildings, it informed Western Disposal, and the City sent a written warning to building managers.

Annual Tonnage: 4,641 in 1990

Western Disposal collects recyclables throughout Boulder County. Outside the City, the hauler co-collects (i.e., collects together) recyclables and refuse. In some areas, residents place recyclables in color-coded bags (glass in one bag, cans and newspaper in another), and disposal crews place the bags, along with refuse, in compactor trucks. In other areas, Western Disposal uses a "Western Curbside Collector"—a packer truck with two bins on each side. Crews place separated recyclables in the four bins and refuse in the rear compactor.

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements: There are no legislative requirements.

Service Providers: Eco-Cycle (private, nonprofit), Green Mountain Recycling Services (private, for-profit), and Western Disposal (private, for-profit)

Number Served: 100-200 are serviced by Eco-Cycle.

Type Served: City schools, offices, restaurants, and bars

Pick-up Frequency: Customers can schedule regular pick-up service, or call the service provider to arrange for pick-up.

Materials Collected: Eco-Cycle and Green Mountain Recycling Services collect corrugated cardboard, high-grade office paper, newspaper, glass, and aluminum cans. Western Disposal collects cardboard.

Set-out Method and Collection: Eco-Cycle provides offices, bars, restaurants, and schools with barrels for each type of recyclable material. Green Mountain Recycling Services provides customers with 5- to 55-gallon drums in which to collect their materials. Western Disposal provides dumpsters for cardboard.

Incentives: None

Annual Tonnage: 3,516 in 1990 (3,441 tons from Eco-Cycle, based on the estimate that 50 percent of the commercial materials it recovers are from the City of Boulder, and 75 tons from Green Mountain Recycling Services)

Only a small percentage of Boulder's businesses was serviced with curbside collection of recyclables in 1990. (Some other businesses used drop-off sites.) Efforts have been made to expand curbside service. In 1988 for example, the U.S. EPA awarded the City of Boulder a $10,000 grant to implement a pilot bar and restaurant glass recycling program. Under this program, which is scheduled to operate between March and October 1991, Green Mountain Recycling Services and Eco-Cycle collect glass in barrels from 36 businesses. Up until 1991, Eco-Cycle collected recyclables free of charge from businesses. Due to a drop in the market price paid for recyclables, Eco-Cycle now charges businesses fees based on the number of containers and frequency of collection.

IBM, located in Boulder, collects, shreds, bales and markets large volumes of office paper. (These tonnages are not available.)

In 1990 Eco-Cycle collected approximately 41 tons of high-grade paper from 75 percent of Boulder's public schools. Many schools collected aluminum cans for fundraising activities. The following year, the School Board provided additional funds to be able to include all schools in Boulder Valley in the recycling program. In 1991 there was 100 percent participation in this program.

The University of Colorado has an extensive recycling program with 225 drop-off sites campus-wide. The drop-offs accept 16 materials for recycling, including paper, yard waste, food waste, motor oil, plastic, computers and other research tools, batteries, and antifreeze. The programs are funded through a 30¢ surcharge per student, avoided disposal costs, and revenues from materials sales. The University's 1989-90 recycling budget totaled $40,000 (70 percent from materials revenues and 30 percent from disposal cost rebates and recycling surcharges).

Drop-off Centers

Number and Type:	247 drop-off sites, of which 225 are located on the University of Colorado campus. The other 22 are off-campus; 8 of these are buy-back centers.
Public or Private:	Private
Sectors Served:	Residential and commercial. Recyclables brought to Eco-Cycle's drop-off site cannot be broken down into residential and commercial tonnages because the center is unstaffed and open 24 hours per day. Western Disposal, Liquor Mart, King Soopers, and Safeway accept recyclables primarily from the residential sector. The University of Colorado's on-campus drop-off sites are used by University students and staff.
Materials Accepted:	Drop-off centers operated by Eco-Cycle and Western Disposal accept newspaper, corrugated cardboard, phone books, aluminum cans, ferrous cans, glass, and lead-acid batteries. Eco-Cycle pays for aluminum and glass delivered by private haulers and residents (except for material collected through the municipal curbside program). Green Mountain Recycling Services accepts high-grade and mixed paper, aluminum and tin cans, and lead-acid batteries. Three buy-back centers—Safeway, Albertson's, and Reynolds Aluminum—purchase only aluminum cans. Liquor Mart purchases glass as well. King Soopers purchases aluminum cans, glass, newspaper, and plastic.
Annual Tonnage:	3,244 in 1990 (1,621 tons from Eco-Cycle, 1,003 tons from King Soopers, and 620 tons from the University of Colorado; equal to 28 percent of total recyclables recovered in the City)

Processing and Marketing of Recyclables

All materials collected at curbside and through Eco-Cycle's drop-off center are brought to the Eco-Cycle processing center in Boulder. No tipping fee is charged. The 2.5-acre site on which the center is located has been leased from the City for the last 15 years. Over the past 3 years, Eco-Cycle has spent nearly half a million dollars on new processing equipment and site modifications; however, much of the processing still occurs outdoors. The sole building contains a Mosley baler, a workroom for the Center's developmentally disabled workers, and two small offices. A mobile home houses the rest of the administrative staff. Materials are sorted outside, unless it is especially windy, cold, rainy, or hot; at those times Eco-Cycle shuts down the facility. All materials, except for glass, are baled. In 1991 Ecocycle started flattening aluminum cans with their new aluminum can flattener, rather than baling them. Commingled cans are sorted with a magnetic sorting conveyor system, and accurate weights are obtained with the Master Can Buyer computerized hopper system. Eco-Cycle processes an average of 72 tons per day of paper, glass, cans, metal, batteries, and plastic (collected from the City and County), at a cost of $37 per ton. Less than 1 percent of the materials processed are rejected and landfilled. Eco-Cycle designed an elevated paper-sorting conveyor system and has nearly completed its construction, at a cost of $80,000. High-grade white and colored paper, and computer paper will be hand-sorted with the new system. According to the director of Eco-Cycle, contamination and the commingling of recyclables are major obstacles to successful marketing of recyclables in Boulder. Through education and publicity programs, Eco-Cycle and the City have strongly emphasized the need for proper sorting.

Eco-Cycle and Green Mountain Recycling Services bring glass directly to Coors Brewery in Golden, Colorado. Eco-Cycle sells aluminum locally. Ferrous cans are sold to Proler in Arizona. Newspaper is sold in Arizona and Utah, and to brokers on the West Coast for overseas shipment. High-grade paper is sold to West Coast mills, which ship some paper overseas. Mixed paper is sold to Republic Paperboard in Denver, and lead-acid batteries are sold to ANA Metals in Denver. Green Mountain Recycling Services sells its materials to Eco-Cycle or to processing facilities in other parts of the State. Western Disposal sells recyclables collected at its drop-off center to Eco-Cycle. In 1990 the University of Colorado sold its recyclables to Recycle America in Denver; in September 1991 it began to sell recyclables to Weyerhaueser in Denver. The University also sends used research materials, such as eyeglasses and computers, to developing countries.

Market Development Initiatives/Procurement

The City has taken an active role in the procurement of recycled paper products. In March 1989, the City Council passed an ordinance establishing a 5 percent price preference for City purchases of recycled paper products. City stationery, copier paper for most large copy jobs, envelopes, memo pads, paper towels, and toilet paper are all made of recycled paper. In April 1990, the City, along with Boulder County, Eco-Cycle, and several large organizations, sponsored a Recycled Paper Fair to encourage the purchase of recycled paper. A Colorado Recycled Products EXPO was held in Boulder on September 25, 1991.

Composting/Mulching Activities

In 1989 the U.S. EPA awarded Boulder a grant to develop composting programs. That year, Boulder instituted a pilot leaf composting program and collected 100 tons of leaves from 5,000 households. The compost was ready in June 1990; it was given away free of charge to residents and used in city parks. After the pilot project, the City shifted its emphasis to backyard composting. Boulder spent the remaining $8,000 of the grant to fund a backyard composting program, which began in spring 1991. The program featured free neighborhood seminars, and the City provided composting bins to some residents. Eco-Cycle includes information on backyard composting in its quarterly newsletter.

During six weekends in fall 1991, the City sponsored a leaf collection program with revenues generated from the recycling tax. Residents dropped leaves off at five sites citywide. Department of Public Works vehicles collected the leaves each weekend and brought them to a local farmer, who tilled the leaves into the soil.

The Public Works Department collects and chips residential brush and branches as part of the annual spring clean-up. Residents set out branches loose, separate from trash. Five City and contracted crews, totalling 40 people, collect branches citywide over a 3-week period, using front-end loaders and dump trucks. The chips are given away to residents or applied by City crews to parks and recreational areas. In the month of January, residents may drop off their Christmas trees for mulching. (In 1989 some of the trees were sunk in the Boulder reservoir to improve the fish habitat.)

The University of Colorado composts yard waste and food waste from University cafeterias, and uses the compost for landscaping throughout the campus.

Amount and Breakdown of Materials Recovered

Material	Residential (Tons, 1990)*	Commercial/ Institutional (Tons, 1990)†	Other (Tons, 1990)	Total (Tons, 1990)
Newspaper	3,733	1,138	–	4,871
Corrugated Cardboard	313	824	–	1,137
High-grade Paper	76	1,054	–	1,130
Mixed Paper		868	–	868
Glass	1,887	218	–	2,105
HDPE and PET Plastic‡	0	1	–	1
Aluminum Cans	106	15	–	121
Ferrous Cans	100	0	–	100
Appliances/White Goods	26	0	–	26
Other Metal	21	19	–	40
Other Materials§	1,003	0	–	1,003
Subtotal MSW Recycled	**7,265**	**4,137**	–	**11,402**
Brush and Leaves**	2,250	13	–	2,263
Christmas Trees††	50	0	–	50
Food Waste‡‡	0	12	–	12
Subtotal MSW Composted	**2,300**	**25**	–	**2,325**
Total MSW Recovered	**9,565**	**4,162**	–	**13,727**
C&D Debris§§	–	–	342	342
Total C&D Recycled	–	–	**342**	**342**
Total Materials Recycled	**7,265**	**4,137**	**342**	**11,744**
Total Materials Composted	**2,300**	**25**	–	**2,325**
Total Materials Recovered	**9,565**	**4,162**	**342**	**14,069**

*Residential tonnages include materials collected by Western Disposal's residential curbside collection program (4,641 tons), Eco-Cycle's drop-off center (1,621 tons; an unknown number of businesses drop off recyclables at the center), and King Soopers, a supermarket chain (1,003 tons).

†Commercial/institutional tonnages include Eco-Cycle's (3,441 tons) and Green Mountain Recycling Services' (75 tons) commercial accounts, and the University of Colorado's recyclables (620 tons).

‡The University of Colorado recycles both HDPE and PET plastics.

§Other materials recycled are aluminum cans, glass, and plastic collected primarily from the residential sector from King Soopers. A tonnage breakdown is not available. Five King Soopers stores in Boulder County recycled 2,508 tons in 1990. Two of these stores are located in the City.

**City of Boulder collected 15,000 cubic yards of residential brush during the 1990 "Spring Clean-Up." This volume is converted to weight using a conversion factor from R.W. Beck Associates of 300 pounds per cubic yard. The commercial figure represents tonnage composted at the University of Colorado.

††In 1990 the City collected 5,000 Christmas trees. (Tonnage is based on an ILSR estimate of 20 pounds per tree.)

‡‡An estimated 26 cubic yards of food waste were recovered from the University of Colorado. The tonnage figure given above is based on a conversion factor of 900 lbs per cubic yard, as reported by Donn Derr, et al. in "Feasibility of Food Waste Recycling in New Jersey," 1984.

§§C&D materials recycled from Western Disposal's transfer center include nonferrous and ferrous scrap and carpet pads.

Source Reduction Initiatives

Through its quarterly newsletter, *Eco-Cycle Times*, and other educational programs, Eco-Cycle encourages Boulder residents to choose environmentally benign products when they shop, including products made from recycled materials.

From October to December 1990, the City of Boulder conducted a Precycle Program funded through a grant from the U.S. EPA. All grocery stores in the City participated. Volunteers posted signs and distributed 12,000 brochures throughout the stores to encourage shoppers to bring their own bags, to buy in bulk, and to make other environmentally sound purchasing choices. Products with minimal packaging, and those made with recycled or recyclable materials, were labeled with a pink precycle tag. Each supermarket had a volunteer-staffed booth to assist shoppers with the precycle campaign. Approximately 2,000 shoppers talked with a precycle volunteer, and 74 percent of residents responding to a City survey said that the program helped them to reduce waste. The City has extended the program for 1 year in one store, using the recycling tax revenues, and is currently developing a travelling Precycle display, and a holiday packaging reduction program. A chain of Montana grocery stores, Butrey's, modeled its precycle program on Boulder's. The Precycle program received the 1990 Boulder County "Energy Conservation Award."

Publicity and Education

Residential

Since the 1970's, Eco-Cycle has actively promoted recycling programs through its model block leader program, processing center open houses, and quarterly newsletter. A volunteer block leader, assigned to each street, distributes recycling literature and promotes neighborhood participation in recycling programs. Block leaders are recognized during the annual Volunteer Appreciation Party, when Eco-Cycle awards "Oscars" to exemplary volunteers, businesses, and schools. Eco-Cycle estimates the cost of the block leader program at $30,000 per year for one full-time residential coordinator, one quarter-time apartment coordinator, and for material costs.

In addition to Eco-Cycle's activities, Boulder promotes recycling through fliers, posters, newspaper ads, public service announcements, and direct mailings. The City also sponsors a recycling hotline.

Commercial/Institutional

Since 1982 the Boulder Valley School District has funded an environmental education program. Eco-Cycle has operated the program since 1988, and employs the school program coordinator. In 1989, 75 percent of the District schools participated in their recycling program, which consists of recyclables collection and solid waste reduction education. Students and faculty separate paper and aluminum cans and store them in recycling containers provided by Eco-Cycle. A contact person in each school informs Eco-Cycle when the bins are full. Eco-Cycle provides each school with a monthly status report on recycling efforts, and students keep track of the number of trees spared due to recycling on banners displayed in each school. During the annual Volunteer Appreciation Day, Eco-Cycle awards tree seedlings to the school(s) with the highest recycling rates. The educational program includes slide shows, field trips to the landfill and processing center, and in-store precycle scavenger hunts. In 1991 the Boulder Valley School District allocated funds to implement recycling in all District schools. The University of Colorado, which has an extensive recycling program, advises other universities how to set up recycling programs on their campuses.

The City of Boulder held business-oriented seminars at the 1991 Recycled Products EXPO, and has developed a brochure on business recycling opportunities. In November 1991, the City began sponsoring pilot cardboard drop-off centers for businesses.

Economics

Costs Cover: Costs include 1990 contract fees paid to Western Disposal and Eco-Cycle for collection and processing of 4,641 tons of recyclables collected at curbside from the residential sector, and 1990 City operating and maintenance costs for (1) an estimated collection and processing of 2,250 tons of spring clean-up brush, (2) processing of an estimated 50 tons of Christmas trees, and (3) program administration and education costs.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
3 Converted Trucks* @ $50,000	$150,000	Recycling	1987
27,500 Recycling Bins @ $5.15 and $5.50	143,205	Recycling	1988
4,000 Recycling Bins @ $5	20,000	Recycling	1990
4,000 Recycling Bins @ $5	20,000	Recycling	1991
2 Roll-off Trucks†	50,000	Recycling	1982, 1990
5 20-foot Cube Trucks (used)†	50,000	Recycling	1976-1991
4 Front-end Loaders @ $125,000 (6% of time)	500,000	Mulching	NA
20 Trucks @ $70,000 (6% of time)	1,400,000	Mulching	NA
10 Tractor Trailer Vehicles	Contracted	Mulching	NA
5 Dump Trucks	NA	Mulching	NA

Note: All equipment has been paid in full.
*Purchased and owned by Western Disposal.
†Purchased and owned by Eco-Cycle. Eco-Cycle bought used vehicles and redesigned the trucks for recycling.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
Mosley Baler*	$500,000	Recycling	1988
40-Foot Truck Scale*	40,000	Recycling	1988
2 Forklifts*	20,000	Recycling	1977, 1990
Front-end Loader*	25,000	Recycling	NA
Magnet Sorter Conveyor*	10,000	Recycling	1988

Capital Costs: Processing (cont'd)

Item	Cost	Use	Year Incurred
Semi-tractor Trailer*	3,000	Recycling	NA
Master Can Buyer Hopper*	$10,000	Recycling	1990
2 Utility Trucks*	25,000	Recycling	NA
Aluminum Can Flattener/ Blower	Donated**	Recycling	1991
Tub Grinder†	NA	Mulching	NA
15 Composting Bins @ $25	375	Backyard Composting	1990

*Equipment owned by Eco-Cycle and paid for in full. R.W. Beck estimates a cost of $900,000 to replace existing equipment.
**Donated by Reynolds Aluminum.
†Tub grinder, used for Spring Clean-up, is owned by a private contractor.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$340,000**	**4,641**	**$73**
Curbside Collection*	$235,000	4,641	$51
Processing*	25,000	4,641	5
Administration††	45,000	4,641	10
Education/Publicity†	35,000	4,641	8
Composting Subtotal	**$120,946**	**2,250**	**$54**
Collection and Processing‡	$120,946	2,250	$54
Administration	0	2,250	0
Education/Publicity	0	2,250	0
Recycling & Composting Total	**$460,946**	**6,891**	**$67**
Collection and Processing	$380,946	6,891	$55
Administration	45,000	6,891	7
Education/Publicity†	35,000	6,891	5

Note: Costs given above represent the City's operating and maintenance costs.
*The City's contract fees paid to Western Disposal and Eco-Cycle for recycling collection and processing in 1990 totalled $270,000. In 1990 Boulder paid Western a flat fee of $160,000 plus an additional fee of $0.44 for each additional household served above 22,000 residences, and $33.50 per month for each of the 34 multi-unit central unit collection points. (In 1989 Western received $21.00 per multi-unit building.) The City also paid Western Disposal and Eco-Cycle a $7.00 per ton subsidy for newspaper due to the drop in market price. Western Disposal received $235,000 and Eco-Cycle received $35,000, of which they spent $10,000 on education and publicity.
†Includes $10,000 from Eco-Cycle, $10,000 from Environmental Affairs, $7,500 for the curbside feedback program, and $7,500 for the recycling hotline.
‡A breakdown for compost collection and processing is not available. The City spent $43,556 over the 3-week collection period for the operation of City vehicles and $77,390 for contracted trucks and drivers.
††Administrative costs exclude Western Disposal's and Ecocycle's administrative expenses, which are included under their contract fees listed above.

Materials Revenues:	$330,000 in materials revenues from drop-off and curbside programs are split between Western Disposal and Eco-Cycle.
Source of Funding:	City of Boulder general funds, U.S. EPA grants
Full-time Employees:	34 (4 Western Disposal employees collect recyclables, and 30 Eco-Cycle employees work at the Boulder Processing Center.)
Part-time Employees:	54 (2 City employees spending approximately half their time on administrative activities related to recycling; 2 part-time employees contracted by the City—1 to run the curbside feedback program and another to manage the recycling hotline; and 45 Public Works Department employees collecting branches during "Spring Clean-Up." Eco-Cycle employees 5 part-time people through the Developmentally Disabled Center's labor program. Eco-Cycle also uses prison crews once per week for processing, and community service workers for varied activities.

Future Solid Waste Management Plans

Boulder plans to further develop its recycling services with money generated from the new recycling tax. Priorities include expansion of the yard waste composting and apartment building collection programs. The City plans to open several corrugated cardboard drop-off sites for businesses. It is also assessing the feasibility of adding plastics to its curbside collection program.

Eco-Cycle hopes to relocate its processing operation to a larger site by 1993. The County, along with Eco-Cycle and R.W. Beck Associates, is evaluating future capacity needs. Eco-Cycle proposes that the new processing facility be built and operated under a public/private partnership. Eco-Cycle proposes that the facility include a community education center, expanded services for yard waste composting, and a household hazardous waste drop-off site. Eco-Cycle also plans to employ prisoners from the local jail, and to develop local manufacturing opportunities for recyclables.

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Endnotes

[1]This set-out ratio is based on multipliers that Waste Management of North America, Inc. has found to be accurate for weekly programs; these range from 2 to 2.5. Source: *The National Recycling Coalition Measurement Standards and Reporting Guidelines*, National Recycling Coalition, October 1989.

Columbia, Missouri

Demographics

Jurisdiction:	City of Columbia
Population:	69,101 in 1990
Area:	44.7 square miles
Total Households:	25,542 (13,391 in single-family homes and 12,151 in multi-unit buildings)
Total Businesses and Institutions:	3,032 (3,000 businesses, 22 public schools, 1 university, 2 private liberal arts colleges, and 7 hospitals)
Brief Description:	Columbia, the seat of Boone County, is located in central Missouri, approximately halfway between Kansas City and St Louis. The University of Missouri is the major employer in the City, employing over 10,000 people. Other large employers include the Boone Hospital Center, Truman Veterans Hospital, and several electrical components manufacturers. The cost of living in Columbia has been consistently rated below the national average, and the unemployment rate for Boone County was 2.8 percent in 1990. In 1987, the most recent year for which data are available, per capita income in Columbia was $11,078.

Solid Waste Generation and Recovery

Annual Tonnages (October 1989 to September 1990)*

	Residential	Commercial/ Institutional and C&D†	Deposit Containers	Total Waste‡
Recovered	**3,242**	**6,671**	**1,290**	**11,203**
Recycled	3,242	6,671	1,290	11,203
Composted	NA	NA	–	NA
Disposed	**27,615**	**45,300**	**–**	**72,915**
Incinerated§	15	0	–	15
Landfilled	27,600	45,300	–	72,900
Generated	**30,857**	**51,971**	**1,290**	**84,118**

Percent by Weight Recovered

Recovered	**11%**	**13%**	–	**13%**
Recycled	11%	13%	–	13%
Composted	NA	NA	–	NA

Note: Waste recovered excludes any organic waste since these figures are not tracked. Whole tires are included in waste disposed, as none were recovered until October 1991.

*Tonnage figures for waste landfilled are extrapolated from the results of a 4-week weighing period in August 1989 conducted by the DPW at the Columbia Sanitary Landfill. Annual tonnages of recyclables collected at curbside are for October 1989 through September 1990 (FY 1990). This figure includes recyclables collected from 200 households outside of the City that are not serviced with refuse collection by the DPW. Tonnages of residential waste recovered through drop-off sites, deposit containers, and recyclables collected from the commercial sector (FY 1988) were obtained from a study conducted by Burns and McDonnell. Tonnage of commercial recyclables is from the period 1988-89 (see Amount and Breakdown of Materials Recovered chart).

† Recycling and disposal of construction and demolition debris in Columbia are not being tracked separately from commercial and institutional waste. In the base year of study (1989-90), a negligible amount of C&D waste was being recovered.

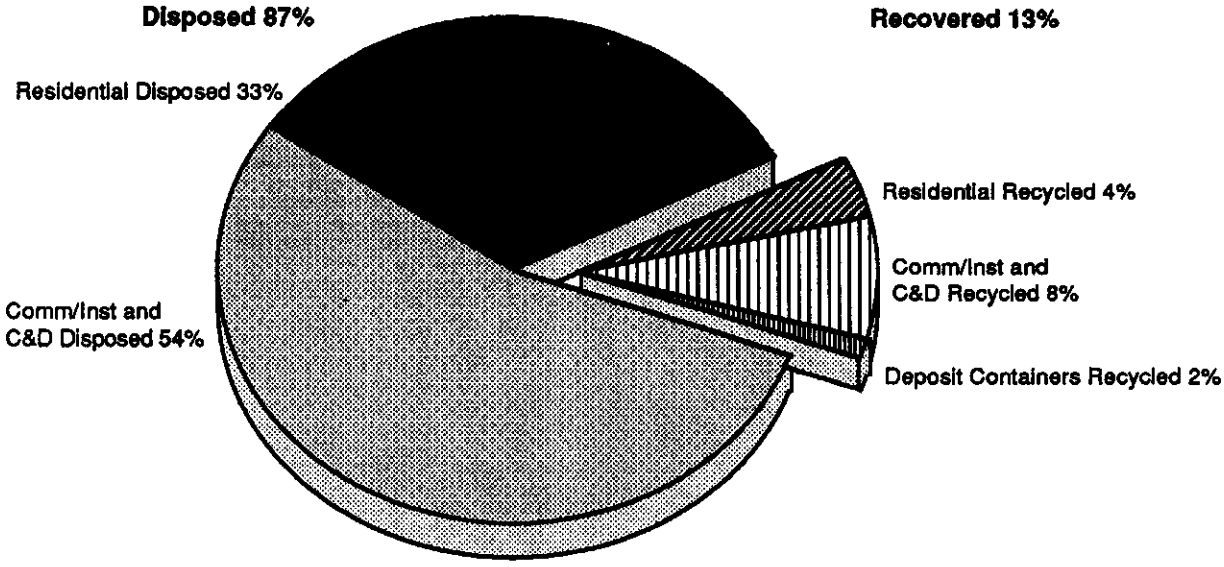
‡ Total waste is the sum of residential, commercial/institutional and C&D, and includes 1,290 tons of deposit containers reclaimed via the container ordinance.

§ Residential waste incinerated represents oil collected through the municipal curbside program (15 tons in FY 1990), which was burned to generate heat at the local landfill offices.

Landfill Tipping Fee: $10.30 per ton from 1988 through September 1990; increased to $11.50 per ton in October 1990, and $12.50 per ton in January 1991. As of October 1991, the tipping fee increased to $19.50 per ton ($1.50 of which goes to the State Department of Natural Resources).

Refuse Collection and Disposal: The City of Columbia collects residential refuse weekly. Residents of single-family homes and multi-unit buildings of four units or fewer are charged $5.94 per month for refuse collection. All such units receive 90 black plastic refuse bags per year, the cost of which is incorporated into the monthly fee. Effective October 1991, the rates were raised to $7.96 per month, and the number of bags distributed was reduced to 75. Apartment buildings of five or more units are eligible for dumpsters, and residents are charged $4.94 per month. This rate was increased to $7.25 as

Total Waste Recovered and Disposed (Percent by Weight, FY 1990)



Note: Due to rounding, numbers do not add to 100%

Refuse Collection and Disposal (cont'd):

of October 1991. Residential refuse collection and disposal cost the City approximately $1,164,936 in 1990 for the collection of the 27,600 tons that were landfilled.

According to a study conducted by Burns and McDonnell, a Kansas City based consulting firm, the Department of Public Works hauls more than 90 percent of commercial/institutional waste in the City. Three private haulers, J.T. Brown Disposal, T-Mac Solid Waste, and Red, White and Blue Disposal, handle the remaining 10 percent of waste from the commercial sector. All waste collected by the municipality is dumped at the municipally owned and operated City of Columbia Sanitary Landfill, an average distance of 8 miles from the City's collection routes.

Materials Recovery Overview

Goals and Legislative Requirements:

In 1977 the City of Columbia passed the only citywide bottle bill in the United States, requiring retailers and distributors to exact a 5-cent surcharge on all carbonated beverages sold in bottles or cans in Columbia, and to refund customers upon the return of such beverage containers.

In 1990 Missouri mandated a 40 percent diversion of its waste stream through source reduction, recycling, and composting by 1998. But stringent materials recovery legislation did not take effect until 1991. In January 1991, lead-acid batteries, whole tires, motor oil, and white goods were banned from landfills. Yard waste will be banned in January 1992. Missouri also enacted a $0.50 product tax on new tires, and a $1.50 per ton surcharge on all material tipped at the landfill.

Community recycling in Columbia began as early as 1971, when the Community Rehabilitation Center (CRC)—an occupational center for developmentally disabled adults—set up a drop-off site for newspapers, glass, and aluminum cans. The City provided the CRC with operational support until 1978, when the center closed due to financial difficulties. In mid-1980, a local resident started Civic Recycling, a private for-profit recycling venture consisting of a multi-material buy-back and commercial collection program. Since its inception, Civic Recycling has been "pivotal to the continued growth of multi-material recycling in the City."[1]

In 1984 a student intern in the City's Solid Waste Division was commissioned by the State Department of Natural Resources to evaluate the feasibility of curbside recycling in Columbia. The study concluded that Columbians showed a significant interest in recycling and that regional markets for recyclable materials existed. Shortly after the study was released, a local community group submitted a proposal to the Columbia City Council for the implementation of a curbside program. The proposal was approved, and Columbia's Department of Public Works (DPW) launched a pilot curbside program in August 1985. During the pilot program, the DPW provided monthly curbside collection of recyclable materials from 3,700 eligible households in selected neighborhoods throughout Columbia.

Curbside collection of recyclables went citywide in July 1986, one year after the pilot program began. Every resident of the City of Columbia and 200 residents outside the City who receive City utilities are eligible for monthly curbside collection of old newsprint, corrugated cardboard, glass and aluminum containers, and motor oil. Persons interested in participating are asked to call the City and "enroll" in the program. Enrollment in Columbia's curbside program has steadily increased. By the end of 1986, 2,210 households were enrolled and, on average, 50 percent of those households participated. Enrollment was up to 5,118 households by October of 1989, the beginning of the fiscal year, and had climbed to 7,060 (which includes 200 households outside of the City limits) by September 1990. As of June 1991, 8,315 households had enrolled. Participation in the program is consistently between 60 and 65 percent of those enrolled. As of mid-1991, more than 5,000 households were voluntarily setting out recyclables once a month. In FY 1990, 1,052 tons of recyclable materials were collected through the curbside program—a 62 percent increase over the tonnage collected in FY 1989. By the end of June 1991 (the third quarter of FY 1991 year), the City had collected more than 1,080 tons of recyclables.

For more than 25 years, residents and landscapers from Columbia have been bringing yard waste to a mulch site operated by the Parks and Recreation Department and have contributed their Christmas trees to the Department's annual bonfire. Columbia's Department of Public Works began collecting Christmas trees at curbside 3 years ago, and is planning to implement curbside service for yard waste by October 1991. The recovery of clean fill in Columbia has been facilitated by an innovative swap program in which the City acts as a clearinghouse. The City attempts to connect those who can supply clean fill with those individuals and or companies that require it. As of Spring 1990, Columbia has

offered a reduced landfill tipping fee (one-half of the mixed refuse tipping fee) for businesses that separate clean fill from the commercial waste stream.

A unique feature of Columbia's materials recovery program is the citywide bottle bill. The idea was conceived by a University of Missouri professor whose class launched a petition drive as a class project. In 1977 the Columbia City Council passed a beverage container ordinance requiring that a 5 cent deposit be placed on all nonrefillable carbonated beverage containers. Beverage distributors mark the containers with an indelible "Columbia" stamp or label and initiate the deposit. Retailers and distributors of beverages are required to accept all such containers for refund. Biodegradable beverage containers and refillable glass bottles are excluded from the ordinance. Since its passage, the ordinance has survived three attempts at repeal. In FY 1990, 12 percent of all material recycled in Columbia consisted of deposit containers.

Recycling Activities

Residential Curbside Recycling

Start-up Date: July 1986 (pilot program began in August 1985)

Service Provider: Department of Public Works, Solid Waste Division

Pick-up Frequency: Monthly

Same Day as Refuse: No

Households Served: 5,096 in single-family homes as of September 1989, 7,060 as of September 1990, and 8,315 as of June 1991.

Mandatory: No

Participation Rate: Of the households enrolled, 61 percent participated in 1989, and 62 percent participated in 1990, based on set-outs per month. This represents 14 percent of total households in FY 1989, and 20 percent in FY 1990.

Materials Collected: Newspaper, corrugated cardboard, paperboard, aluminum beverage containers, flint, green, and brown glass, and motor oil are collected at curbside. Lead-acid batteries were added in 1991. The Department of Public Works collects major appliances at curbside on request for $5 per item.

Set-out Method: Residents are asked to source separate their recyclables. Newspaper is set out in bags or bundled and tied with string. Corrugated cardboard and paperboard are flattened and set out boxed or bagged. Glass is separated by color and placed in separate boxes or bags. Aluminum cans are bagged. Used motor oil is placed in capped plastic containers. In case of rain, the DPW recommends that residents cover the recyclables with plastic, which crews will leave behind for residents to reuse. If recyclables are set out incorrectly, crew members leave bright yellow stickers on set-out containers indicating why the material was not collected. Blue Piper Case Pro 14-gallon bins (Model RC 12) are available from the City for $5 per container. As of the end of 1990, more than 200 recycling bins had been purchased.

Collection Method and Vehicles: A two-person crew (one driver and one laborer) collects segregated recyclables at curbside, using a 16-foot compartmentalized gooseneck trailer attached to a 1-ton pick-up truck. Materials are placed in nine separate bins in the trailer: four for newspaper, one for each color of glass, one for aluminum cans, and one for corrugated cardboard and kraft paper bags that are used in set-out. As of June 1990, a 25-cubic-yard packer truck with one crew member was used for corrugated cardboard collection.

Economic Incentives: None

Enforcement: Not applicable. Scavenging has been a problem, but the City has not taken any action to prevent it.

Annual Tonnage: 1,052 tons in FY 1990, and 1,434 tons in FY 1991

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements: Under the City's Container Deposit Ordinance, businesses that sell beverages are required to accept aluminum, glass, and plastic beverage containers marked "Columbia."

Service Provider: Civic Recycling

Number Served: Approximately 300. Civic Recycling estimates that it collects recyclables from 10 percent of the businesses in Columbia, including eight beverage retailers, that collect an estimated 90 percent of the deposit beverage containers.

Type Served: Businesses and institutions, including grocery stores, department stores, hospitals, medical facilities, the University of Missouri, and primary and secondary schools

Materials Collected: Corrugated cardboard, newspaper, office paper, glass, aluminum, and PET plastic

Pick-up Frequency: Varies with the volume of recyclables generated. Typically materials are collected weekly or every other week.

Set-out and Collection Method: Civic Recycling supplies 90-gallon toters to many businesses. Custodians collect paper from desktop boxes or wastebasket companion bins in these toters and take them to a central storage area in the facility. Civic Recycling picks up the paper either directly from the toters or from bins or dumpsters into which the contents of the toters are deposited. Other businesses and institutions use large centrally located bins. Commingled waste paper is hauled by dump truck to the processing center.

Incentives: The cost of recyclables collection is competitive with, and often lower than, the cost of refuse collection.

Annual Tonnage: Not available

Drop-off Centers

Number and Type:	One privately run buy-back center and six scrap yards service the City of Columbia. In addition, grocery stores and other retailers of carbonated beverages accept glass, aluminum, and plastic containers covered under Columbia's deposit ordinance.
Public or Private:	Private
Sectors Served:	Residential and commercial sectors
Materials Accepted:	Newspaper, high-grade paper, other paper, glass, aluminum, bimetal cans, plastic (HDPE and PET), scrap metal, motor oil, and batteries
Annual Tonnage:	Not available

Salvage/Reuse

Pallets are rebuilt by Civic Recycling. In FY 1989, the company collected and rebuilt 39,000 pallets (at 30 pounds per pallet, approximately 585 tons). The City of Columbia and some area businesses bring their pallets to Civic Recycling. Civic Recycling also collects pallets from other businesses. The Salvation Army and thrift stores throughout the City of Columbia provide residents the opportunity to reuse clothing that would otherwise be landfilled.

Processing and Marketing of Recyclable Materials

The City of Columbia contracts with a private company, Civic Recycling, for the processing of materials collected through the City's curbside program. Under the original arrangement, the City received 60 percent of the market value that Civic Recycling received for aluminum, 50 percent for glass, and 40 percent for newspaper and corrugated cardboard. Due to a glut in the newspaper market, Columbia did not receive any revenue for newspaper after April 1989. In June 1991, the City renegotiated its contract with Civic Recycling. The City now receives 100 percent of the average monthly price for aluminum and glass based on figures published in *Recycling Times*, and 70 percent of the average monthly indexed price from the *Paper Stock Report* for corrugated cardboard, but pays Civic a $15 per ton processing fee for newspaper.

Civic Recycling's intermediate processing center (IPC), which includes three buildings totalling 26,000 square feet, is sited on 8.5 acres with a rail spur, an average distance of 5 miles from City collection routes. The center, which began operating in 1980, now employs 20 to 26 full-time employees. It processes approximately 75 tons of recyclable materials per day (with a maximum capacity of 100 tons per day assuming the same operating schedule) including office paper, file stock, old newsprint, corrugated cardboard, aluminum and tin cans, three colors of glass, and PET plastics. Materials from commercial collection routes and from municipal curbside programs, and containers collected from area supermarkets, are tipped onto a main floor, swept into a pit with a front-end loader and lifted by conveyor into a manual-sorting area. Mixed office paper is graded by hand and baled. Customers are asked to color-sort glass, so minimal hand-sorting is required at the IPC. Glass is crushed in Gaylord boxes and shipped to Owens-Brockway in Illinois. Aluminum is densified and baled, and sold to both regional and out-of-state markets including Reynolds, Alcoa, Alcan, and Kaiser. Plastics are baled and sold to two regional facilities. Corrugated cardboard, office paper, and old newsprint are baled and stored in rail cars. When the cars are full, the materials are sold to the highest bidder. Waste paper has been sold to Jefferson Smurfit Paper Company in Illinois, Southeast Paper in Georgia, and markets in the Southwest and Mexico.

Civic Recycling chips wooden pallets that cannot be rebuilt with a pallet shredder and tub grinder. The mulch produced is used by City residents. The City began collecting white goods and lead-acid batteries in January 1991, spurred by a State landfill ban. A local scrap metal recycler, Central Metals, sells the scrap to McKinley Iron or to markets in Kansas City, and returns the capacitors to the City. The DPW is storing the capacitors until its household hazardous waste program is implemented in April 1992; at that time, the capacitors will be disposed of by a licensed hazardous waste hauler. Batteries from the municipal curbside program are sent to a local dealer, who recycles them through a battery recycler in Southern Missouri. Despite the presence of manufacturers of rubber goods and tire-derived fuel in Illinois, Tennessee, and Texas, the market for used tires in Columbia is very weak. Columbia recommends that residents have tires shredded because several local haulers will haul shredded tires for free.

Market Development Initiatives/Procurement

According to a study by Burns and McDonnell, "Civic Recycling has demonstrated its commitment to the recycling industry and appears to be capable of expansions and innovative marketing in order to maintain its position as the City's only major broker/processor." Dave Allen, owner of Civic Recycling, has actively pursued markets for the materials processed at the IPC. In addition to making arrangements with a local newspaper publisher for the use of recycled fiber in the newspaper, Allen has contracted to collect office paper from State offices and aluminum and tin food cans from the State prison system. He is currently establishing an office paper collection program in State prisons. Allen has written proposals to the State on various options for enlivening regional paper markets, including the construction of a recycled paper mill in the area. He also initiated a project with the Agricultural Extension Service to test the feasibility of using old newsprint for animal bedding on local farms.

Columbia's Solid Waste Division procures paper with at least 10 percent post-consumer recycled content for all advertisements, brochures, and letters. In 1987 the Missouri Department of Environmental Improvement and Energy Resources Authority completed a comprehensive study of potential state and regional markets for recyclable materials. As of January 1991, the State of Missouri has committed $1 million per year for the next 5 years to fund market development activities.

Mulching Activities

The City of Columbia owns a mulch site, operated by the Department of Parks and Recreation, where residents and landscapers can drop off leaves and grass clippings. The site is adjacent to Cosmos Park (the City's largest public recreation facility), less than 2 miles from the center of the City. Mulch can be picked up for free at the site. Residents and landscapers use the mulch as a soil amendment. The City Department of Parks and Recreation uses it for beautification of City parks, and the State Department of Conservation uses it for wildlife habitat improvement. Burns and McDonnell estimated that 2,974 tons of leaves, 2,159 tons of grass clippings, and 177 tons of brush are generated in Columbia each year, but tonnages of yard waste recovered at the mulch site have not been tracked.

According to Bruce Murray of the Department of Parks and Recreation, as early as 25 years ago, Christmas trees were collected at an asphalt lot in Cosmos Park and burned in a huge bonfire. Concerns by residents that the bonfire was polluting the air halted the practice around 1980. Since 1988 the City Department of Public Works has collected Christmas trees at curbside during the 3 weeks following New Year's Day. Crews pick up the trees on the same day as regular refuse using two 25-cubic-yard rear-loading packer trucks. The State Department of Soil Conservation uses whole trees for soil erosion control, and the Department of Natural Resources uses whole trees for fisheries habitat improvement. In addition, the Department of Parks and Recreation operates two drop-off sites (one at Cosmos Park

and the other at a University of Missouri parking lot) for Columbia and Boone County residents. Between 50 and 75 percent of the trees collected at the drop-off sites are hauled off by residents wanting whole trees. The remainder are chipped by a private contractor and used by residents and the Department of Parks and Recreation as a ground cover. The capital costs for the chipping of Christmas trees are incurred by a tree-trimming company under contract with the City, and are not available.

In addition to advertising the curbside and drop-off collection of Christmas trees, the City published a guide to backyard composting, reprinted from a Missouri Department of Natural Resources publication. The guide was mailed to residents along with the monthly utilities bill.

Amount and Breakdown of Materials Recovered*

Materials	Residential* (Tons,1989-90)	Commercial/ Institutional (Tons,1988-89)	Other† (Tons,1988-89)	Total (Tons,1988-89)
Newspaper	1,965	1,215	–	3,180
Corrugated Cardboard	461	2,436	–	2,897
Office Paper	–	2,110	–	2,110
Glass	709	15	773	1,497
Aluminum Cans	107	–	447	554
PET Plastic	–	–	70	70
Other Metals	–	310	–	310
Wood Waste (Pallets)‡	–	585	–	585
Subtotal MSW Recycled	**3,242**	**6,671**	**1,290**	**11,203**
Leaves & Grass Clippings	NA	NA	–	NA
Brush	NA	NA	–	NA
Christmas Trees§	41	NA	–	NA
Subtotal MSW Mulched	**NA**	**NA**	**NA**	**NA**
Total MSW Recovered**	**3,242**	**6,671**	**1,290**	**11,203**
Total C&D Recovered	**0**	**0**	**0**	**0**
Total Materials Recovered	**3,242**	**6,671**	**1,290**	**11,203**

* Annual tonnages, except for those collected from the residential sector through the municipal curbside program, are estimates from a study conducted by Burns and McDonnell, a Kansas City-based consulting firm, for FY 1989. Of the 3,242 tons of residential recyclable materials, 1,052 tons were collected through the curbside program in 1989-90; the rest are 1988-89 estimates.

†A total of 1,290 tons of materials, comprised of glass (773 tons), aluminum (447 tons), and PET plastic (70 tons), were recovered through deposit returns.

‡Tonnages for 39,000 pallets reconstructed by Civic Recycling in the FY 1989 were estimated by Burns and McDonnell using a conversion factor of 30 pounds per pallet.

§4,060 Christmas trees were collected at curbside. Using a conversion factor of 20 pounds per tree, 41 tons were collected. Additional tonnages collected at two drop-off sites were not tracked.

**Waste recovered excludes any organic waste recovered, since these figures are not tracked.

From October 1988 through September 1989 (FY 1989), 2,721 tons of materials were collected from the residential sector. Of this, 24 percent (666 tons) was collected through the curbside program. In FY 1990, 3,242 tons were collected from the residential sector, of which 32 percent was from residential curbside collection.

Residential Curbside Recycling Program
(Annual Tonnages and Percent Increase in Recovery—FY 1989 to FY 1990)

Material	Residential Curbside (Tons, 1988-89)	Residential Curbside (Tons, 1989-90)	Percent Increase
Newspaper	469.85	708.29	51%
Corrugated Cardboard	73.72	162.05	120%
Glass	110.37	178.57	62%
Aluminum Cans	1.54	3.00	95%
Total	**655.48**	**1,051.91**	**62%**
Households Served*	5,096	7,060	
Participation Rate†	61%	66%	

* The number of households served is the number enrolled in the curbside program at the end of the fiscal year.

† Participation rate is calculated as a percentage of enrolled households, not of total eligible households, and is based on set-outs per month.

Deposit Ordinance

While many states have enacted bottle bill legislation, Columbia is the only city in the country to have enacted a citywide deposit ordinance. A University of Missouri class project on recycling provided the impetus. The students surveyed owners of area businesses to determine their support for a container deposit law. Of those surveyed, none supported a container deposit law. However, when the survey results were published in the newspaper, many other business people contacted the reporter to express their support for beverage container deposits. They organized Columbians Against Throwaways to work for a bottle bill. Since its passage in 1977, the bottle bill has survived three attempts at repeal. Columbians Against Throwaways is credited with this success and is now gathering support for a statewide bottle bill. Burns and McDonnell estimate that of the deposit containers generated in Columbia, 85 percent are returned.

Source Reduction Initiatives

The City's Solid Waste Division supports "precycling" and "environmental shopping" through presentations for civic organizations and schools. In addition, the City has run precycling ads in the local paper advising residents to "Think Before You Buy."

Publicity and Education

In June 1989, the Solid Waste Division sent a survey to residents along with their monthly utilities bill. The purpose of the survey was to find out how many residents knew about the curbside recycling program, how many used the drop-off center, and whether residents wanted more frequent pick-up of

recyclables. Four thousand and sixty-three residents responded. Eighty-six percent of the respondents were aware of the curbside program; 58 percent were participants in the program. Nearly 80 percent favored increasing collection frequency to twice a month. According to Cheryl Crafton, the Waste Minimization Coordinator, the survey was helpful in getting a sense of what residents wanted from the recycling program.

Columbia's Solid Waste Division uses presentations, signs on City buses and refuse vehicles, newspaper ads, and annual mailings to publicize the recycling program and to educate Columbia residents on the importance of recycling. More than 60 presentations are given to schools and civic organizations each year, with an average audience of 25 to 30 people. Signs on refuse collection vehicles read "Show Me You're Recycling Columbia," playing on Missouri's reputation as the "Show Me State." A local resident writes a weekly newspaper column called the "Citizen Recycler," and newspaper ads are run approximately once a month, primarily to inform the public which materials can be recycled and to target the recovery of certain materials. In addition, utility mail inserts provide residents with updates on the City's recycling program.

Economics

Costs Cover:

Capital costs cover the collection of 1,052 tons of recyclables by the City in FY 1990 through the municipal curbside program, and the curbside collection of 41 tons of Christmas trees.

The City incurred no capital costs for the processing of recyclables, since processing occurs in the private sector. The capital costs for the chipping of Christmas trees are incurred by a tree-trimming company under contract with the City, and are not available.

Operating and maintenance costs include labor and overhead for the collection of 1,052 tons of recyclable materials, the collection of 41 tons of Christmas trees, administration, and education and publicity costs.

City of Columbia's Capital Costs: Collection

Item	Cost	Use	Year Incurred
25-cubic-yard Packer Truck† (92% recycling and 8% composting)	$88,000	Recycling/Christmas Tree Collection	1982
16' Gooseneck Trailer	5,509	Recycling	1985
1-ton Chevy Pick-up Truck	12,600	Recycling	1989

Note: Most equipment is amortized over a 10 year period. The packer truck was used by the DPW for refuse collection prior to the initiation of the recycling program.

† Use of this truck for the collection of corrugated cardboard and Christmas trees began in June 1990. Previously the truck was used for refuse collection.

Civic Recycling's Capital Costs: Processing

Item	Cost	Use	Year Incurred
1 Open-end Baler	NA	Recycling	NA
1 Close-end Economy Baler	NA	Recycling	NA
1 Selco Double Ram Baler	$187,000	Recycling	1991
1 Blo Apco Shredder	NA	Recycling	NA
1 3-belt Conveyor System	NA	Recycling	NA
1 3-belt Conveyor System	38,000	Recycling	1991
2 Bobcat Front-end Loaders	NA	Recycling	NA
1 Trailer	NA	Recycling	NA
3 Forklifts	NA	Recycling	NA
4 Digital Scales	NA	Recycling	NA
1 Truck Scale	NA	Recycling	NA

Annual and Per Ton Operating and Maintenance Costs (FY 1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$88,339**	**1,052**	**$84**
Residential Curbside Collection	$51,398	1,052	$49
Processing*	0	1,052	0
Administration	28,291	1,052	27
Education/Publicity†	8,650	1,052	8
Composting Subtotal‡	**NA**	**NA**	**NA**
Christmas Tree Collection	NA	NA	NA
Curbside Christmas Tree Collection§	$1,658	41	$40
Drop-off Christmas Tree Collection	NA	NA	NA
Christmas Tree Chipping**	1,040	NA	NA
Administration	1,704	41	42
Education/Publicity	0	41	0
Recycling & Composting Total	**NA**	**NA**	**NA**
Collection	NA	NA	NA
Processing	$1,040	NA	NA
Administration	29,995	1,093	$27
Education/Publicity	8,650	1,093	8

Note: Costs given above represent operating and maintenance costs incurred by the City only.

* 1989-90 processing costs for recyclable materials collected at curbside were incurred by Civic Recycling and are not available.

† Estimate by the Waste Minimization Coordinator, based on expenditures in 1988/89.

‡ Composting tonnages and costs are only available for the City's Christmas tree mulching program. While other composting costs are incurred by the City, these are not tracked separately and considered minimal by the City.

§ The cost of Christmas tree collection is estimated based on the use of two laborers, paid an average of $6.50 per hour, working 10 hours per day for 13 days.

**Of the Christmas trees collected at drop-off sites, approximately 25 percent were chipped by a tree-trimmer under contract with the City's Water and Light Department. The Department of Parks and Recreation estimates the cost based on one crew chipping trees for 4 hours at each of two sites, at $130 per hour.

The cost savings realized by diverting recyclable materials from disposal in Columbia is calculated at $10.30 per ton, and amounts to $115,391 (4,532 tons from the residential sector including recyclables, bottle returns, and Christmas trees, and 6,671 tons from the commercial sector). In addition, the 4,207 gallons of oil (approximately 15 tons) collected and burned as fuel are estimated by Burns and McDonell to save the City $0.40 per gallon, totalling $1,683.

Materials Revenues:	$7,066 in FY 1990
Source of Funding:	At present the recycling program is funded partly by revenues from the sale of recyclable materials, and partly by residential refuse collection fees. Of those fees, $0.06 per household per month goes to recycling education and promotion. As of January 1991, a surcharge of $1.50 per ton has been added to the tipping fees at all landfills; these monies go to the State to fund recycling activities and market development.
Full-time Employees:	1 full-time Waste Minimization Coordinator hired by the City in August 1990. (Prior to that there was one part-time staff person for administration.) 1 full-time driver/collector employed by the City to collect recyclables as of February 1989. As of October 1, 1991, 2 additional driver/collectors were hired to collect yard waste. In January 1992, 1 full-time driver/collector was hired to collect recyclables.
Part-time Employees:	1 from October 1989 through May 1990; 2 as of June 1990, 3 as of October 1991.

Future Solid Waste Management Plans

Community groups have been active in formulating Columbia's past and future approach to solid waste management. Columbia will begin twice monthly collection of recyclable materials in March 1992, in response to community groups calling for more frequent collection. Recyclables will be collected on the same day as regular refuse. In addition, tin food cans and plastic milk jugs will be picked up at curbside. Two additional collection vehicles have been funded for these increased services. Five drop-off sites for newsprint, aluminum beverage containers, corrugated cardboard, plastic milk containers, steel cans, and clear, green and brown glass jars and bottles will be operational in the fall of 1991.

The City has sited a composting facility on land adjacent to the City landfill. As of October 1, 1991, yard waste is banned from the City's landfill. Funds have been allocated for collection of yard waste 9 to 10 months out of the year. Curbside collection of grass clippings, leaves, and brush began October 1991, using side-loading packer trucks from the DPW fleet. Also effective October 1, 1991, the number of bags allotted to residents for refuse was decreased from 90 per year to 75 per year. Ten specially marked, clear plastic bags for yard waste, brush, and bundles of limbs will be provided to each resident free of charge.

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References

Baker, Catherine, "The City That Said No To Trash." *Public Citizen,* November/December 1988.

Burns and McDonnell. *Waste Management Practices Report. City of Columbia.* March 1990.

City of Columbia Public Works Department. *The Columbia Curbside Recycling Program.* Rev. ed. April 24, 1990.

"The State of Garbage in America: Legislative Initiatives." *BioCycle,* May 1991.

Endnote

[1]Burns and McDonnell, *Waste Management Practices Report, City of Columbia,* March 1990, appendix B–2.

Dakota County, Minnesota

Demographics

Jurisdiction:	Dakota County
Population:	274,016 in 1990
Area:	571 square miles
Total Households:	100,000 (70,000 single-family households and 30,000 households in multi-unit buildings)
Total Businesses and Institutions:	44,227
Brief Description:	Dakota County, one of seven counties that comprise the Twin Cities Metropolitan Area, is the fastest growing county in Minnesota. Rapidly expanding suburban development characterizes the northern half of the County. The southern half is largely rural with smaller communities. The County includes 14 urban/suburban cities, 13 rural townships, and 6 rural municipalities. The populations of these communities range from less than 200 to more than 50,000. The largest employers in the County are professional firms, service industries, and educational institutions.

Solid Waste Generation and Recovery

	Residential	Commercial/ Institutional	Other*	Total MSW
	Annual Tonnages (1990)			
Recovered	**33,089**	**27,748**	**2,489**	**63,326**
Recycled	18,976	27,748	0	46,724
Composted	14,113	0	2,489	16,602
Disposed	**80,398**	**86,262**	**-**	**166,660**
Landfilled	79,194	86,262	-	165,456
Incinerated†	1,204	0	-	1,204
Generated	**113,487**	**114,010**	**2,489**	**229,986**
	Percent by Weight Recovered			
Recovered	**29%**	**24%**	**-**	**28%**
Recycled	17%	24%	-	20%
Composted	12%	0%	-	7%

Note: Although C&D debris such as building materials, brick, asphalt, wood waste, scrap metal, and concrete is collected throughout the County, tonnages are not tracked by the County and are thus not included in the above table. Numbers may not add to total due to rounding.

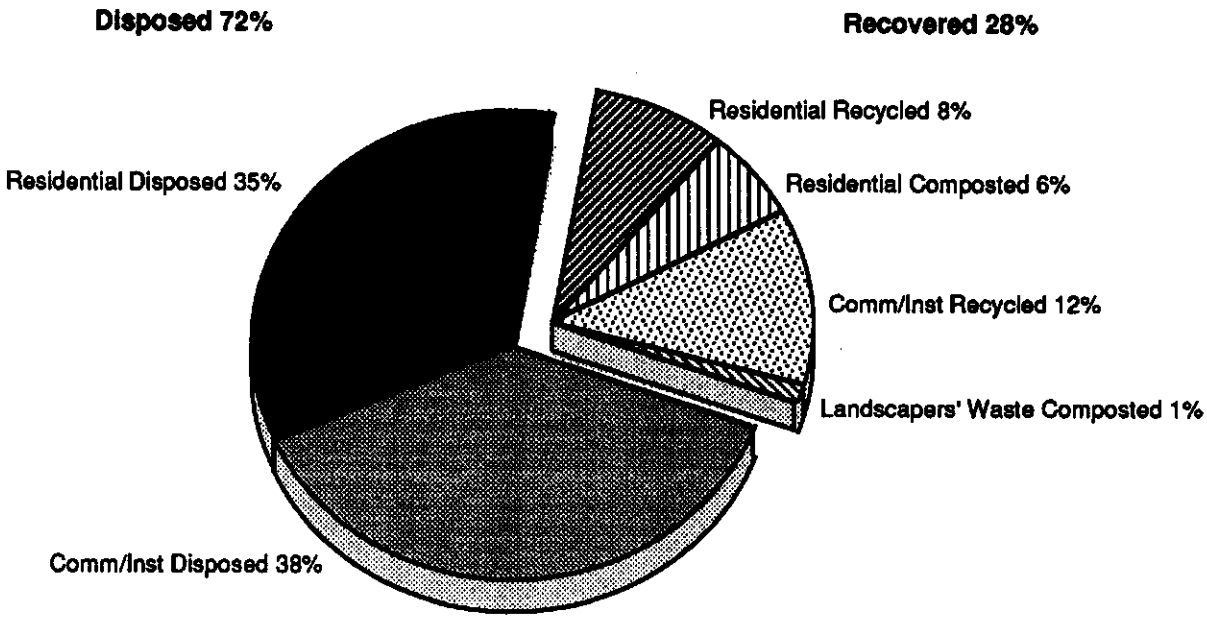
*Represents recovered landscapers' yard waste, which cannot be broken down into residential and commercial/institutional.

†1,720 tons of tires were collected in Dakota County in 1990. Although 516 tons were recycled into crumb rubber, 1,204 tons were burned as a fuel source and are included under waste incinerated.

Landfill Tipping Fee: $36 per ton in 1988, $45 per ton in 1989, $55 per ton in 1990. (The fees are based on the average of fees charged at the landfills and include landfill surcharge fees.)

Refuse Collection and Disposal: Thirty-five private haulers collect refuse from the residential sector and approximately ten haulers collect refuse from the commercial sector. Only one municipality in Dakota County, the City of Farmington, has public refuse collection. In 1992 Farmington residents will pay weight-based refuse rates. The City of Hastings issues three kinds of licenses to private haulers: one for residential only, one for a combination of residential and commercial, and one for commercial and industrial. In 1990 there were three licensed demolition landfills in Dakota County accepting only construction and demolition debris; two are licensed in 1991. Five special waste facilities in the County accept nonhazardous solid waste requiring special management. Examples of this waste include ash, contaminated soils, coal slag, and spent bauxite. Two sanitary landfills, Burnsville and Pine Bend, receive approximately 50 percent of all waste disposed in the metropolitan region. Minnesota Pollution Control Agency (MPCA) denied the permit on Nov. 26, 1991 for an 800-ton-per-day mass burn incinerator. There is currently an appeal on the decision.

Municipal Solid Waste Recovered and Disposed (Percent by Weight, 1990)



Note: Due to rounding, numbers do not add to percent disposed and percent recovered subtotals

Materials Recovery Overview

Goals and Legislative Requirements:

In 1985 the State of Minnesota banned the landfilling of waste oil, tires, white goods, and lead-acid batteries. The State mandated a goal of recycling 25 percent of the waste stream statewide by 1993; in the seven Counties surrounding the Twin Cities, this goal is 35 percent. Minnesota required counties to develop recycling plans and specific waste reduction goals by October 1990. The State banned the landfilling of yard waste, effective January 1992.

In March 1989, Dakota County passed an ordinance that prohibits the commingled collection of yard waste and refuse, recyclables and refuse, and the landfilling of yard waste after August of 1989. Also in 1989, many of the 35 municipalities receiving County funding for recycling passed local ordinances requiring private haulers to collect recyclables.

In 1988 the Minnesota State Legislature amended the Waste Management Act to ban the landfilling of yard waste in the Metro Area effective January 1990. In September 1991, the Metropolitan Council, which represents the seven-county Metro Area surrounding the Twin Cities, established a recycling goal of 50 percent by 2000.

During the 1980s, numerous drop-off and buy-back centers throughout Dakota County collected recyclables, yet volumes generated were small. Since 1985 Dakota County has funded community

landfill abatement activities. Each community received one dollar per household, funded through a landfill surcharge fee, to initiate or improve and expand recycling and composting programs. The Metropolitan Council (which represents the seven Twin Cities counties) has also provided Dakota County funding to support municipal recycling activities. In 1986 the Metropolitan Council provided communities eligible for County recycling funds at the rate of $0.50 per household. Communities that reported their source-separated recycling tonnages to the County also received an extra $4 per ton from the Metropolitan Council.

In 1988 Dakota County approved a Recycling Implementation Strategy that provided guidelines for communities to begin curbside recycling programs. In 1989 the seven county Metro Council created a Local Recycling Development Grant Program to organize and fund recycling activities. All haulers were charged a $10 per ton surcharge at the landfill in addition to a tipping fee. Revenues, averaging between $5 and $6 million per year, were divided between recycling and landfill cleanup programs in the seven county area. In 1990 Dakota County landfill surcharges totalled $4,995,000; the County kept $4,301,214 and distributed $296,346 to other counties in the Metropolitan Area. The remaining money will be distributed to other metropolitan area counties. The surcharge provided ample start-up funds for expanded recycling efforts in Dakota County, and no public debt was incurred. As landfill abatement activities increased, however, the total amount collected through landfill surcharges decreased. Late in 1989, legislation extended the State sales tax to include waste collection services. A portion of this tax was transferred to counties specifically for landfilled abatement. In 1990, $388,071 raised through the State sales tax was directed towards solid waste abatement activities in Dakota County.

Curbside recycling was implemented in Dakota County in April 1989. All refuse haulers in the County were required to collect newspaper, glass, aluminum and ferrous cans, and yard waste from single-family households. By the end of 1990 curbside collection extended to all 30,000 multi-unit residences in the County. Corrugated cardboard, as well as HDPE, PET, and other plastic containers with a neck, were added to the curbside program in June 1991.

In January 1990, button and household batteries were collected from the municipalities of Farmington, Hastings, and Rosemount and disposed of as household hazardous waste. In March 1991, Dakota County established one permanent household hazardous waste facility, which is open one Saturday each month; two more will be added by the end of 1991. Residents may recycle household hazardous wastes three times per year at County one day drop-off sites.

In April 1989, the County established the Recyclables Collection Center, a central processing and marketing facility. Recycle Minnesota Resources (RMR) a private for-profit company received the contract to operate and maintain this facility and to market materials. Revenues from the recyclables were to be shared: 60 percent to the County and 40 percent to the vendor. In 1991 two private facilities were constructed and began operations. These facilities, one operated by BFI and the other by Knutson Rubbish, accept recyclables from other haulers.

In 1989 the County passed an ordinance prohibiting the commingled collection of yard waste and refuse, and placed restrictions on landfilling yard waste. All haulers in the County were required to provide residents with curbside collection of source-separated yard waste. Haulers now bring yard waste to one of five compost sites in the County. In 1991 the County mandated source-separation of Christmas trees.

Dakota County relies on the private sector to provide collection service for source-separated recyclables. In 1990, to partially offset the costs of collection, haulers were paid $643,873 by cities through the Dakota County commercial landfill abatement funding assistance program. The County pays haulers an average of $30 to $35 per ton (based on market rates) for recyclables delivered to the processing center. (In 1990 the County paid $358,428 to private haulers.) The County's programs have allowed for flexibility so that communities can design and implement their own programs. A subcommittee of the Solid Waste Management Agency Advisory Committee formed a Long-Range Funding Task Force to recommend new County funding policies.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	April 1989
Service Provider:	Over 35 private haulers collect recyclables in 30 cities and townships. One city has municipal collection, and two cities contract with private haulers for collection.
Pick-up Frequency:	Weekly
Same Day as Refuse:	Varies by city
Households Served:	65,000 in single-family households in 1989, 70,000 in single-family households and 10,000 in multi-unit buildings in 1990, and 70,000 in single-family households and 30,000 in multi-unit buildings in 1991
Mandatory:	Voluntary for residents; however, most Dakota County communities require all haulers to collect newspaper, aluminum and ferrous cans, and glass food and beverage containers. All haulers in the County have complied with the requirements. In June 1991, the County added HDPE, PET, other plastic containers with a neck, and corrugated cardboard to its list of required materials for collection.
Participation Rate:	70 percent in 1989, 75 percent in 1990 (based on hauler collection surveys showing at least one set-out per month)
Materials Collected:	In 1988 newspaper, glass food and beverage containers, aluminum and ferrous cans, corrugated cardboard were collected. In June 1991 haulers also began to collect HDPE, PET, and other plastic containers with a neck. Most haulers also collect white goods for a fee. In 1990 some haulers expanded the materials collected to include high-grade paper, lead-acid batteries, and oil; in 1991 some also collected mixed paper and magazines. However, the County did not require these additional materials to be collected.
Set-out Method:	All cities provide residents with a 21-gallon container. These containers hold three paper bags: one for aluminum and ferrous cans and plastics, one for glass, and one for newspaper. Newspaper can also be placed loose beside the bags. Cardboard is bundled separately and placed next to the bin. One hauler, Waste Management Inc., collects all materials commingled except newspaper and cardboard.
Collection Method and Vehicles:	Some haulers have modified their vehicles to collect recyclables. Most haulers have specialized recycling vehicles.
Economic Incentives:	Cities and towns in Dakota County have independently developed their own recycling programs with funding from the Landfill Abatement Assistance Program. Some recycling coordinators have introduced lotteries; residents are eligible for a weekly drawing if they set out materials at curbside. In 1991 these lotteries were stopped because they did not appreciably increase participation.

Economic Incentives: (cont'd)

In 1990 some haulers offered a discount on refuse collection rates, averaging 10 percent, to residents who recycled a minimum of once per month. By the end of 1990 all haulers offered residents variable refuse rates. Some haulers offer a choice of 30-, 60-, or 90-gallon containers, some charge for the number of containers set out at curbside; some charge for each garbage bag set out. The City of Farmington will begin to charge weight-based refuse rates in January 1992.

In addition to County payments for recyclables, some cities and townships pay haulers additional subsidies of up to $30 per ton.

Enforcement:

Haulers can refuse to pick up recyclables if materials are incorrectly set out at curbside.

Annual Tonnage:

13,346 tons in 1990

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:

Source separation is not required for commercial enterprises. In January 1991, recycling of three unspecified materials became mandatory in public schools. An amendment to the Minnesota Waste Management Act stipulates that new or significantly remodeled buildings of more than 1,000 square feet must provide adequate space for the separation, temporary storage, and collection of recyclable materials.

Service Provider:

Private waste haulers; the three largest are BFI, WMI, and Knutson Rubbish.

Number Served:

The County government does not know the number of businesses receiving curbside collection of recyclables. A conservative estimate is that 30 percent, or 13,000, of Dakota County's businesses and institutions recycle through either drop-off or curbside programs. While many smaller businesses use the drop-off centers, larger businesses contract with private haulers to collect materials.

Type Served:

Strip malls, office buildings, schools, restaurants, grocery stores

Materials Collected:

Newspaper, corrugated cardboard, high-grade and mixed paper, glass food and beverage containers, aluminum and ferrous cans, and HDPE, PET, and other plastic containers with a neck

Pick-up Frequency:

Frequency of collection varies widely from daily pick-up to an as-needed basis. Most businesses receive weekly pick-up.

Set-out and Collection Method:

BFI customers collect paper in bags, which are then placed in a dumpster or small roll-off container with all other materials, including corrugated cardboard. Knutson Rubbish requires customers to bag paper and cardboard in separate clear plastic bags, and to put all other recyclables commingled in dumpsters. WMI requires customers to place paper and cardboard in one dumpster and all other materials commingled in another one.

Incentives:

Some haulers charge a lower fee (or no additional fee) for recycling collection than for refuse collection.

Enforcement: Not applicable

Annual Tonnage: 27,748 tons; most of which was collected by waste haulers

In 1986 Dakota County initiated an office paper recycling program in County buildings. Staff brought the paper to central storage locations, and vendors would collect the paper on an as-needed basis. By 1990 the program had expanded to include glass, beverage cans, plastic containers with a neck, newspaper, and magazines. A crew made up of of juveniles ordered by the court to make restitution to aggrieved parties, collect these materials under the supervision of the Court Services staff. A portion of the juveniles' wages is used towards their restitution payments.

Drop-off Centers

Number and Type: Numerous drop-off centers, buy-back centers, and scrap yards are located throughout Dakota County. There are 75 drop-off sites where residents can bring button batteries for recycling.

Public or Private: Private. The Dakota County Recyclables Collection Center (RCC) is privately run but publicly owned.

Sectors Served: Residential and commercial

Materials Accepted: Residents can drop off the same materials collected at curbside at the Recycle Minnesota Resources Redemption Center or the Dakota County RCC; both these facilities pay for aluminum cans and glass. At three sites, Goodwill/Easter Seals has placed a trailer for collection of plastic containers, aluminum cans, ferrous cans, cardboard, newspaper, office paper, household items, clothes, eyeglasses, and toys. A number of waste haulers, churches and schools in the County operate drop-off centers that collect one or more of the following materials: newspaper, aluminum cans, ferrous cans, high-grade paper, cardboard, and glass. Many businesses accept used motor oil, which is burned primarily as a fuel source, and car batteries. Several businesses also accept tires for a fee. Tires are burned as a fuel source. Residents can drop off appliances for a fee at 10 sites in the County, including appliance stores and landfills. Four sites accept construction and demolition debris. Steel drums are salvaged and reconditioned at Barrel Reconditioner.

Annual Tonnage: In 1989 drop-off sites throughout the County collected 4,398 tons of recyclables. In 1990, 5,630 tons were collected.

Salvage/Reuse

Charities and second-hand stores located in the County, such as Goodwill and the Salvation Army, recover a variety of household items. Dakota County estimates that it recovered 1,743 tons of household items and clothing through these centers in 1990.[1]

Construction & Demolition Debris Recovery

In 1990 it was estimated that 3 landfills and 10 businesses recovered construction and demolition debris in the County. Although the County does not track tonnages recovered, a wide variety of materials is recovered. For example, SKB Demolition Landfill, a subsidiary of Carl Bolander & Sons, charges $4.50 per cubic yard for clean or mixed loads of C&D debris. It recovers wood waste, stumps, pallets, and clean wood from demolition and construction sites. These materials are processed into a mulch product sold to landscapers and residents. An estimated 20,000 tons of mulch were recovered in 1990. SKB also crushes concrete, brick, and stone on site into smaller pieces, which are further processed at the Company's processing plant in neighboring Ramsey County. The resulting materials are used as a road base. Reinforcing rods removed at the processing plant are sold as scrap metal. At the Dawnway Demolition Landfill, recovered concrete is recycled into gravel and asphalt is recovered and used to surface new roads.

Processing and Marketing of Recyclables

Dakota County established the Recyclables Collection Center (RCC) in April 1989. The County leased the building from R.L. Johnson Co., purchased the processing equipment, and selected Recycle Minnesota Resources, Inc. (RMR) to operate and maintain the facility. RMR is also responsible for marketing newspaper, high-grade office paper, corrugated cardboard, glass, aluminum and ferrous cans, and HDPE, PET, and other plastic containers with a neck. RMR began accepting plastic beverage containers in June 1990. Approximately two-thirds of County haulers brought 11,061 tons of residential materials to the Center in 1990. Dakota County pays haulers between $30 and $35 per ton based on market rates for these materials. The remaining haulers bring sorted or unsorted materials directly to various markets. In 1991 two private facilities, one operated by BFI and the other by Knutson Rubbish, began operations. These facilities only accepted recyclable materials from their own haulers in 1990, but expanded in 1991 to include other haulers.

The 22,860-square-foot RCC building includes space for processing and storing recyclables, administration and education, and a buy-back center for County residents. No outside storage is permitted on the facility's 2.5 acres. Three full-time and several part-time employees process the recyclables approximately 307 days per year. The processing facility, designed to process 20 tons per day, processes approximately 40 tons per day. Less than 1 percent by weight of recyclables are rejected during processing and landfilled. Newspaper, corrugated cardboard, aluminum and ferrous cans, and plastic are baled separately. Up to 10 percent of the paper is shredded and baled for animal bedding. A can separator divides steel and aluminum cans. In 1989 operating costs for the RCC totalled $35 per ton, excluding payments to haulers. Dakota County tries to secure diverse markets for its recyclables, rather than depending on a few markets. The County assists RMR in developing new market opportunities.

Local farmers buy bales of shredded newspaper for animal bedding. Minnesota scrap processors, such as Performance Computer Forms, Waldorf Corporation, Metro Paper Recovery, Pioneer Paper Stock, and Rohn Industries, purchase newsprint, high-grade paper, and cardboard. Ferrous cans are sold to AMG in Dakota County; aluminum is sold in Pennsylvania, Texas, Kentucky, and Indiana. Plastic is sold to Avon Corporation in Minnesota for manufacture into plastic products such as car bumpers. Some tires are manufactured into crumb rubber; others are being tested for use in asphalt roads.

Procurement

The County is required to purchase recycled or reusable materials for government offices as long as the cost does not exceed 10 percent of the purchase price of unrecycled materials. County policies on procurement are being expanded in 1991, and will concentrate on setting a specific recycled content standard for office paper purchases.

Composting Activities

Because haulers are prohibited from landfilling yard waste or commingling yard waste and refuse during collection, they must provide curbside yard waste collection from April through November. Residents, landscapers, and haulers can drop off leaves, grass clippings, garden waste, and prunings up to 6 inches in diameter at one of the five compost sites in the County year-round. In 1990 haulers collected 14,105 tons of yard waste and 8 tons of Christmas trees through the curbside program, while residents and landscapers dropped off 2,489 tons at the compost sites. A total of 16,602 tons was collected in the County through the yard waste programs in 1990.

Dakota County's "User Fee Schedule" encourages collection of loose yard waste. In 1990 the County charged haulers a higher tipping fee ($5.50 per cubic yard) for bagged yard waste than for loose waste ($3.50 per cubic yard). At the three County-owned compost sites, residents and landscapers were also charged variable rates depending on whether material was brought in loose or bagged. Landscapers were charged $3.00 per cubic yard for brush, $5.50 per cubic yard for bagged yard waste, and $3.75 per cubic yard for loose material. Residents were charged $2.00 per cubic yard for brush, $0.15 per bag of yard waste, and $3.75 per cubic yard for loose material.

Dakota County holds backyard composting workshops for residents. At these workshops it stresses the composting of vegetative organics in addition to yard waste. In the spring of 1991, the County sponsored two 1-year pilot backyard composting projects, one in Apple Valley and one in South St. Paul. In Apple Valley, one 45-gallon compost bin per family was provided to each of 100 families; in South St. Paul, bins were sold to 100 families at one-fourth of the bin's cost. To determine the success and cost effectiveness of the program, participants were asked to fill out a questionnaire when they received their bins; the County will also send a follow-up questionnaire at the end of 1991. The County asked participants questions such as the extent of their composting experience, the size of their lot, and how much yard waste and other vegetative organics they set out at curbside.

Curbside Collection

Start-up Date:	April 1989 (for countywide collection)
Service Provider:	All waste haulers in the County
Households Served:	65,000 in 1989, 70,000 in 1990
Mandatory:	Voluntary for County residents; however, Dakota County requires all waste haulers to collect source-separated yard waste.
Materials Collected:	Leaves, grass clippings, brush, and Christmas trees
Set-out Method:	Yard waste can be either loose or bagged. Although Dakota County encourages collection of loose yard waste and charges haulers more for bagged waste, most waste is brought bagged to the County compost site.
Collection Vehicles and Method:	Compactor trucks
Collection Frequency:	Weekly from April to November for yard waste. Christmas trees are collected during the first two weeks of January.
Economic Incentives:	None

Composting Site

Five composting sites are located in Dakota County. Two, located in the Cities of Lakeville and South St. Paul, are County-owned processing sites operated by R.D. Pecar & Co. under contract with the County. A third County site, also operated by R.D. Pecar & Co., is located in the City of Eagan at a transfer station; yard waste collected there is transferred to the Lakeville site. The two other sites are associated with landfills. Both residents and landscapers can drop off yard waste at the three County-owned sites; haulers can bring materials to the two County yard waste processing centers. All users pay cubic yard fees based on the "User Fee Schedule." Less than 1 percent of the material brought to the site is rejected and landfilled.

Operators empty bagged yard waste and mix it with native soils (to increase bulk density) and with water. Mixing of materials occurs as yard waste flows through a series of conveyors and passes through "clump-breaker" type shredders. This mixture is stockpiled in piles averaging 32 feet high. The process is repeated after 6 weeks and again when the second screening pile is reduced to 70 percent of its volume. Brush, screened out during compost processing, is remixed with subsequent batches of yard waste. Larger brush, prunings, and Christmas trees are chipped as mulch. A finished product is available after a 4-week curing period. Residents can collect up to 1/4 cubic yard of compost free of charge. Landscapers and residents can purchase quantities over 1/4 cubic yard for $8 per cubic yard. Compost is used as a soil amendment and mulch. At the County-owned sites, 1,684 tons of brush and 9,367 tons of other yard waste were composted and shredded in 1990.

The County received odor complaints at one time from a housing development 1,320 feet from the facility when a static pile was moved.

The Metropolitan Council is funding a pilot composting project in Rosemount. Leaves, yard waste, and telephone books, in different combinations, are composted in a 20-foot-wide by 200-foot-long pit contained in a greenhouse. A "Compostamatic" turns the compost when it reaches a temperature of 140 degrees Fahrenheit. Compost is complete in approximately 6 weeks depending on the materials used. This compost is currently undergoing testing and is not yet sold.

Amount and Breakdown of Materials Recovered

Material	Residential (Tons, 1990)	Commercial/ Institutional (Tons, 1990)	Other (Tons, 1990)	Total (Tons, 1990)
Newspaper	10,922	0	–	10,922
Corrugated Cardboard	62	6,529	–	6,591
High-grade Paper	0	6,273	–	6,273
Mixed Paper	0	12,345		12,345
Glass	3,074	315	–	3,389
Plastic Containers*	55	NA	–	55
Aluminum Cans†	†	204	–	204
Ferrous Cans†	1,174	0	–	1,174
Appliances/White Goods	1,334	269	–	1,603
Other Metal	96	1,321	–	1,417
Tires‡	516	137	–	653
Lead-Acid Batteries§	NA	355	–	355
Other**	1,743	0	–	1,743
Subtotal MSW Recycled	**18,976**	**27,748**	–	**46,724**
Yard Waste	14,105	0	–	14,105
Landscapers' Waste	–	–	2,489	2,489
Christmas Trees	8	0	–	8
Subtotal MSW Composted††	**14,113**	**0**	**2,489**	**16,602**
Total MSW Recovered	**33,089**	**27,748**	**2,489**	**63,326**

Notes: Listed tonnages represent collected material. Less than 1% by weight of recyclable materials brought to the County processing facility are disposed of as residue. Dakota County collected 11 tons of household hazardous waste for separate disposal. This tonnage is not included.

*Includes HDPE and PET containers, and any other plastics with a neck.

†Ferrous cans recovered from the residential sector include aluminum and bimetal cans.

‡1,720 tons of tires were collected from the residential sector in 1990. 516 tons were recycled into crumb rubber and 1,204 tons were burned as a fuel source.

§Lead-acid batteries are collected for recycling. Residential tonnages are not tracked.

**Other includes household items recovered through local charities such as toys, clothing, and books.

††16,594 tons of yard waste were brought to the five compost sites. Landscapers brought approximately 15 percent of this yard waste, or 2,489 tons, to the compost sites. Yard waste includes brush, grass clippings, and leaves. 9,367 tons of grass clippings and leaves and 1,684 tons of prunings were delivered to the two County-owned sites. Based on a County estimate of 15.1 pounds per tree, private haulers collected 1,060 Christmas trees in 1990.

Source Reduction Initiatives

All Dakota County's haulers charge volume-based refuse rates. In 1992 Farmington (the only municipality in the County with municipal collection) will be one of the first North American cities to implement weight-based refuse rates for residential customers. Volume- or weight-based refuse rates are a direct economic incentive for residents to generate as little waste as possible.

The City of Farmington has outfitted two of its refuse trucks with a hydraulic weighing system produced by Wray-Tech. Farmington will provide 90-gallon containers to residents and 300-gallon containers to commercial businesses for the pilot project slated to run from June through December 1991, and plans to begin charging residents weight-based refuse fees in January 1992. The driver of the refuse truck will direct the gripper arm to hydraulically lift and dump refuse into the truck. A pressure transducer, located on the gripper arm, will measure the weight and automatically record it on a computerized route list within a data base.

Publicity and Education

All Dakota County's cities, suburbs, townships, and rural communities have included plans for educational and publicity programs in their recycling program funding applications. Dakota County has implemented a strong recycling outreach program, including a hotline, a speaker bureau, school activities, posters, billboards, newspaper ads, mailings, workshops, meetings, tours of the Recyclables Collection Center, and assistance to other state and county governments. The County also publishes a recycling directory that lists all County drop-off sites.

Recycle Minnesota Resources, Inc. provides tours to school groups and has designated a room at the processing facility for educational purposes.

Economics

Costs Cover: Capital costs cover the County's cost for equipment used to process 11,061 tons of residential recyclables at the Recyclables Collection Center (RCC). Operating and maintenance (O&M) costs include (1) payments to local municipalities for the collection of residential recyclables and compostables (33,835 tons in 1990), including payments for recyclables and subsidies paid to private haulers, (2) payments to local municipalities for program administration, and (3) County administrative and education/publicity costs. O&M processing costs cover the County's payment to contractors for processing recyclables brought to the RCC and 11,051 tons of yard waste brought to the two County composting sites and one yard waste transfer site. Private haulers collect recyclables and yard waste in all but one city. These private capital and operating costs are not available.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
Ford 1-ton Truck*	$7,750	Recycling	1990

*In 1990 Dakota County purchased a used truck for its office paper collection program.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
2 Balers @ $50,000 & $15,000	$65,000	Recycling	1989 & 1990
Baler*	12,000	Recycling	1989
Front-end Loader	24,000	Recycling	1989
Forklift	18,000	Recycling	1989
8 Hoppers, 4 @ $569, 4 @ $1,234	7,212	Recycling	1989
12 55-gallon Containers @ $83	996	Recycling	1989
Baler Conveyor	6,000	Recycling	1989
Gravity Box	3,000	Recycling	1989
Air Compressor	300	Recycling	1989
2 Scales @ $4,000 & $30,000	34,000	Recycling	1989 & 1990
Pallet Jack	400	Recycling	1989
Perforator	12,000	Recycling	1989
Granulator	10,000	Recycling	1989
2 Shredders @ $11,500*	23,000	Recycling	1989
2 Conveyors for Animal Bedding @ $3,500*	7,000	Recycling	1989
Video Camera for Scale	1,500	Recycling	1990
Concrete Dividers	4,000	Recycling	1990
Unloading Bins for Glass	3,000	Recycling	1990
3 Conveyors†	NA	Composting	NA
6-foot Trommel Screen†	NA	Composting	NA
Clump Breaker†	NA	Composting	NA
Tub Grinder†	NA	Composting	NA
Seppi Tree/Brush Chopper†	NA	Composting	NA
Skid-steer Loader†	NA	Composting	NA
Front-end Loader†	NA	Composting	NA
John Deere 450 Trackdozer†	NA	Composting	NA

*Dakota County purchased listed equipment and paid it off in full through landfill surcharge fees and grants it received from the Metro Council. RMR purchased all other recycling equipment.

†Equipment purchased and owned by R.D. Pecar & Co.; purchase prices and years acquired are not available.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$2,338,122**	–	–
Collection*	$643,873	–	–
Municipal Funding*	437,821	–	–
Processing†	895,428	11,061	$81
Administration	280,000	–	–
Education/Publicity	81,000	–	–
Composting Subtotal	**$420,782**	**11,051**	**$38**
Collection‡	$0	11,051	$0
Processing§	360,782	11,051	33
Administration	50,000	11,051	5
Education/Publicity	10,000	11,051	1
Recycling & Composting Total	**$2,758,904**	–	–
Collection	$643,873	–	–
Municipal Funding	437,821	–	–
Processing	1,256,210	22,112	$57
Administration	330,000	–	–
Education/Publicity	91,000	–	–

Note: Costs given above represent costs to Dakota County only.

*Collection costs and municipal funding for recycling programs are funds paid to municipalities for recycling activities. These include community subsidies of $643,873 paid to private haulers for recycling collection and funding for local programs. (Some of the funds distributed cover tons collected and delivered to processing centers other than the RCC.) Dakota County provides funding to municipalities based on population. In 1990 municipalities with populations greater than 5,000 received $3,888 or $0.70 per household, whichever is greater. Municipalities smaller than 5,000 receive $0.70 per household plus $388.

†Processing costs for recycling are (1) Recycle Minnesota Resources contract fee of $372,000, (2) $358,428 in hauler payments for recyclables at the RCC, and (3) $165,000 paid in rent for the processing facility.

‡Collection costs for yard waste are covered by private haulers

§Composting processing costs are (1) the County contract fee of $343,632 paid to R. D. Pecar and Co., which operates the two County-owned yard waste composting sites, based on an estimate of fixed costs and processing costs, and (2) transfer and transportation O&M costs totalling $17,150.

Materials Revenues: $408,400 ($400,000 in revenues for the sale of recyclables brought to the RCC; Dakota County retained $240,000. R.D. Pecar received $8,400 from compost sold at the County's two sites)

Source of Funding: The Metropolitan area funds its recycling and composting programs through the Landfill Abatement Program and the sales tax on waste collection services. In 1990 Dakota County Landfill Abatement surcharges totalled approximately $4.9 million. The County retained $4,301,214 of this, and distributed $296,346 to other Counties. (Not all of the money collected was distributed.) The Metro Council Landfill Abatement surcharges brought $73,901 to Dakota County in 1990. Statewide the 6 percent sales tax on garbage collection returned $388,071 to the County during 1990.

Full-time Employees:	4 County employees work in administration. Three and one-half full-time equivalent employees work at the composting sites.
Part-time Employees:	14 (2 Dakota County interns and 12 city employees funded through County grants.)

Future Solid Waste Management Plans

In 1991 Dakota County developed a commercial recycling strategy to increase recovery rates in business establishments. This plan calls for one full-time and one part-time staff person to train recycling coordinators to perform waste audits and help businesses set up recycling programs. The County also plans to expand the Recyclables Collection Center to process magazines, more types of plastics, and increased amounts of corrugated cardboard. In 1991 a waste hauler began collection of food waste from area restaurants for composting. That year the County adopted ordinances which mandated source separation of Christmas trees at landfills in Dakota County regardless of the trees' origins.

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Dakota County Solid Waste Management, Recycling Implementation Strategy, Dakota County, MN, November 1988.

Dakota County Solid Waste Master Plan. Dakota County, 1987.

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Endnotes

[1]While charities and shops throughout the county salvage these materials, most municipalities do not track these tonnages.

King County, Washington*

Demographics

Jurisdiction: King County

Population: 991,060 in 1990 (excluding Seattle's population, which was 516,000 in 1990)

Area: 2,038 square miles (excluding Seattle, which has an area of 92 square miles)

Total Households: 379,090 (261,270 in single-family residences, approximately 44,470 in buildings with two to nine units, 70,980 in buildings with ten or more units, and 2,370 in mobile home and other dwellings). Households in Seattle are not included in these figures.

Total Businesses: Approximately 49,000 businesses (excluding businesses in Seattle)

Brief Description: King County is located in the northwestern corner of Washington State. Its population is divided evenly among Seattle, suburban centers, and unincorporated areas. It contains a total of 31 incorporated municipalities, 5 of which are rural, and the remainder are suburban/urban; 92 percent of the population lives in urban/suburban cities and unincorporated areas, 8 percent live in rural areas. The county's 1990 median household income was $37,500.

*The City of Seattle, which is located in King County, withdrew from King County's solid waste management system in June 1991. Seattle currently disposes of its waste in Arlington, Oregon. The County's goal of 65 percent waste reduction by the year 2000 does not include tonnages recovered and disposed from Seattle. For this reason, the data presented in this case study cover County programs, excluding the City of Seattle, except where otherwise indicated. For more information on Seattle's waste disposal and recovery activities, see the Seattle case study in Volume III of this report.

Solid Waste Generation and Recovery

Annual Tonnages Excluding Seattle (1990)

	Residential	Commercial/ Institutional	Self-Haul*	Total MSW
Recovered	**125,386**	**193,967**	**86,429**	**405,782**
Recycled	77,328	159,439	68,471	305,237
Composted	48,058	34,528	17,958	100,545
Disposed†	**520,723**	**347,149**	**96,430**	**964,302**
Incinerated	0	0	0	0
Landfilled	520,723	347,149	96,430	964,302
Generated	**646,109**	**541,116**	**182,859**	**1,370,084**

Percent by Weight Recovered

Recovered	**19%**	**36%**	**47%**	**30%**
Recycled	12%	29%	37%	24%
Composted	7%	6%	10%	6%

Notes: Tonnages for King County (excluding Seattle) were provided by the State Department of Ecology. A total of 102,850 tons of pre-consumer ferrous scrap and auto hulks (which are not considered MSW or C&D) are not included in the above figures.

Due to rounding, numbers may not appear to add total.

Construction and demolition debris is disposed of by private haulers outside of the County. The King County Solid Waste Division estimates that 1.6 million uncompacted cubic yards of construction and demolition debris are generated each year in King County. There are some private recyclers of construction debris in the County, but the tonnages they recycled are not available.

*Self-haul tonnages are those brought to drop-off sites and drop-boxes. The State estimates that 80 percent of this material is brought by the residential sector, and the remaining 20 percent is brought by the commercial/institutional sector.

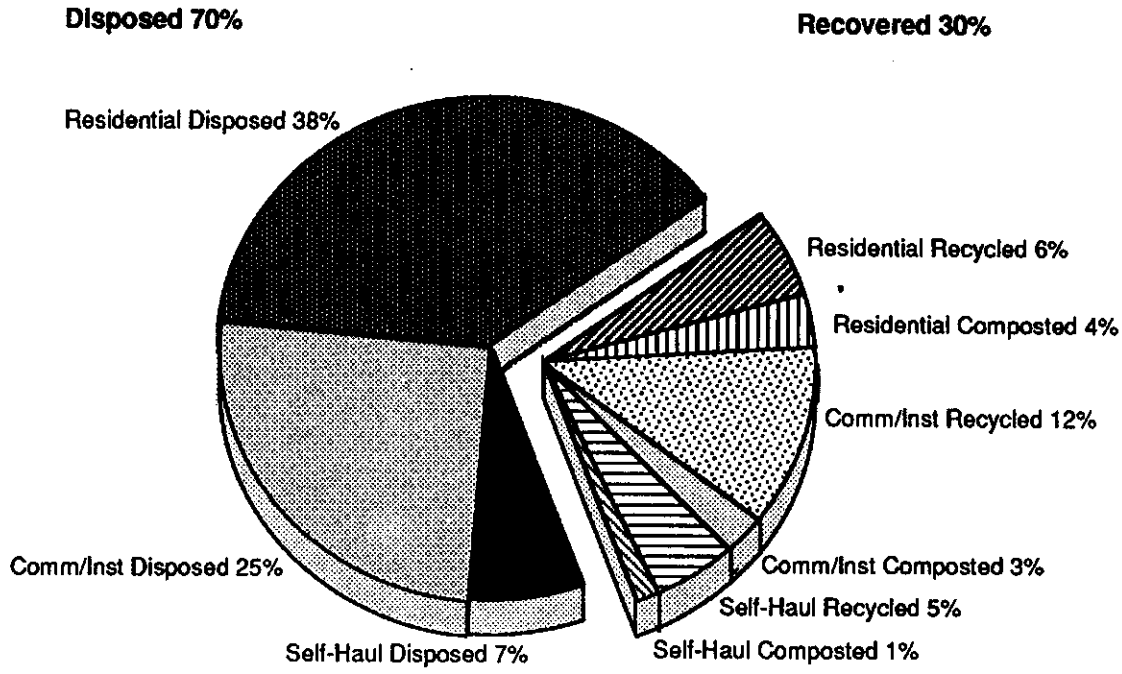
†Tonnage for residential, commercial/institutional, and self-haul waste disposed was estimated by the County based on the assumption that 10 percent of total MSW disposed was from self-haul sites, and 60 percent of the remaining tonnages was residential.

Landfill/Transfer Station Tipping Fees: $47.00 per ton in 1988, 1989 and 1990; due to increase to $66.00 in 1992

Refuse Collection and Disposal: Refuse haulers in King County are regulated by the Washington Utilities and Transportation Commission (WUTC) or municipalities, and operate within specific franchise areas. In some cities, the municipality contracts out service; in other cities, the rates are set by the WUTC and haulers charge residents directly for service. In unincorporated areas, haulers charge residents directly for service.

Collection rates vary between cities and unincorporated areas, from city to city, and between franchise areas. Single and multi-unit buildings in the unincorporated areas also have different rates. Volume-based variable can rates are used throughout the cities and unincorporated areas. For example, monthly refuse/recycling rates in unincorporated areas range from $5.60 to $8.05 for a mini-can (approximately 20 gallons), $7.47 to $11.65 for one 32-gallon trash can or toter, and $9.72 to $17.20 for two 32-gallon trash cans or one 60-gallon toter.

Municipal Solid Waste Recovered and Disposed (Percent by Weight, 1990)



Note: Due to rounding, numbers do not add to 100%.

Refuse Collection and Disposal (cont'd):

In both cities and unincorporated areas, rates vary depending on the existence of curbside recycling and/or yard waste collection programs. In many cities, residents pay for recycling and yard waste collection in addition to refuse collection. In most cities, residents are charged a combined garbage/recycling rate.

All solid waste generated in King County except construction and demolition refuse is disposed of in County landfills. The Solid Waste Division operates five landfills and six transfer stations. In 1990 the largest County landfill, the 920-acre Cedar Hills Regional Landfill, accepted 97 percent of the County's waste, while the four rural landfills (Cedar Falls, Hobart, Vashon, and Enumclaw) accepted 3 percent. The Cedar Falls landfill was closed in 1990. Hobart and Enumclaw are to be replaced by transfer stations by 1994. The Vashon landfill will be replaced by a new landfill on the same site.

The private landfill that accepted construction and demolition debris closed in 1991. In December 1991 the County signed contracts with two large facilities located outside of the County to handle construction and demolition waste: Rabanco Regional Landfill and Washington Waste System, Inc.

Refuse Collection and Disposal (cont'd):

Seattle's withdrawal from the County's solid waste disposal system in June 1991 has increased the projected life of the Cedar Hills landfill to the year 2022. Formerly, Seattle accounted for approximately one-third of all materials disposed in the Cedar Hills landfill.

Materials Recovery Overview

Goals and Legislative Requirements:

With its 1986 Ordinance 7737, King County resumed the role of solid waste planning authority for the County. (The Puget Sound Council assumed this task for an interim few years.) All cities in the County, except Seattle and Milton, entered into a Solid Waste Interlocal Agreement that established the County's authority to prepare a comprehensive solid waste management plan. Under the Interlocal Agreements, the County assumed responsibility for solid waste management, planning, and technical assistance to cities. While the County has control over all nonrecyclable refuse, cities are authorized to provide solid waste collection themselves. The County has solid waste management responsibility for unincorporated areas.

In January 1988, County Ordinance 8383 initiated a process of evaluating waste reduction and recycling as integral components of the County's solid waste management plan. Ordinance 8771, passed in December 1988, established ambitious goals for municipal solid waste reduction and recycling: 35 percent by 1992, 50 percent by 1995, and 65 percent by the year 2000, and required the County to develop a solid waste management plan to meet State requirements. County goals concern MSW materials only, and exclude C&D debris and auto hulks.

In July 1989, King County responded to the requirements of the 1989 Waste Not Washington Act and the County with a proposed Comprehensive Solid Waste Management Plan (CSWMP). The CSWMP establishes County and municipal requirements for residential and commercial recycling programs, market development and procurement programs, and education programs. The County is in the process of updating the 1989 plan, and intends to issue a new plan in Spring 1992.

The King County Solid Waste Division operates the Cedar Hills Regional Landfill, the largest landfill in the State, and manages an array of waste reduction and recycling programs.

Comprehensive solid waste management planning in King County was initiated with the passage of the Comprehensive Solid Waste Management Act in 1969. In 1970 the King County Policy Development Commission recommended interim policies for solid waste disposal. The Commission considered recycling, incineration, and landfilling; its final recommendation was to continue landfilling. The County began a comprehensive planning process in 1971. In 1974 the River Basin Coordinating Committee completed the preparation of a solid waste plan, and in 1982 the Puget Sound Council of Governments updated this plan.

In 1986 King County Ordinance 7737 established the process for adopting the 1989 King County Comprehensive Solid Waste Management Plan. Each city in the County was given the option to plan independently or jointly with the County, or to authorize the County to prepare the plan for the city. In October 1988, the City of Seattle notified the County that it would withdraw from the County

disposal system and implement an independent, "non-King County" disposal system. Seattle withdrew from the County solid waste management system on June 1, 1991, and now uses a landfill in Oregon.

In 1988 King County adopted aggressive waste reduction and recycling goals (see above), which established waste reduction and materials recovery as the County's primary waste management strategy. These goals were adopted after almost a full year of intensive review and input by citizens, government officials, and the solid waste industry. In order to meet its goals, the County in 1989 proposed its Comprehensive Solid Waste Management Plan, which establishes County and city requirements for materials recovery activities. Under the plan, cities are required to (1) ensure curbside collection of certain recyclable materials from single-family and multi-unit residences, (2) implement collection programs for both residential and nonresidential yard waste, (3) monitor progress toward waste reduction goals, (4) implement rate structures for garbage collection services, (5) adopt procurement policies for the purchase of goods made from recyclable or recycled material, and (6) adopt requirements that new construction provide adequate space for recycling collection system. The County must fulfill all these same responsibilities as well as provide collection of recyclables and yard waste, in the form of convenient drop-box or buy-back systems, in all rural areas; provide nonresidential technical assistance programs for the development of recycling and composting programs; and provide educational programs in schools and communities. Cities have the option of implementing nonresidential technical assistance programs themselves, or letting the County do so. If a city elects to implement these programs, King County will provide funding proportional to the size of the program.

Twenty-nine of the County's 31 cities have elected to be part of the King County solid waste planning area. By September 1991, 17 of King County's municipalities, representing 67 percent of the population of the County's incorporated areas, had begun household recycling programs; and 27 had variable can rates.

Mercer Island, located in Lake Washington, has an examplary residential recycling program. With a 1991 population of 21,190, Mercer Island recovered 3,609 tons of the 9,040 tons of waste generated from one- and two-family households, equivalent to 40 percent of its waste stream, through curbside recycling and yard waste collection in 1990. From January to June 1991, Mercer Island's one- and two-family households recovered 51 percent, or 2,320 tons, through recycling and composting its waste stream. Yet it was not until October 1989 that Mercer Island's contracted refuse hauler, Eastside Disposal Service, offered curbside collection of recyclables. Eastside began collecting yard waste, including grass clippings and brush, in April 1990. The Island has also operated a recycling drop-off center for the last 18 years, where it collected 1,255 tons of recyclables in 1990. Drop boxes for newspaper are located in church parking lots and elsewhere throughout the Island. One hundred and sixty four tons of newspaper were collected through these boxes in 1990. Materials are taken to the Rabanco processing center in Seattle.

In 1990 the County was recovering 30 percent of its waste stream through recycling and composting activities. In order to meet its ambitious recycling and waste reduction goals, the County is investing a considerable amount of money in planning and research activities. In 1990 it spent a total of $1,417,951 on various education and publicity activities; of this, it spent $120,020 on its master composter/recycling program, which trains volunteers to perform recycling outreach. Additionally, it spent $50,000 to research the potential for food waste composting. In May 1991, King County adopted an ordinance enabling franchised solid waste haulers to provide household recyclable collection services to the 460,000 residents of unincorporated urban areas in King County.

Recycling Activities

Residential Curbside Recycling

Start-up Date: Curbside collection programs were implemented in ten of King County's cities in 1989. (Seattle's program began in 1988.) By the end of 1990, curbside programs were initiated in 13 cities. Redmond's program began in March 1990, and Kirkland's program began in April 1990. Kent implemented the first program in January 1989, Bellevue and Renton implemented programs in August 1989, Mercer Island's program started in October 1989. Programs were initiated in January 1991 in Snoqualmie, in August 1991 in Tukwila, and in October 1991 in Normandy Park and Sea-Tac. Plans call for program start-up in March 1992 in Des Moines and the spring of 1992 in Federal Way.

Service Provider: The County is divided into franchise areas. Rabanco, Waste Management, Inc., Lawson Disposal, and RST Disposal are the largest parent companies; each has smaller affiliated companies. For example, Eastside Disposal, an affiliate of Rabanco, services Beaux Arts, Hunts Point, Lake Forest Park, and Mercer Island; Waste Management operates in Bothell, Duvall, Kirkland, and Renton; and RST Disposal operates in Federal Way and Sea-Tac.

Pick-up Frequency: Weekly to bimonthly depending on the program

Same Day as Refuse: Yes, for many programs

Households Served: A figure for the total number of households served is not available. By September 1991, 17 of the County's municipalities, representing 67 percent of the population had curbside recycling programs. Typically, one- to four-unit residences are served through curbside programs. On August 31, 1991, Lawson Disposal began servicing apartment buildings with four or more units in the City of Issaquah. Eastside Disposal offers curbside collection of recyclables on a pilot basis to one apartment complex on Mercer Island. Fibres International collects recyclables from many multi-unit buildings in Redmond; Nick Raffo and Sea-Tac Disposal collect recyclables from multi-unit buildings in Tukwila. The Cities of Bellevue and Federal Way are planning multi-unit recycling service. Multi-unit collection was implemented in unincorporated areas in August 1991.

Mandatory: Recycling is not mandatory for residents; however, cities are required to provide recycling services to residents.

Participation Rate: 80 percent of single-family households (estimated by King County's Recycling Coordinator)

Materials Collected: Newspaper, high-grade paper, corrugated cardboard, mixed paper, glass, aluminum, and ferrous cans. Six cities also collected plastic bottles (PET and HDPE) in 1990. Beaux Arts, Lake Forest Park, Normandy Park, Renton, Clyde Hill, Hunts Point, Medina, and Yarrow Point did not collect plastic containers in 1990. In 1991 Lake Forest Park and Normandy Park began to collect PET and HDPE plastic bottles.

Set-out Method:	Two commingled systems are used in King County. Some cities provide 90-gallon containers for all recyclables. (In 1991 glass was separated from the other materials.) In other cities, a three-bin system is used. Residents are provided with three stackable bins that range in size from 11 to 14 gallons. In most cases, newspapers are placed in one bin, mixed waste paper is placed in another, and glass, tin, aluminum, and plastic are placed in the third.
Collection Method and Vehicles:	Collection method and vehicles used vary from program to program. Materials are generally not sorted by vehicle crews en route. Generally, one crew member operates each vehicle.
Economic Incentives:	In 1990, 27 municipalities had instituted variable refuse rates. These rates give residents an incentive to recycle and to reduce refuse disposed.
Enforcement:	Not applicable
Annual Tonnage:	In 1990, 77,328 tons of recyclables were collected at curbside.

Multi-unit Collection

Some cities have begun to require haulers serving their area to offer recyclables collection to multi-unit buildings. Resident participation in these programs is voluntary. In July 1989, the City of Issaquah began a pilot program servicing multi-unit buildings. Residents deposited recyclables in 90-gallon toters that had an internal rack to separate materials. The toters were picked up twice a month. Although residents participated in the program, the City found that approximately 40 percent of collected materials were contaminated and not recyclable. In July 1991, the City began servicing multi-unit buildings citywide with on-site collection of recyclable materials. The City of Redmond began servicing both single and multi-unit households as of March 1990. North Bend and Snoqualmie also offer recycling to multi-units as of February 1991. Multi-unit collection began in unincorporated areas in August 1991.

In 1989 the City of Tukwila received a planning grant from King County to develop a waste reduction and recycling program. The City used the grant to conduct a pilot recycling program, from June to August 1989, in multi-unit complexes. Although Tukwila has a small residential population of 11,000, approximately 50 percent of all housing units are located in multi-unit complexes.

Tukwila contracted with Sound Resource Management Group, Inc. (SRMG) to conduct surveys and coordinate the pilot program. From a survey of all housing complex managers or owners, two buildings were chosen for the pilot project: a 54-unit apartment building and a 186-unit condominium complex. The 3-month pilot program was designed to make recycling a convenient alternative for residents. Red dumpsters with "Recycling Only" stickers were placed next to green refuse dumpsters. All collected materials were commingled in the red dumpsters. Materials collected included newspaper, mixed paper, corrugated cardboard, glass, aluminum cans, ferrous cans, and plastics. Sea-Tac Disposal Company, Inc., the hauler that provides 95 percent of collection services in the City, provided weekly collection service and dumpsters free of charge for the pilot program.

In addition to the initial survey, SRMG trained the building managers and gave them educational materials, such as descriptive fliers, to distribute to residents. Although participation increased as the pilot progressed, overall participation and collection rates during the program were relatively low. SRMG and the City of Tukwila attributed the difference in participation rates to the education initiatives of the managers. In the apartment complex, the manager took the time to speak to every resident, whereas the condominium complex manager only set out fliers in the mail area. Twelve tons of materials were collected during the pilot. Tonnages varied from 1/2 ton per week at the beginning of the program to 2 or 2 1/2 tons per week at the end of the program. During the 3-month project, there was

an 11 percent overall reduction in the waste stream by weight. It was estimated that a 30 percent diversion rate would have to be maintained for recycling costs to break even with refuse collection costs.

Since the pilot project, the City has conducted public meetings on curbside recycling for multi-unit residences, sent out mass mailings, and contacted the managers of all multi-unit complexes to develop recycling programs. Collection programs are developed individually by each complex and its hauler. Collection frequency, for instance, may vary from one complex to another. The City has developed a program in which a volunteer from each complex acts as the "Recycling Captain" for the building. Recycling Captains are responsible for education initiatives. As of September 1991, there were six to eight volunteers. Each building will receive a red dumpster for recyclables similar to the dumpsters used in the pilot project. The City plans to have all the dumpsters in place and the program fully implemented by the fall of 1991.

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:	The 1989 Comprehensive Solid Waste Management Plan charges the County with the responsibility for encouraging commercial recycling opportunities. The plan does not specify how these services should be delivered, and businesses are not required to recycle.
Service Provider:	Rabanco, Waste Management, Lawson Disposal, RST Disposal, and Federal Way are among the waste haulers and their affiliates that offer recycling collection service to the commercial sector.
Number Served:	Not available. A recent survey indicated that 35 multi-tenant office buildings in the City of Bellevue were recycling.
Type Served:	Primarily large businesses
Materials Collected:	Corrugated cardboard, high-grade paper, computer paper, mixed paper, various metals
Pick-up Frequency:	Varies
Set-out Method:	Varies
Collection Method and Vehicles:	Varies
Incentives:	King County provides technical assistance to businesses, including on-site waste consultations, an information hotline, workshops, printed materials, videos, and coordination of collection services. The County has provided waste consultations to hotels, shopping malls, and the airport.
Annual Tonnage:	Not available

Self-haul and Drop-off Centers

Number and Type:	56 (49 private drop-off sites and 7 County-run sites). The County has drop-off areas at three transfer stations (First Northeast, Factoria, and Houghton), three rural landfills (Hobart, Vashon, and Enumclaw), and one drop box at the closed Cedar Falls landfill.
Public or Private:	Public and private

Sectors Served:	Residential and commercial/institutional
Materials Accepted:	Varies. Generally, newspaper, high-grade paper, corrugated cardboard, mixed paper, glass, aluminum and ferrous cans, scrap metal, and plastic (PET and HDPE) are accepted. Some recyclers will only accept aluminum and ferrous metal, while others will only accept HDPE and PET plastic. Nine drop-off centers accept batteries.
Annual Tonnage:	In 1990 a total of 86,429 tons of recyclables, nearly one-quarter of all recyclables collected in the County, were collected at drop-off sites. 1,037 tons were collected at the three transfer stations and 928 tons at three landfills.

The County is responsible for providing recycling opportunities to residents in rural unincorporated areas. It has partially fulfilled this obligation through drop boxes and depots located at disposal facilities.

Processing and Marketing of Recyclables

There are three large intermediate processing centers (IPCs) in King County: the Rabanco Recycling Center, the Recycle America Processing Center, owned by Waste Management, Inc., and Fibres International. Rabanco and Recycle America are located in Seattle, and Fibres International is located in Bellevue. Waste Management and Rabanco process materials from their residential and commercial pick-up programs. There are three other processing/buy-back centers in King County: CEI Recycling, Neighborhood Recycling Center, and Valley Recycling.

The Rabanco Recycling Center was built on the site of a former steel warehouse and began operations in June 1988. The 80,000-square-foot processing facility is located on 5 acres. The plant is designed to process 500 to 700 tons per day of recyclables from a variety of waste streams, including clean paper, cardboard, newspaper, and plastic loads; paper-rich loads of commercial waste collected from selected commercial garbage routes; and commingled recyclables. It is estimated that the start-up costs for the plant were between $6 and $8 million. The facility uses a combination of conveyors, trommel, disc screens, magnetic separation, air classification, hand picking, and baling to recover and process recyclable materials. Approximately 90 percent of the recovered material is paper, which is sold through Rabanco's subsidiary, Ideal Paper Stock, to markets in the Pacific Rim. Glass and metal are marketed locally. Color-sorted glass is sold to Ball Incon, a Seattle glass beneficiation plant. MRI, a local company, removes the tin from bimetal cans; the remaining steel is sold to plants in the Puget Sound region. Aluminum is sold to regional plants.

The Recycle America Processing Center was opened by Waste Management in 1988 to process recyclables collected by Recycle America. The 43,000-square-foot facility processes newspaper, cardboard, mixed paper, tin, glass, and aluminum. Since 67 percent of materials have been source-separated by the generators, the facility is primarily used for baling, with a maximum capacity of 400 tons per day. Glass, tin, and aluminum are sorted on a pick line through a combination of magnets and hand-sorting. Waste paper is baled and brokered through Fibres International to markets in South Korea and Taiwan, which use the paper as filler stock for other paper grades. The facility is also designed to process commercial loads rich in cardboard and other paper. About 1 percent by weight of the materials collected at curbside was reported rejected as residue in 1990.

Market Development Initiatives/Procurement

In 1989 the King County Council formed the King County Commission for Marketing Recyclable Materials (as required by County Ordinance 8771) to enhance markets for recyclable materials and to encourage the use of recycled products. The purpose of this Commission is to seek, solicit, and promote marketing opportunities for reusing materials that would otherwise be disposed, and in particular to encourage the use of recovered materials in manufacturing and production processes, and promote the use of products made from recycled materials. Commission members represent business, government, recycling, and economic development interests.

In December 1989, King County adopted an ordinance establishing rules and policies for the procurement of a range of recycled products, including paper products, building insulation, retread tires, cement, cement concrete with fly ash, and re-refined oil. For example, all County agencies are required to procure recycled paper if its price is less than 15 percent higher than virgin paper. King County defines recycled high-grade paper as having a minimum content of 25 percent post-consumer material or 50 percent total waste material (excluding material commonly reused within an original manufacturing process). The ordinance also establishes procedures by which vendors of other recycled products, such as recycled plastic products or compost, can qualify for a preferential purchase.

In September 1990, King County's Commission for Marketing Recyclable Materials, together with the Greater Seattle Chamber of Commerce and the Seattle Solid Waste Utility, launched the Business and Industry Recycling Venture (BIRV) to urge businesses to procure products made from recycled material. Two recycling information specialists, one from the City and one from the County, provide information on recycling services and vendors of recycled products to businesses. As of June 1991, the BIRV had assisted over 200 businesses through on-site consultations and telephone service.

In January 1991, the Commission received a $250,000 grant from the Washington State Department of Ecology to undertake a 2-year program of testing and marketing compost products from three facilities in the County.

The Commission evaluated existing and potential market conditions for recyclables in its July 1991 *Annual Report & Five Year Plan*. The report details market conditions, such as supply and demand trends, for mixed waste paper, newsprint, high-grade paper, plastics, tires, metals, motor oil, construction debris, and yard waste compost.

Composting Activities

King County's composting program has four components: backyard composting, curbside yard waste collection in cities and unincorporated urban areas, drop-box sites (serving rural areas), and a mobile yard waste collection program serving urban areas. While the County is responsible for yard waste programs and cities are not required to offer curbside pick-up of yard waste, many cities have implemented programs. Service providers are contracted to pick up yard waste weekly, bimonthly, or monthly. The composting facilities serving King County are all privately-owned. Rabanco owns and operates the Cedar Grove Compost Facility; Valley Topsoils has a facility in Algona; Iddings, Inc. operates a facility in the Kent area; and Northwest Wood Recycling operates a facility in Woodville. Until recently, Pacific Topsoils in Snohomish County accepted yard waste from King County.

An estimated 17 percent of King County's waste stream is yard waste. The County wants to divert 90 percent of all yard waste from the waste stream by the year 2000 and has planned a range of composting activities.

County Ordinance 9928, passed in May 1991, required the County to offer curbside yard waste collection in unincorporated urban areas. Collection programs began in August 1991, with yard waste set out in 90-gallon containers. Three haulers serve 180,000 households: Rabanco, RST/Raffo, and Waste Management, Inc. RST/Raffo and Waste Management offer weekly pick-up and Rabanco picks up on a

bimonthly schedule. RST/Raffo also offers curbside pick-up for multi-unit buildings. The County is planning to set a rate structure that creates a financial incentive for residents to separate their yard waste from other refuse.

Christmas trees are accepted free of charge at County transfer stations and rural landfills for two weeks following Christmas. In 1990, 700 tons (over 13,000 cubic yards) of trees were collected and hauled to a composting facility, representing a 144 percent increase over 1989.

The County is also researching food waste composting. For example, food waste generated at the 1990 County fair was collected and composted to determine whether compost of a consistent quality could be produced, and to determine the feasibility of composting food waste on a larger scale. The food waste compost produced from the County fair food waste was used as a soil amendment for the planting of vegetables and flowers at the County fairgrounds. An educational exhibit at the 1991 County fair featured a demonstration of the food waste composting process.

In the summer of 1991, the County received a grant to test a variety of composting methods, working jointly with the City of Seattle Solid Waste Utility. The County will also test the feasibility of backyard food waste composting and on-site commercial food and yard waste composting.

Backyard Composting

As an integral component of King County's 1989 Comprehensive Solid Waste Management Plan (CSWMP), the Solid Waste Division of the Department of Public Works developed and implemented a Backyard Composting Program. The goal of the program is to increase public awareness of recycling and waste reduction. The County provides bins at a subsidized rate ($8.75) to residents, and technical assistance through the Master Recycler/Composter Program, Nursery Composting Demonstration Program, and a recycling and composting information telephone line. The County began to promote the program in June 1989, in press releases and on local television stations. With slogans such as "Money does grow on trees," the County tries to persuade residents to compost in their backyards to save money in avoided yard waste collection charges, and reduce the need for purchases of fertilizers and soil amendments. The County also distributes literature on how to safely compost food waste and pet waste. The County distributed 16,000 backyard composting bins in four residential, unincorporated areas between June 1989 and March 1990. Although the bins were available to all County residents, the County targeted unincorporated areas because the one-third of the County's population that lives in such areas receives fewer services than do city residents. During the second year, the program expanded to include the cities in the County. By the end of 1991, the County will have distributed a total of 41,000 bins. The distribution system differed for the unincorporated areas and the cities. In the unincorporated areas, specific areas first received mass mailings, and then the bins were delivered to each household. In the cities, after the mass mailing, interested residents went to specific stores to buy the bins. In 1990 the County spent $682,239 on planning, outreach, and bins for the backyard composting program, the majority of which was spent on the purchase of bins. ($380,334 was spent to purchase approximately 19,000 bins; County residents reimbursed the County a total of $195,460 for bins.)

During the first year of the program, the King County Solid Waste Division conducted a study to quantify yard waste diversion as a result of its backyard composting program in unincorporated areas. The study indicates that participation is very high and that at least 50 percent of participants' yard waste is composted in their backyards. Of 11,111 participants, 38 percent did not compost before receiving the compost bin. Two-thirds of all participants were composting 75 percent of their yard waste, and the other third was composting approximately 50 percent. Based on the assumption that each household produces 800 pounds of yard waste each year, an estimated 1,590 tons of yard waste were diverted in 1989. In 1990 an estimated 4,706 tons were diverted.

The program continues to evolve. Currently the County is investigating commercially available backyard composting bins that are made of 100 percent recycled materials. For example, the County is interested in a plastic bin made by Green Ban, and in another bin that is produced locally from locally

collected plastic. The County already offers a bin made from western cedar, a by-product of lumber and milling in the Pacific Northwest.

Curbside Collection

Start-up Date:	By 1990, nine cities had implemented curbside yard waste collection programs. By September 1991, 16 cities had implemented such programs. Collection began in Renton in August 1989, October 1989 in Bellevue, March 1990 in Kirkland and Redmond, April 1990 in Mercer Island, September 1991 in Sea-Tac, and February 1991 in Bothell. Collection is due to begin in January 1992 in Des Moines. Curbside collection for the unincorporated areas began in August 1991. There is no curbside collection in rural areas. The rural City of Duvall intends to start curbside collection of yard waste in January 1992.
Service Provider:	Varies; often the provider is the same as the one for curbside recyclables but pick-up may be a different day than pick-up for refuse.
Households Served:	By September 1991, 130,000 single-family households were served in unincorporated urban areas; 70,000 single-family homes in urban cities.
Mandatory:	No. In some cities, such as Bellevue and Mercer Island, it is mandatory for residents to separate yard waste from refuse. King County Ordinance 9928, passed in May 1991, required the County to offer curbside yard waste collection in unincorporated urban areas.
Materials Collected:	Leaves, grass clippings, brush, and Christmas trees (seasonal)
Collection Vehicles & Method:	Rear packer trucks
Set-out Method:	Haulers determine which containers are to be used for yard waste set-out. Most haulers allow yard waste to be placed in clean garbage cans, paper bags, and boxes, and many have 90-gallon toters for customers to lease. Most no longer allow customers to use plastic bags for yard waste.
Collection Frequency:	Raffo, RST Disposal, Sea-Tac Disposal, and Meridian Valley Disposal collect yard waste every other week from March through November, and monthly from December through February. Lawson Disposal and Waste Management's four subsidiaries—Skyway Disposal, Sno-King Garbage, Rainier Disposal, and Sunset—collect yard waste weekly from March through November, and monthly from December through February.
Economic Incentives:	In some instances, yard waste collection is less expensive than refuse pick-up. For example, Lawson Disposal charges $8.25 per month for yard waste collection, but between $7.45 and $28.10 per month for refuse collection, depending on the amount generated. Similarly, RST charges $4.38 per month for yard waste collection, but between $7.10 and $26.25 per month for refuse.

Drop-off Collection

The County does not offer curbside collection of yard waste in the unincorporated rural areas, but it has offered a seasonal mobile collection program in urban areas and drop-off collection at the Factoria transfer station, as well as drop-off areas at the Hobart landfill and the Cedar Falls drop-box located in rural areas. The mobile collection program began in May 1989 and was directed at the unincorporated areas of the County, although no effort was made to restrict access to the sites. The program ran from May to October with five drop-off sites: Federal Way, Kent, Issaquah, North Bend, and Duvall. Yard waste was collected one week per month. Residents were not charged to drop off yard waste. Between May and October 1989, 2,801 tons of yard waste were collected. In 1990 the County reduced the program to four sites (Woodinville, Shoreline area, Sea-Tac area, and Federal Way area), offered drop-off collection at each site one weekend per month, and charged residents $5.25 per cubic yard and a refuse tax. As a result, the volume of yard waste collected dropped drastically. From June to November 1990, only 683 tons of yard waste were collected. The County plans to discontinue the program after 1991 because the curbside collection program in unincorporated urban areas reduces the need for a mobile program.

Moreover, in July 1990, the County opened yard waste drop-off areas at the Hobart landfill and the Factoria transfer station, where it charges $31 per ton. The fee is $16 less than the fee for refuse. At the Hobart landfill, yard waste can be dropped off during the landfill's normal operating hours. The drop-off area at the Factoria transfer station is open during the week from 6 p.m. to 11 p.m. and on weekends until 5:30 p.m. From July to December 1990, a total of 689 tons of yard waste were collected at the two sites (458 tons at Factoria and 231 tons at Hobart). From January to June 1991, 1,039 tons were collected. Beginning in mid-October, the County also offers a 40-cubic-yard drop box at the Cedar Falls landfill, which was closed in 1990. From October to December 1990, 12 to 18 tons of yard waste were collected. During the first 6 months of 1991, 98 tons were collected.

In 1990, 700 tons of Christmas trees were collected and chipped for soil stabilization at the Cedar Hills Regional Landfill.

Composting Site

King County does not own or operate a composting facility. There are four private operations that process yard waste collected by municipal programs, and material from commercial and residential generators. Only Valley Topsoil is open to the public. The Rabanco Facility, located in Maple Valley, accepts yard waste and produces mulch and topsoil. Iddings, Inc., in Kent, has a capacity to process 100,000 tons per year and produces topsoil and hog fuel (wood chips for fuel). Valley Topsoil in Algona accepts yard waste and horse/cow manure, and produces topsoil, bark, and mulch. The County incurs a tipping of $25 per ton of yard waste it delivers to private composting sites.

Amount and Breakdown of Materials Recovered

Material	Residential (Tons, 1990)	Commercial/ Institutional (Tons, 1990)	Self-Haul* (Tons, 1990)	Total (Tons, 1990)
Newspaper	35,061.9	13,723.7	28,672.0	77,457.5
Corrugated Cardboard	3,983.9	61,990.8	19,402.3	85,376.9
High-grade Paper	848.2	10,550.2	2,965.8	14,364.2
Mixed Paper	25,232.8	20,457.3	5,323.0	51,013.1
Refillable Bottles†	0	570.6	152.4	722.9
Other Glass	8,225.7	5,754.6	2,251.7	16,232.1
PET Plastic	96.9	90.8	54.7	242.4
HDPE Plastic	66.3	0	117.6	183.9
LDPE Plastic	0	200.0	0	200.0
Other Plastic	0	227.1	74.3	301.3
Aluminum Cans	927.9	523.1	2,415.1	3,866.2
Ferrous Cans	2,482.5	1,474.8	392.3	4,349.6
Appliances/White Goods	13.3	739.5	2,660.0	3,412.8
Ferrous Scrap‡	241.3	5,240.7	597.4	6,079.4
Nonferrous Scrap	12.9	13,552.0	1,701.5	15,266.4
Vehicle Batteries	0	6,128.0	1,067.0	7,195.0
Tires	0	2,165.1	133.0	2,298.1
Motor Oil	0	12,297.4	198.0	12,495.4
Textiles	134.1	3,753.3	292.4	4,179.9
Subtotal MSW Recycled	**77,327.7**	**159,439**	**68,470.5**	**305,237.1**
Food Waste	0	21,360.9	0	21,360.9
Yard Waste	47,903.2	13,049.3	17,164.0	78,116.5
Wood Waste	155	118.2	794.0	1,067.2
Subtotal MSW Composted	**48,058.2**	**34,528.4**	**17,958.0**	**100,544.6**
Total MSW Recovered	**125,385.9**	**193,967.4**	**86,428.5**	**405,781.7**

*Self-haul material was recovered at buy-back sites and drop boxes located throughout the County. The State estimates that 80 percent of this material is brought by the residential sector, and the remaining 20 percent is brought by the commercial/institutional sector.

†Refillable beer bottles.

‡Only 6,079 tons of the 108,929 tons of ferrous scrap reported by the State to be recovered by the County can be verified to be post-consumer, non-industrial material.

Source Reduction Initiatives

King County promotes solid waste source reduction through its backyard composting programs (described earlier) and variable refuse rates. It educates residents on how to reduce households' waste through its master recycler/composter program, and its comprehensive home waste audit manuals. Additionally, source reduction is a major component of its school program. The County encourages office-related source reduction behaviors, such as double-sided copying, through its procurement policies.

Publicity and Education

Residential

King County publicizes the Waste Reduction and Recycling Program through direct mailings, utility bill inserts, television and radio advertisements, and community displays. The County also sets up information booths at community events, runs a recycling/composting information hot line, and has a recycling curriculum. Its Master Recycler/Composter Program trains volunteers to educate friends, neighbors, and co-workers about home composting, source reduction, recycling, and household hazardous waste management.

Implementation of the Master Recycler/Composter Program began in January 1990 when the first training session was held. Three 2-month training sessions are held each year, 25 people participate in each session and agree to contribute 40 hours each to community outreach initiatives. In 1990, 75 Master Recyclers/Composters (MRCs) were trained; and another 75 were trained in 1991. Capital expenditures for the program include more than $10,000 for training manuals and curricula, $6,000 for outreach tools, and $10,000 for the construction of two demonstration sites. The County spends $15,000 for each training session (for training and equipment), for a total of $45,000 per year. Other ongoing costs include $15,000 a year for coordination and publicity and $3,000 a year for the maintenance of the demonstration sites. In 1990 the County spent $70,000 on total program costs. As of September 1991, it had invested a total of $135,000 in the program and will continue to invest at least $63,000 a year.

Commercial

The County provides technical assistance to businesses including on-site waste consultations, an information hot line, workshops, printed materials, videos, and coordination of collection services. In 1990 it spent $15,000 on educational materials, $45,000 on workshops, and additional money on technical assistance to develop recycling and waste reduction programs in the commercial/institutional sector.

Economics

Costs Cover: Recyclables and yard waste are collected and processed primarily by the private sector. Capital and equipment costs are thus not available. The County's annual costs, which consist primarily of administration, research, education, and development of recycling and composting programs, are listed below. Also listed are the County's operating and maintenance costs for the collection of 2,023 tons of yard waste through its various drop-off programs.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**NA**	–	–
Drop-Off Collection and Processing*	$200,000	1,965	$102
Administration†	NA	–	–
Education/Publicity†	NA	–	–
Composting Subtotal	**NA**	–	**NA**
Collection	$144,350	2,023	$71
Mobile Collection‡	103,733	634	164
Drop-off Collections§	33,072	689	48
Christmas Tree Collection	7,545	700	11
Processing (Tipping Fees)**	50,575	2,023	25
Administration†	NA	–	–
Education/Publicity†	NA	–	–
Recycling & Composting Total	**$1,944,876**	–	–
Collection and Processing	$394,925	$3,988	$99
Administration††	135,000	–	–
Education/Publicity‡‡	1,414,951	–	–

*At transfer stations and rural landfills.

†Administrative and education/publicity costs cannot be broken down into recycling and composting costs.

‡Mobile collection costs include labor, site preparation, equipment rental, and some publicity expenses.

§Drop-off collection costs include improvements made to the drop-off sites, the cost of delivering material to compost sites, and some publicity expenses. They exclude the revenue received from the drop-off fee charged ($31 per ton).

**Tipping fees for delivery of 1,323 tons of yard waste and 700 tons of Christmas trees collected through mobile and drop-off collection to private composting sites.

††Administration costs include $16,000 in general project administration, $10,000 for the administration of the business and industry recycling council, and $59,000 for service area coordination, and $50,000 to develop food waste composting.

‡‡Includes $30,000 spent on a waste exposition, $10,470 on the newsletter, $10,000 on publicity and organization of a recycling week, $25,000 for a hotline, $10,505 for a home audit book, $6,650 for a recycling information center, $517,000 for various school recycling programs, $15,499 for community events, $2,597 for a speakers' bureau, $70,000 for the Master Recycler/Composter Program, $150,000 for certain public outreach programs, $30,000 for nursery composting demonstration projects, $4,730 for technical assistance workshops, $15,000 for nonresidential education material, $45,000 for nonresidential workshops, $14,500 for nonresidential consulting, $8,000 for recycling information booklets, and $450,000 for waste audits.

Materials Revenues: Most revenue is kept by private haulers; the County receives limited revenue from one of its drop-off contracts.

Source of Funding: Tipping fees at County solid waste facilities, and collection fees for yard waste drop-off programs fund County recycling and waste reduction activities.

Full-time Employees: 20 employed by the County's Waste Reduction and Recycling Program

Future Solid Waste Management Plans

In May 1990, King County established a Waste Monitoring System to measure recyclable materials disposed, collected, and processed. The County first completed a waste composition survey and identified 14 different waste categories. By the end of 1991, the County had compiled information on the amount of each waste category recycled in all cities. With this information, the County intends to target specific geographical areas where recycling levels should be raised. The County also plans to increase recycling programs in nonresidential sectors, such as businesses, institutions, and municipal offices, which generate approximately 40 percent of all waste. Since State statutory language in regulating commercial collection is ambiguous, it is unclear what authority King County or its municipalities have to establish standards for collection of nonresidential recyclables. King County's Solid Waste Division is in the process of finalizing a nonresidential Strategic Plan, which will be incorporated into the 1992 Plan Update. Some of the options that the County is considering are enactment of a service level ordinance to establish a countywide system providing convenient and economical nonresidential recycling opportunities, a requirement for mandatory source separation of specified recyclables by nonresidential generators, and the implementation of incentives such as penalties for the disposal of recyclables with mixed waste.

In March 1991, the County began exploring options for processing its nonrecycled waste in a mixed waste processing facility. On the advice of a consultant, it decided to postpone such plans until issues such as tonnage guarantees could be satisfactorily resolved. The County is continuing to research this matter.

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Lafayette, Louisiana

Demographics

Jurisdiction:	City of Lafayette
Population:	90,000 in 1990
Area:	41 square miles
Total Households:	29,500 (28,500 in single-family residences and approximately 1,000 in multi-unit buildings)
Total Businesses and Institutions:	7,654 (7,579 businesses and 75 institutions)
Brief Description:	Lafayette is predominantly a residential community of single-family homes located in Lafayette Parish. The City's primary industries are tourism and oil. In 1989 average per capita income was $14,154; 1990 median household income was $23,961.

Solid Waste Generation and Recovery

Annual Tonnages (November 1989 - October 1990)

	Residential	Commercial/ Institutional	Total MSW
Recovered	**4,651**	**3,125**	**7,776**
Recycled*	2,440	3,125	5,565
Composted†	2,211	0	2,211
Disposed‡	**30,000**	**35,880**	**65,880**
Incinerated	0	0	0
Landfilled	30,000	35,880	65,880
Generated	**34,651**	**39,005**	**73,656**

Percent by Weight Recovered

Recovered	**13%**	**8%**	**11%**
Recycled	7%	8%	8%
Composted	6%	0%	3%

Note: Tonnages of construction and demolition debris are not tracked; therefore, no figures for C&D or "Total Waste" are included in this table.

*Commercial/institutional recycled tonnages contain a small percentage of residential material recovered through drop-off sites. Additional commercial materials recovered but not tracked include white goods, motor oil, batteries, and scrap metal, as well as corrugated cardboard recycled by many Lafayette supermarkets.

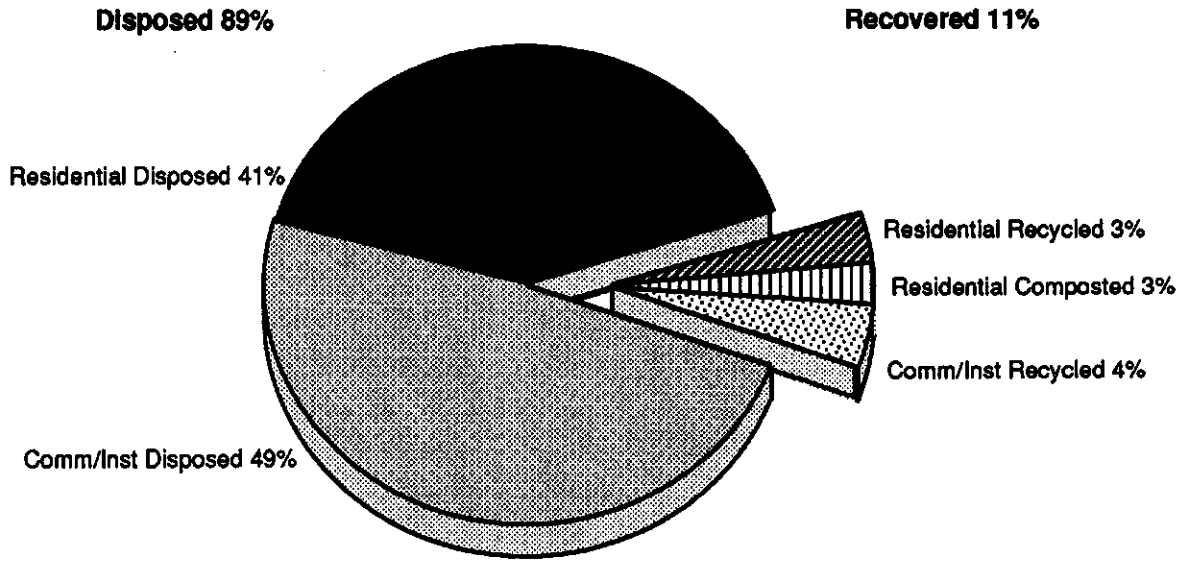
†The City's curbside yard waste program did not begin until May 1990; thus, yard waste tonnages were generated over a 5-month period. Over the 11 month period from May 1990 to April 1991, 5,760 tons of yard waste were composted.

‡Waste disposed includes tires.

Landfill Tipping Fee: $10 per ton at the city-owned Municipal Landfill in 1988, $25 per ton at the New Iberia Landfill in 1989, and $20 per ton at the Livingston Parish Landfill in 1990. (Tipping fees at this landfill increased to $25 in 1991.)

Refuse Collection and Disposal: The City of Lafayette contracts with Waste Management of North America to collect refuse twice a week from all single-family households. For this service the City of Lafayette charged all single-family households $5.19 per month in 1990. In 1991 residents pay $5.55 per month. Multi-unit residences must contract with private waste haulers for refuse service. Commercial and institutional waste is collected by BFI, Waste Management, and All American Waste. Refuse haulers also collect white goods, furniture, and wood waste. All residential, commercial, and institutional waste destined for disposal is hauled to the Livingston Parish Landfill in Livingston, Louisiana, 98 miles away. Construction and demolition debris is disposed at the Scott Construction Dump in Scott, Louisiana.

Municipal Solid Waste Recovered and Disposed (Percent by Weight, FY 1990)



Note: Due to rounding, numbers do not add to percent disposed and percent recovered.

Materials Recovery Overview

Goals and Legislative Requirements:

In 1988 the State of Louisiana passed a bill (Act 185) mandating a 25 percent reduction of the waste stream through recycling and composting by the year 1992. If the goal is not met, the cities will be assessed a fee of 20¢ per ton for every ton landfilled. The Act also bans the landfilling of certain materials, including white goods, waste oil, whole tires, and lead-acid batteries.

Although scavenging has not been a big problem, the City has adopted an anti-scavenging ordinance, which provides for fining persons scavenging in residential areas.

The Sierra Club, the Boy Scouts, and Lafayette Planetarium offered Lafayette residents their first recycling opportunities during the mid-1980's. These community organizations provided drop-off sites for collection of newspaper, glass, aluminum, and magazines.

In 1988 the City of Lafayette initiated Louisiana's first municipal curbside recycling program. This is one of the largest recycling programs in the South, providing curbside service to over 27,500 households. The impetus came from the scheduled closing of the City's only municipal landfill, and Lafayette's unsuccessful efforts to site an alternate landfill. In 1987 the Mayor, the City Council, and citizen groups moved to initiate an aggressive curbside recycling and composting program in response to this "disposal crisis." The Lafayette City Council allocated $35,000 towards public education and

publicity for the new curbside program. In March 1988 a recycling specialist was hired to design, coordinate, and implement the program. Curbside collection of recyclables began in October 1988.

The City awarded a one-year contract to The Recycling Foundation, a nonprofit organization formed by two owners of local bottling plants, based on their bid to collect materials free of charge. The Recycling Foundation was to provide weekly collection of newsprint, glass, and aluminum cans to 26,500 single-family households citywide. Additionally, it was to process the materials and deliver them to market. The Foundation planned to return all profits from the recycling operation to local schools for the purchase of environmental education materials. However, the organization lost money in the first 2 years of the program's operation. In November 1989, the Foundation charged the City a contract fee of $95,700 for the year, or 29¢ per household per month, to reflect costs more accurately. This contract fee increased in 1991 to $293,700, or 89¢ per household per month. The 1990 contract required the provision of curbside service to 28,000 households.

In May 1990, Lafayette established the State's first municipal yard waste composting facility. The City awarded Recycle America a contract to provide weekly curbside collection of leaves, grass clippings, brush, branches, and stumps to all single-family households.

Lafayette's only municipal landfill was closed in 1988. Although the City now disposes of its waste 98 miles away, Lafayette was able to reduce household refuse recycling, and yard waste collection rates by $1 per month in FY1990 because of the high volume of material diverted from the landfill through recycling and composting.

Lafayette's recycling and composting programs have been credited with stimulating new recycling businesses (such as buy-back centers) and creating 25 new jobs.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	October 20, 1988
Service Provider:	The Recycling Foundation, a local nonprofit organization, under contract with the City
Pick-up Frequency:	Weekly
Same Day as Refuse:	Yes; recyclables are picked up on one of the two days on which refuse is collected.
Households Served:	27,500 single-family households in FY1989; 28,000 in FY1990
Mandatory:	No
Participation Rate:	55 percent in 1989, 62 percent in 1990 (based on counting actual set-outs once a month)
Materials Collected:	Newspaper, glass, aluminum cans, ferrous cans, and all HDPE and PET plastic containers
Set-out Method:	Residents are supplied with three stackable bins (11.3 gallons each), one for commingled glass and plastic; one for aluminum, tin, and steel cans; and one for newspaper.

Collection Method and Vehicles:	A three-person crew collects source-separated materials and places them in three compartments in Eager Beaver trailers pulled by 1-ton pick up trucks. Commingled materials are not further separated en route.
Economic Incentives:	None
Enforcement:	Not applicable
Annual Tonnage:	2,440 tons from November 1989 through October 1990

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:	None
Service Provider:	The Recycling Foundation
Number Served:	Approximately 25 businesses and institutions
Type Served:	Government offices, schools, supermarkets, hospitals, and restaurants
Pick-up Frequency:	Ranges from 1 to 5 days per week, depending on the amount of storage space available
Materials Collected:	Corrugated cardboard; newspaper; high-grade and mixed office paper (such as envelopes, file stock, and copier paper); glass; ferrous and aluminum cans; and HDPE and PET plastic containers
Set-out Method:	Businesses lease a small dumpster from their hauler to store recyclables.
Incentives:	Garbage fee reductions as a result of smaller garbage dumpsters
Enforcement:	Not applicable
Annual Tonnage:	Not available

The Recycling Foundation offers curbside collection to businesses and institutions for a fee. However, many commercial businesses prefer to use the Foundation's drop-off center at no charge.

In April 1989, Lafayette City Hall initiated an office paper recycling program. Other City offices have since followed suit. In January 1991, the Chamber of Commerce surveyed all city businesses to ascertain their interest in recycling. One hundred and fifty businesses expressed an interest in initiating recycling programs.

Currently, many Lafayette supermarkets recycle large volumes of cardboard outside the City; however, these tonnages are not tracked.

Drop-off Centers

Number and Type:	5. Three buy-back/drop-off centers (The Recycling Foundation, The Attic, and Recycling Services of Lafayette) and two scrap yards (The Aluminum Recycling Center and A&E) service the entire City.
Public or Private:	All the drop-off centers are privately operated. The Recycling Foundation is nonprofit; the others are for-profit businesses.

Sectors Served:	Commercial/institutional and residential
Materials Accepted:	All drop-off centers buy back aluminum cans. The Recycling Foundation accepts newspaper, high-grade paper, mixed paper, corrugated cardboard, ferrous cans, and HDPE and PET plastic containers. The Attic (which closed in mid-1990) accepted and repaired white goods for reuse. Recycling Services of Lafayette accepts mixed paper, corrugated cardboard, and glass. Both the Aluminum Recycling Center and A&E accept batteries and assorted scrap metal. National Oil, Speedy Oil, K-Mart, and Wal-Mart accept motor oil.
Annual Tonnage:	3,125 tons of materials were recovered from the residential and commercial sector at drop-off centers in fiscal year 1990. Although residents of multi-unit buildings not served with curbside collection of recyclables do use the drop-off sites, most materials were collected from the commercial sector. Many businesses, such as banks, offices, hospitals, and some restaurants, drop off their recyclables. Tonnages for motor oil, batteries, white goods, and scrap metal are not tracked or estimated.

Processing and Marketing of Recyclables

Recycled materials collected through The Recycling Foundation's curbside program and drop-off center are processed at its intermediate processing center (IPC) in Lafayette. In 1988 the Foundation leased two buildings on the same site, 12,000 and 8,000 square feet respectively, to process all the materials it collected. It began in October 1988 to collect materials and first subcontracted processing out to private operators. After 6 months, however, the subcontracting company failed, and The Recycling Foundation became the operator as well as the owner of the IPC. The center accepts recyclables from outside the City and from private haulers; it does not charge a tipping fee.

Recyclables are unloaded from the Eager Beaver trailer onto the IPC tipping floor. Ten employees (including prison laborers) hand-separate plastics by resin and glass by color. They remove from newsprint all contaminants such as rubber bands, junk mail, and plastic bags. A conveyor belt is used for sorting large loads of plastic, but is seldom used otherwise because it causes glass breakage. The Foundation uses two downstroke vertical balers for plastic and cardboard, a West Coast glass crusher for glass cullet, and a can densifier for aluminum and steel cans. An estimated 1 percent by weight of recyclables brought to IPC are rejected during processing and landfilled. The IPC can process up to 30 tons per day; in 1989-1990, the Foundation processed approximately 20 tons per day of recyclable materials.

The Recycling Foundation has access to a limited number of local markets. Newspaper is marketed through Southeast Recycling in Dublin, Georgia, corrugated cardboard through Inland-Orange in Orange, Texas. Glass is sold to Owens Brockway in Waco, Texas, aluminum cans to Alcan in Berea, Kentucky or Alcoa in Tennessee, and ferrous cans to Prolar International in Houston. HDPE and PET plastics are sold to Red Stick Plastic in Prairieville, Louisiana. The City of Lafayette sells the mixed paper collected through its office paper recycling program to A.C.C.O. in Houston, Texas.

Market Development Initiatives/Procurement

Although a Lafayette Parish ordinance passed in December 1990 mandates that municipal offices procure a minimum of 10 percent recycled paper, procurement of recycled paper is not yet required in the City of Lafayette. Lafayette will adopt an ordinance to require recycled paper procurement in all municipal buildings through a "procedures and policy manual" (PPM). Once the PPM is signed by the Mayor, the procurement policy should be adapted by March of 1992.

Composting Activities

Lafayette implemented the first municipal curbside collection of yard waste in Louisiana in 1990 and constructed the State's first municipal yard waste composting facility. In 1990 the City charged all single-family households a fee of $1.17 per month for weekly curbside collection of yard waste. Christmas trees are used whole as wave barriers and sediment traps for coastal erosion.

Curbside Collection

Start-up Date:	May 1990
Service Provider:	Recycle America (a division of Waste Management)
Households Served:	27,500 households in 1990, 28,500 in 1991
Mandatory:	No
Materials Collected:	Leaves, grass clippings, branches, brush, stumps smaller than 6 inches in diameter, and Christmas trees
Set-out Method:	Materials are bagged, bundled, stacked, or placed in open containers supplied by residents.
Collection Vehicles & Method:	Three-person crews collect yard waste, using 32-cubic-yard compactor trucks. (A smaller 25-cubic-yard truck handles shorter runs.)
Collection Frequency:	Weekly year-round
Economic Incentives:	None
Annual Tonnage:	2,211 tons were collected in the 5-month period from May through October 1990. Over the 11-month period from May 1990 to April 1991, 5,760 tons of yard waste were composted.

Composting Site

Recycle America brings residential yard waste collected through the municipal curbside program to the City-owned and operated composting facility, located on a 10-acre site in Lafayette. Recycle America and county residents pay a $24 per ton tipping fee to deposit materials there. The fees cover the cost of the processing operation. Approximately 95 percent of yard waste delivered is collected through the curbside program.

Yard waste collected at curbside and through drop-off is unloaded on the 200-foot by 224-foot asphalt compost pad. The City does not accept yard waste from private haulers or landscapers. An estimated 1 to 2 percent by weight of the yard waste collected is rejected and landfilled. All materials except Christmas trees are ground in a tub grinder and then formed into windrows averaging 100 feet long by 12 feet wide by 6 feet high. Operators measure temperatures of "active" windrows weekly. After 1 month, compost is re-formed into "curing" windrows averaging 20 feet wide by 10 feet high. The composting process is complete in approximately 10 months, and the end product is used in public facilities such as parks and recreation areas. To date there have been no odor problems at the compost site.

Amount and Breakdown of Materials Recovered

Material	Residential (Tons, 1989-90)	Commercial/ Institutional (Tons, 1989-90)	Total (Tons, 1989-90)
Newspaper	1,500	500	2,000
Corrugated Cardboard	0	1,200	1,200
High-grade Paper	0	500	500
Other Paper	0	250	250
Glass	720	500	1,220
PET Plastic	35	0	35
HDPE Plastic	35	0	35
Aluminum Cans	60	175	235
Ferrous Cans	90	0	90
Subtotal MSW Recycled	**2,440**	**3,125**	**5,565**
Yard Waste*	2,211	0	2,211
Subtotal MSW Composted	**2,211**	**0**	**2,211**
Total MSW Recovered	**4,651**	**3,125**	**7,776**
Asphalt†	NA	NA	NA
Total C&D Recovered	NA	NA	NA

Notes: The above chart applies to a 12-month period from November 1989 through October 1990 for recyclables, and to a 5-month period from May 1990 through October 1990 for yard waste material. Residential tonnages recycled represent materials collected through curbside alone; drop-off tonnages are included under commercial/institutional tons.

Materials recovered reflect tonnages recovered excluding rejects subtracted.

Appliances and white goods, scrap metal, oil, and lead-acid batteries are collected at drop-off centers; tonnages are not tracked.

*Lafayette estimates yard waste tonnages based on a conversion factor of 500 pounds per cubic yard. Tonnages above represent 8,844 cubic yards of yard waste collected.

†Lafayette recycles asphalt in new road construction; however, tonnages are not tracked.

Publicity and Education

Residential

Before implementation of its curbside recycling program, Lafayette conducted an extensive public outreach program. Twenty-five hundred homes were targeted for door-to-door visits. Additionally, during the first year alone, a total of 42 recycling presentations were made on a state and local level. Lafayette uses brochures, public service announcements, direct mailings, and billboards to publicize its recycling and composting programs.

Teachers of grades K-6 at the Lafayette County schools have incorporated recycling, litter, and solid waste management studies into their science curricula. In 1989 the Department of Public Works and BFI sponsored an International Puppet Show on recycling as part of the Festival International de Louisiane.

Commercial

In January 1991, the Chamber of Commerce distributed literature on source reduction in the work place to city businesses.

Economics

Costs Cover: Capital and operating and maintenance costs given below cover: (1) collection of 2,440 tons of residential recyclables at curbside, and (2) collection of 2,211 tons of residential yard waste at curbside. The City of Lafayette pays for the curbside collection of recyclables and yard waste and for the processing of recyclables through contract fees. The City pays directly for compost processing equipment, labor at the compost site, education, publicity, and program administration.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
78,000 Recycling Bins	$400,000	Recycling	1988
Chevrolet 1-ton Truck*	16,000	Recycling	1988
2 Eager Beaver Trailers* @ $13,000	26,000	Recycling	1988
Chevrolet 1-ton Truck*	18,000	Recycling	1989
2 Gooseneck Trailers* @ $6,000	12,000	Recycling	1989
Ford 1-ton Truck*	13,000	Recycling	1989
Ford 1-ton Truck*	18,000	Recycling	1989
1 25-cubic-yard and 2 32-cubic-yard Compactor Trucks†	250,000	Composting	1990

Note: The City purchased the recycling bins, which were fully paid for at the time of purchase.
*Equipment, purchased and owned by The Recycling Foundation, was purchased through a Container Recovery Corporation 5-year loan.
†Equipment purchased and owned by Recycle America.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
50-foot Truck Scale*	Leased	Recycling	
2 Downstroke Selco Vertical Baler* @ $8,280	$16,560	Recycling	1989
West Coast Glass Crusher*	10,000	Recycling	1989
Conveyor Belt*	9,360	Recycling	1989
CP Manufacture 600 Densor*	20,320	Recycling	1989
Nissan Forklift*	17,500	Recycling	1990
Stumpmaster Tub Grinder†	125,000	Composting	1990
Front-end Loader†	65,000	Composting	1990

*Equipment purchased and owned by The Recycling Foundation.

†The City purchased the tub grinder and front-end loader, which were fully paid for at the time of purchase.

Annual and Per Ton Operating and Maintenance Costs (FY 1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$243,200**	**2,440**	**$100**
Curbside Collection and Processing*	$95,700	2,440	$39
Administration	97,500	2,440	40
Education/Publicity	50,000	2,440	20
Composting Subtotal	**$240,875**	**2,211**	**$109**
Collection and Processing	$198,375	2,211	$90
Collection†	160,875	2,211	73
Processing†	37,500	2,211	17
Administration	32,500	2,211	15
Education/Publicity‡	10,000	2,211	5
Recycling & Composting Total	**$484,075**	**4,651**	**$104**
Collection and Processing	$294,075	4,651	$63
Administration	130,000	4,651	28
Education/Publicity	60,000	4,651	13

Notes: Costs given in this table represent the City of Lafayette's operating and maintenance costs for recycling and composting in fiscal year 1990 (November 1989 to October 1990).

Numbers may not add up to total due to rounding.

In fiscal year 1991 (November 1990 to October 1991), The Recycling Foundation's contract fees for recycling collection and processing increased to $293,700.

*Contract fee paid to The Recycling Foundation, covers recycling collection and processing costs. The City paid The Foundation $0.29 per household per month in fiscal year 1990, 27,500 households were served.

†The cited collection cost ($160,875) represents costs for yard waste collected over the 5-month period, derived by prorating the $386,100 in contract fees paid to WMI from May 1990 through April 1991. Processing cost ($37,500) represents yard waste processing costs over the same period derived by prorating the City's $90,000 annual operating budget for composting.

‡A total of $20,000 was spent on education and publicity for the City's composting programs. The City of Lafayette spent $10,000, and WMI spent $10,000.

The Recycling Foundation's 1989-1990 contract fee of $95,700 covered collection and processing of recyclables. The cost of $160,875 for yard waste collection (prorated over the 5-month collection period) is a contract fee, based on a per household cost, paid to Recycle America. Compost processing costs of $37,500 (prorated costs over a 5-month period) cover two employees' salaries and benefits, and all operating and maintenance costs at the compost site. Funds for education and publicity were received from the Louisiana Department of Environmental Quality ($15,000), the City of Lafayette ($10,000), WMI ($10,000), and The Recycling Foundation ($35,000).

In 1988-1989 Lafayette residents paid $7.85 per household per month for weekly collection of recyclables and garbage collection twice per week. In 1989-1990, Lafayette offered three services—weekly recycling collection, weekly yard waste collection, and twice-weekly garbage collection—at a rate of $6.85 per household. Rates for the same services increased in 1990-1991 to $8.10 per household per month.

Materials Revenues: None for the City (The Recycling Foundation's 1990 materials revenues totalled $90,000). Finished compost is not sold.

Source of Funding: In fiscal year 1990, Lafayette charged residents $7.85 per household per month for collection of refuse, recyclables, and yard waste, whether or not residents participated in recovery programs. (Yard waste collection began in May 1990.) Compost tipping fees paid by Recycle America and Lafayette County residents ($12 per ton) cover compost processing expenses.

Full-time Employees: 4 City employees, 34 private employees. The City of Lafayette employs 2 people to process yard waste at the composting facility and 2 people to perform educational, publicity, and administrative functions in the recycling office. The Recycling Foundation employs 11 people for curbside collection of recyclables, 10 people for materials processing, and 3 for administration. Recycle America employs 10 people for yard waste collection.

Future Solid Waste Management Plans

Lafayette will promote recycling in its institutional sector during the next phase of its recycling program. In 1991 the University of Southwestern Louisiana began a campus-wide recycling program, collecting aluminum cans and high-grade paper. The Lafayette Parish schools are slated to begin recycling aluminum and high-grade paper in the fall of 1991. Other City plans include implementing a program for household hazardous waste collection, expanding educational materials on source reduction and packaging, and requiring procurement of recycled paper in all municipal offices.

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References

"Program Description." Environmental Quality Recycling Section, Department of Public Works, Lafayette, LA. Undated.

Lincoln Park, New Jersey

Demographics

Jurisdiction:	Borough of Lincoln Park
Population:	10,978 in 1990
Area:	6.94 square miles
Total Households:	4,260 (2,772 in single- and two-family dwellings, 1,128 in condominiums, and 360 in garden apartments)
Total Businesses and Institutions:	195 businesses and 4 institutions. Most of the businesses are small.
Brief Description:	Lincoln Park is a suburban residential community located in Morris County, between two major New Jersey metropolitan areas, Newark and Paterson. Much of its land is wetlands protected from development. The primary employers in the County are AT&T and Allied-Signal Chemical Corporation, in the private sector, and the County government and Picatinny Arsenal, in the public sector. Lincoln Park's per capita income was $15,616 in 1987 (the most recent year for which figures are available).

Solid Waste Generation and Recovery

	Residential*	Comm/ Instit	Other†	Total MSW	C&D Debris‡	Total Waste
Annual Tonnages (1990)						
Recovered	**3,796**	**3,213**	**1,876**	**8,886**	**604**	**9,490**
Recycled	1,409	3,193	–	4,603	522	5,124
Composted	2,387	20	1,876	4,283	83	4,366
Disposed**	**3,954**	**1,395**	–	**5,349**	**NA**	**NA**
Incinerated	0	0	–	0	NA	NA
Landfilled	3,954	1,395	–	5,349	NA	NA
Generated	**7,750**	**4,608**	**1,876**	**14,234**	**NA**	**NA**
Percent by Weight Recovered						
Recovered	**49%**	**70%**	–	**62%**	**NA**	**NA**
Recycled	18%	69%	–	32%	NA	NA
Composted	31%	††	–	30%	NA	NA

Note: Tires are included in residential and commercial waste recovered. Due to rounding, percentages may not add to total. A total of 1,991 tons of paper waste recycled from three printers and/or manufacturers of paper products are excluded from tonnages listed above. Such tonnages are not considered post-consumer municipal waste. If such material were to be included, Lincoln Park would have recovered 79% of its commercial waste and 67% of its MSW in 1990.

* Residential recovered tonnages include some commercial material brought to the drop-off by businesses and excludes 99 tons of recyclable material that were collected by a private hauler from 2 condominium complexes in the City. This tonnage is included under commercial waste, as is the corresponding waste disposed.

† Consists of 1,876 tons of stumps and logs collected by tree-trimming companies from residents and businesses in the Borough. This figure cannot be divided into residential and commercial.

‡ Construction and demolition debris recovered consisted of 522 tons of asphalt, of which the Borough reclaimed 61 tons and the private sector recovered 461 tons; an additional 83 tons of wood waste from the demolition of two houses in the Borough, was recovered and composted by the private sector. Tonnages of C&D disposed in private landfills are not available.

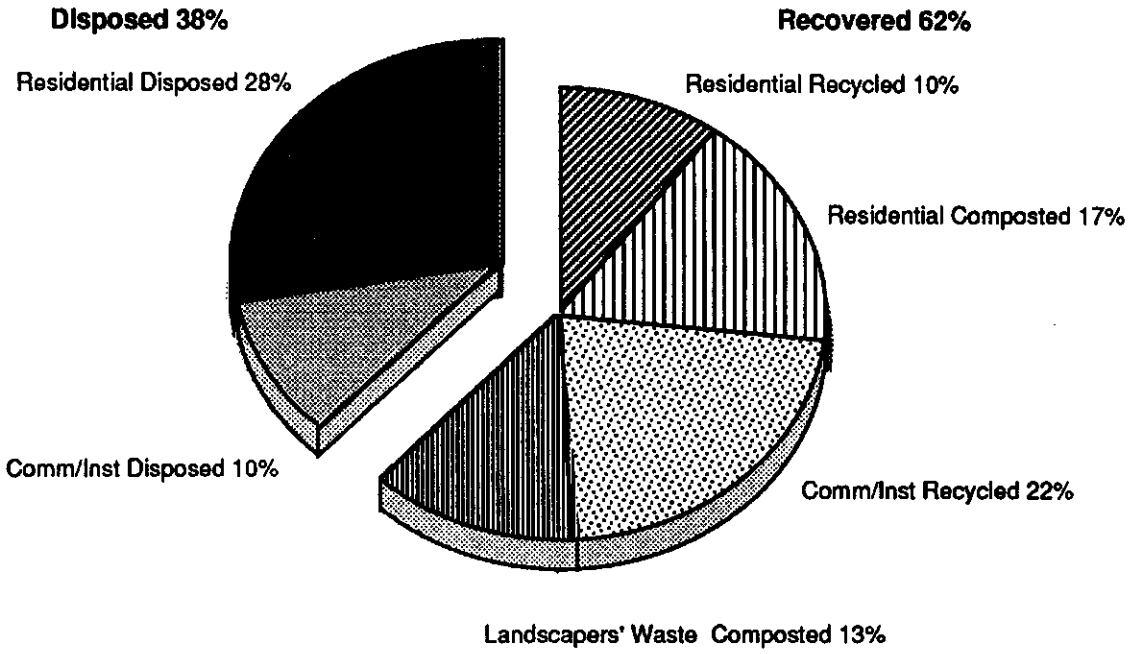
** Commercial and residential waste disposed may be underreported due to violations of solid waste requirements by private waste haulers. One hauler, San Giacomo, which serviced two condominium complexes in Lincoln in 1990, was issued an administrative order for failing to bring waste generated in the Borough to the Morris County Transfer Station 70 times between July and December 1988. San Giacomo reported having collected 99 tons of recyclable materials in Lincoln Park in 1990. Lincoln Park's Recycling Coordinator believes that illegal dumping was a minimal problem in 1990. In 1991 San Giacomo had its waste hauling license revoked. Jersey Carting, a commercial hauler, was indicted for bringing recyclable materials to HUB Recycling, an illegal dump site.

†† Less than 1 percent

Transfer Station Tipping Fee: $122.42 per ton in 1989, $118.80 in 1990, and $125.48 in 1991

Refuse Collection and Disposal: Lincoln Park contracts with Suburban Disposal Company for the collection of its residential solid waste from all single-family and two-unit buildings. Under the contract, the Borough pays a per ton collection and transportation fee to the hauler and is responsible for paying the tip fee at the transfer station. In 1990 the City paid a total of $685,939 for the collection, transportation and disposal of 3,954 tons of residential refuse ($173 per ton), of which $219,990 was paid to Suburban Disposal for collection and transportation and $465,949 consisted of tipping fees at the transfer station. Refuse is collected twice a week from single-family households and duplexes, and three times a week from multi-unit com-

Municipal Solid Waste Recovered and Disposed (Percent by Weight, 1990)



Note: Due to rounding, percentages do not add to 100%

Refuse Collection and Disposal (cont'd):

plexes. In 1990 businesses contracted with private haulers to haul 1,395 tons of refuse to the Morris County transfer station (owned and operated by the Chambers Development Corp.), where all refuse generated in Lincoln Park must go according to Borough and State law.

The transfer station, located in Parsippany, is an average distance of 5 miles from Borough refuse collection routes. From the transfer station, waste is long-hauled to out-of-state landfills. It is illegal for the Borough to dispose of any materials that are designated as recyclable.

Chambers Development Corp. has been negotiating with the Morris County Municipal Utilities Authority for a tipping fee increase, since the original contract was negotiated with little consideration of the possibility that waste would be diverted through recycling, reducing the company's revenues. Chambers was awarded tipping fee increases of 5 percent per year over the next 5 years, beginning in 1990. Taxes on materials delivered to the facility and host fees are calculated as a percent of the tipping fees and are paid in addition to the tipping fee.

Materials Recovery Overview

Goals and Legislative Requirements:

In April of 1987, the State of New Jersey passed the Statewide Mandatory Source Separation and Recycling Act (P.L. 1987, c.102). The law requires that each municipality recycle 15 percent of the municipal solid waste stream in the first year of its recycling program and 25 percent thereafter, and offer residents the opportunity to recycle a minimum of three materials. As of April 1990, the County mandated that grass clippings be collected separate from refuse and composted, or left on the lawn. Borough law requires residents to recycle at least 16 designated materials.

The Borough of Lincoln Park recovers recyclable materials primarily through its Recycling Depot, a drop-off center open only to residents and area businesses. Lincoln Park also collects newspapers and yard waste through a residential curbside collection program. Recycling in Lincoln Park began with the Boy Scouts, who started collecting newspapers, corrugated cardboard, aluminum cans, and glass in conjunction with the Department of Public Works (DPW) in 1979. In January 1987, the DPW took over the collection, when a glut in the newspaper market rendered its collection unprofitable for the Boy Scouts. The Recycling Depot (or drop-off center) sited in the Public Works Yard was first established in 1983 for collection of newspaper, glass, and aluminum cans from Lincoln Park's residents. The Depot gradually expanded the types of materials it accepted. As of 1989, the Borough accepts at the Recycling Depot and requires residents to recycle newspaper, high-grade paper, corrugated cardboard, magazines, junk mail, glass, aluminum, tin cans, plastic bottles, appliances, scrap metal, tires, oil, car batteries, leaves, brush (including Christmas trees), and grass clippings.

In 1990 the Borough, again, increased the range of materials accepted at the Depot to include bimetal cans, all types of plastic bottles, and scrap lumber. Eight new roll-off containers were added to the yard, enabling the Borough to ship materials to market in the same containers in which they are collected. The Borough is expanding the size of the recycling yard from 1 to 2.5 acres, and is strongly encouraging commercial establishments in the area to use the facility. Lincoln Park received a $15,000 grant from the Plastic Recycling Corporation of NJ for a plastics compactor, which went on line in July 1991.

The recycling program in Lincoln Park has been touted as one of the most successful in New Jersey. Because residents are willing to bring materials to the drop-off center, the Borough can keep the cost of recycling to a minimum. In 1988 Lincoln Park recovered a total of 41 percent of its waste stream, 34 percent through recycling and 7 percent through composting. In 1989 the Borough was recovering 53 percent of its waste, and in 1990 it had recovered 62 percent of its municipal solid waste, 32 percent through recycling and 30 percent through composting. This rise in the recovery rate is partially due to an increase of yard waste recovered from 817 tons in 1988 to 4,283 tons in 1990—a jump of nearly 200 percent over 2 years. Paul Sarames, the Deputy Recycling Coordinator, attributes the increase to residents' heightened awareness of the program, and to the fact that some private haulers who did not report tonnages recycled in 1988 did report in 1989 and 1990. As a result of the Borough's successful recycling activities, Richard Lovallo, Lincoln Park's "part-time" Recycling Coordinator, won the Morris County Municipal Recycling Coordinator award in 1989, and received an award from the New Jersey Recycling Forum in 1990. Channel 9 News in New York featured Lincoln Park's program on the environmental segment of its news program in August 1991.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	January 1987
Service Provider:	Department of Public Works (DPW)
Pick-up Frequency:	Monthly
Same Day as Refuse:	No
Households Served:	4,260 households—2,772 single-family residences and duplexes, 360 garden apartment units, and 1,128 condominiums. The largest condominium building is three stories high, with a total of 276 units.
Mandatory:	Yes. The Borough mandates that residents recycle 16 materials.
Participation Rate:	95 percent recycle newspaper (based on monthly set-out rates and sign-in sheets)
Materials Collected:	Newspaper
Set-out Method:	Newspaper must be bundled with twine or put in a kraft paper bag.
Collection Method and Vehicles:	A DPW dump truck operated by a three-person crew is used to collect newspaper.
Economic Incentives:	Fines
Enforcement:	The Borough Administrator and/or designee may assess fines for improper separation of materials. Refuse containing recyclables is "red-tagged" and not picked up by the garbage hauler. No fines have been issued to date.
Annual Tonnage:	According to Richard Lovallo, the Borough Recycling Coordinator, an estimated 70 percent (or approximately 508 tons in 1990) of the newspaper recycled by the residential sector in Lincoln Park is collected at curbside.

In 1990 the Borough began collecting newspapers from the five condominium complexes free of charge. Because of space limitations, the Borough has made individual arrangements with the management association of each. The DPW collects newspapers monthly from the garden apartments also free of charge. Two complexes are serviced by San Giacomo Disposal, a solid waste hauler, which transports newsprint, bottles, and cans to its own facility and reports the tonnages collected to the Borough. At two of the complexes, the DPW collects newspapers monthly and residents have agreed to collect and deliver other recyclables to the drop-off center.

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:	The Borough of Lincoln Park requires that all commercial establishments recycle glass, aluminum, high-grade paper, newspaper, and corrugated cardboard.

Of the approximately 195 businesses located in Lincoln Park, many are doctors', lawyers', and dentists' offices; others are "Mom and Pop" stores. Most of these establishments deliver their

recyclable materials to the Recycling Depot. Paul Sarames, the Deputy Recycling Coordinator, estimates that at most, there are 20 large businesses in the Borough generating large volumes of recyclable materials. Several of these sell directly to markets. For example, A&P and Shoprite supermarkets ship materials to their own warehouses. Private refuse haulers, such as Pinto Refuse from Montville, United Carting, and Jersey Carting collect recyclables from their commercial customers. Based on tonnage reports submitted to the Borough by these haulers, and the businesses that have signed in at the drop-off center, Borough officials estimate that more than 90 percent of the businesses in the community are in compliance with the mandate to recycle.

Drop-off Center

Number and Type:	One
Public or Private:	Public
Sectors Served:	Residential, commercial, and institutional
Materials Accepted:	Newspaper, high-grade paper, corrugated cardboard, paperboard, magazines, junk mail, color-separated glass, aluminum and bimetal cans, PET and HDPE plastics, other plastic containers that have held liquids, appliances, scrap metal, tires, motor oil, batteries, wood pallets, lumber waste, leaves, brush, and grass clippings
Separation Method:	Users are asked to separate all materials and deposit them in the appropriately labelled container. Glass is sorted by color and placed in wooden bins; magazines and junk mail are placed in self-dumping hoppers; all other materials are placed in one of ten 30- or 40-cubic-yard roll-off containers.
Mandatory:	Yes
Participation Rate:	70 percent of total Borough households, according to sign-in sheets
Annual Tonnage:	1,925 tons in 1990 (962 tons of recyclables and 963 tons of compostables)

The drop-off yard is conveniently located in the center of the Borough near a major shopping center. Eight roll-off containers and one roll-off truck were purchased for materials collected at the drop-off site. This addition makes hauling the materials to market a one-step process. In 1990 the Borough Depot began accepting materials from commercial establishments. Two restaurants, a few pizzarias, and an American Legion hall bring their glass to the drop-off center. Because the Borough can tip tires at a lower cost than can the private sector, service stations and businesses bring auto tires to the center at a fraction of what they were paying. In 1991 the drop-off center is being expanded from 1 to 2.5 acres, to accommodate the increase in materials brought to the recycling center by residents and small businesses. The Depot is open Mondays through Fridays from 7:30 am to 3:30 pm, and on Saturday from 8:00 am to 5:00 pm. It is staffed for 20 hours during the week by the Borough Recycling Coordinator.

Processing and Marketing of Recyclables

Newspaper collected through Lincoln Park's curbside recycling program and materials accepted at the Borough's Recycling Depot require minimal processing on site prior to being transported to market. Workers in the DPW yard pull contaminants (almost all of which are recyclable) from the newspaper collected at curbside. The newspaper is then dumped into 30-cubic-yard roll-off containers; when the

containers are full, they are shipped, as is, to market. Color-sorted glass and other materials are also shipped in roll-off vehicles to various end markets. No materials are rejected as nonrecyclable. The Borough delivers old newsprint, corrugated cardboard, and high-grade paper unbaled to Joseph Damato Paper Stock Corp. in Paterson, New Jersey, and clear and colored glass to REI Distributors in Newark. Junk mail and magazines are sold to Marcal in nearby Elmwood Park, where they are used to make toilet tissue. (Marcal makes all its paper products from waste paper.) Aluminum cans are sold to All Container. Ferrous scrap, including cans and metal from white goods, is sold to one of several companies in the Newark area: Naparano Shredding, United, or A&A Scrap. Plastics are sold to Materials for Recycling (MFR) in Newark and Lobosco in Paterson. Motor oil is sold to a Pennsylvania firm, S&M Waste Oil, where it is re-refined. Car batteries are typically sold to A&A Recycling. New York Tire Recyclers accepted tires for recycling, charging $0.87 per tire, but went out of business in mid-1991. The Borough is looking for new markets for used tires.

Minimal revenues are earned from the sale of batteries or plastic. Lincoln Park does receive revenue from its aluminum, but donates a percentage of this money to a local food pantry and puts the remainder into a scholarship fund. In 1988 the Borough received $7,000 for the sale of newspaper, glass, and aluminum, of which it donated $5,500. Revenues from the sale of glass and newspaper are used to cover the costs charged to the Borough for recycling corrugated cardboard, brush, and tires. In 1990 the Borough received approximately $10,000 from the sale of recyclable materials, but it spent $12,000 to recycle brush, and $3,800 to recycle tires.

Composting Activities

Lincoln Park recovers yard waste through curbside collection of leaves and grass clippings, and through the public drop-off site. The Borough reports that more households are setting out yard waste at the curb in 1990 than in 1989. This increase is attributed in part to the County requirement, effective in April 1990, that grass clippings (if not left on the lawn) be set out at the curb separate from refuse. The Borough brings leaves and grass clippings to two local compost facilities and brush to three private chipping and composting companies. In addition, the Borough encourages residents (particularly those at condominium complexes) and some businesses to compost in their backyards.

Curbside Collection

Start-up Date:	Leaf collection began in 1976. The Borough added brush in January 1980, and grass clippings in January 1989. Christmas trees have been collected at the curb since 1988.
Service Provider:	Department of Public Works
Households Served:	2,772 in 1990 (all single-family houses and duplexes in the Borough)
Mandatory:	Yes. All materials are mandatory.
Materials Collected:	Leaves, brush, grass clippings, and Christmas trees
Set-out Method:	Residents may bag or rake loose leaves, brush, and grass clippings to the curb. Residents may place Christmas trees, unadorned, at the curb for 2 to 3 weeks following Christmas Day.

Collection Vehicles & Method:	Yard waste is collected at curbside by two City employees. They pick up leaves with a vacuum pulled by a DPW dump truck. The DPW uses packer trucks with two crew members for bagged leaves and grass. Christmas trees are collected in a dump truck.
Collection Frequency:	The DPW provides curbside collection for leaves according to a schedule, which is published in the local newspapers. Leaves, brush, and grass clippings are collected at least twice a month during April, May, October, and November. The DPW collects brush with the help of the Sheriff's Labor Assistance Program.
Economic Incentives:	None
Annual Tonnage:	1,424 tons in 1990

Composting Site

Lincoln Park Borough collects leaves, brush, grass clippings, and Christmas trees for composting through a seasonal curbside program and a year-round drop-off program at the recycling center. According to the Recycling Coordinator, more than 90 percent of residents either set out this yard waste at the curb or bring it to the drop-off center. In 1990 a total of 963 tons of yard waste were dropped off by residents and small businesses.

DPW workers bring yard waste and Christmas trees from the curbside routes and yard waste collected at the Recycling Yard to one of two facilities: the Morris County Shade Tree Composting Facility, a County-owned and operated facility in Morris Plains, New Jersey, approximately 15 miles from Lincoln Park, and the Town of Montville compost site, 5 miles from Lincoln Park. Large brush and stumps that are not accepted at either of the above facilities are sent to the Ox Stump Factory in Ledgewood 20 miles away.

In 1988 the Borough brought leaves and grass clippings to the Shade Tree site and was not charged a tipping fee. The Montville site would not accept brush. As of 1990, the Borough is charged $3.71 per cubic yard to tip yard waste at the County compost site. Operators place leaves and grass clippings in windrows, which are turned every 10 days; the compost process is complete in 90 days. Although residents can take finished compost free of charge, most is sold to soil contractors for $1.50 per cubic yard. The Ox Stump Factory, which opened in 1989, accepts yard waste, brush, and tree stumps for a fee of $8.00 per cubic yard. Until the Ox Stump Factory opened, the Borough had no end user for stumps, which it stockpiled in the Public Works Yard. Brush is brought to each facility as is, but the Borough chips Christmas trees before delivering them to the County site. In 1991 the Borough began hauling wood waste (lumber and scrap construction wood) to Advanced Recycling in Newark, which charges the Borough a tipping fee of $8.00 per cubic yard.

Amount and Breakdown of Materials Recovered

Material	Total (Tons, 1988)	Total (Tons, 1989)	Total (Tons, 1990)
Newspaper	694.2	796.9	810.8
High-grade Paper	47.6	39.6	23.2
Corrugated	1,501.5	1,601.9	1,378.2
Other Paper*	1,047.8	3,286.2	1,481
Commingled†	8.9	193.3	–
Glass	189.5	25.4	180.9
Aluminum	6.0	15.9	22.5
Plastic	22.4	128.2	133.0
Other Metal	69.6	318.3	191.8
Batteries	3.1	14.3	11.8
Tires	21.0	44.8	47.1
Motor Oil	40.5	68.3	103.4
Food Waste	75.8	96.6	85.8
Other (Textiles)	0	0	22.9
Subtotal MSW Recycled	**3,727.9**	**6,629.7**	**4,603**
Leaves	730.0	1,391.4	1,374.2
Brush & Christmas Trees	86.7	370.3	611.8
Grass Clippings	–	404.0	421.0
Stumps and Logs	–	–	1,876.0
Subtotal MSW Composted	**816.7**	**2,165.7**	**4,283.0**
Total MSW Recovered	**4,544.6**	**8,795.4**	**8,886**
Asphalt	–	315.2	521.5
Wood Waste	–	1,729.8	82.9
Total C&D Recycled	**0**	**315.2**	**521.5**
Total C&D Composted	**0**	**1,729.8**	**82.9**
Total C&D Recovered	**0**	**2,045.0**	**604.4**
Total Materials Recycled	**3,727.9**	**6,944.9**	**5,124**
Total Materials Composted	**816.7**	**3,895.5**	**4,365.9**
Total Material Recovered	**4,544.6**	**10,840.4**	**9,490**

*A total of 1,990.8 tons of paper waste, collected from two manufacturers of paper products, are excluded from 1990 tonnages. Such paper waste is included in 1989 tonnages.

†Includes glass and aluminum. In 1990 no material was commingled. Residents were asked to separate all food and beverage containers by material.

Material	Residential (Tons, 1990)	Commercial/ Institutional (Tons, 1990)	Other (Tons, 1990)	Total (Tons, 1990)
Newspaper	725.9	84.9	–	810.8
Corrugated Cardboard	166.1	1,212.1	–	1,378.2
High-grade Paper	–	23.2	–	23.2
Other Paper*	110.3	1,480.9	–	1,591.2
Glass	161.7	19.2	–	180.9
Plastic Containers	–	9.0	–	9.0
Other Plastic	28.5	95.5	–	124.0
Aluminum Cans	17.7	4.8	–	22.5
Ferrous Metal	128.0	48.1	–	176.1
Non-ferrous Metal	11.5	4.2	–	15.7
Food Waste	0	85.8	–	85.8
Tires	40.2	6.9	–	47.1
Motor Oil	14.2	89.2	–	103.4
Batteries	5.2	6.6	–	11.8
Other (Textiles)	–	22.9	–	22.9
Subtotal MSW Recycled	**1,409.3**	**3,193.3**	–	**4,602.6**
Leaves	1,354.2	20.0	–	1,374.2
Brush and Christmas Trees	611.8	–	–	611.8
Grass Clippings	421.0	–	–	421.0
Stumps and Logs	–	–	1,876.0	1,876.0
Subtotal MSW Composted†	**2,387.0**	**20.0**	**1,876.0**	**4,283.0**
Total MSW Recovered	**3,796.3**	**3,213.3**	**1,876.0**	**8,885.6**
Asphalt	60.9	460.6	521.5	521.5
Wood Waste	–	–	82.9	82.9
Total C&D Recycled‡	–	–	**521.5**	**521.5**
Total C&D Composted	–	–	**82.9**	**82.9**
Total C&D Recovered	–	–	**604.4**	**604.4**
Total Materials Recycled	**1,409.3**	**3,193.3**	**521.5**	**5,124.1**
Total Materials Composted	**2,387.0**	**20.0**	**1,958.9**	**4,365.9**
Total Materials Recovered	**3,796.3**	**3,213.3**	**2,480.4**	**9,490**

Note: Thirty-nine tons of auto scrap were recovered in 1990. This tonnage is excluded from waste recovery and generation figures as it is not considered to be part of the municipal solid waste stream or construction and demolition debris. A total of 1,990.8 tons of printer's and/or manufacturer's paper waste is also excluded. Listed tonnages represent marketed material.

* Other paper from the residential sector includes high-grade paper, magazines, and junk mail.

† Of the MSW composted, approximately 1,424 tons were collected at curbside and 963 tons were collected at the drop-off site. The Borough uses a combination of conversion factors and an average of sample weights to determine the tonnages of yard waste and an average of sample truck weights (taken each season) to determine tonnages of yard waste. The conversion factors that the Borough uses are approved by the NJ Department of Environmental Protection and are as follows: 35 bags per ton for bagged leaves, 2.86 cubic yards per ton for vacuumed leaves, 2 cubic yards per ton for compacted leaves, 8 cubic yards per ton for stumps and logs, and 4 cubic yards per ton for wood chips.

‡ Of the asphalt recovered, 60.9 tons were collected and recycled by the Borough, and 460.6 tons of asphalt were recovered privately. Eighty-three tons of wood waste were recovered by private companies under contract with the Borough from the demolition of two houses.

Publicity and Education

Every year the Borough sends a flier to all residents detailing what materials are mandated for separation, what materials may be recycled voluntarily at the drop-off center, and how to prepare all materials. The Borough spent $400 on its mailing in 1988, $1,000 in 1989, and $250 for reprints in 1990. The Borough also sends two mailings a year to encourage participation in the mandatory recycling program. In its 1990 annual mailings to area businesses, Lincoln Park has urged them to report their recycling activities, as required by County law. The local newspaper advertises Lincoln Park's recycling successes. Articles include information about the percentage of materials recovered and photographs of residents at the recycling center. The photographs help to create a feeling of pride in the recycling program. The newspaper also prints the collection schedule for leaves and brush.

In May 1988, fourth-grade children in Lincoln Park were treated to a 50-minute lesson on recycling, reuse, and reduction by "Glinda Garbajh," a character conceived and developed in 1987 by Penny Jones, the County Recycling Education Specialist. In 1990 efforts to teach school children about recycling have been stepped up. The County Recycling Education Specialist supplies teachers with news articles, a brochure listing books and educational videos, the New Jersey Teachers Guide on Recycling, and an evaluation form. The Borough added a puppet show to the K-6 curriculum at the Pine Brook School in 1990. Produced and performed by the Peppermint Players from Morris County, the puppet show was first performed on Earth Day 1990.

Economics

Costs Cover:

The capital costs listed below are the Borough's costs for equipment used for collecting materials at curbside and through the drop-off site, and for transportation to market of 1,470 tons of recyclable materials (1,409 tons of residential recyclables and 61 tons of construction and demolition debris) and 2,387 tons of compostable material.

The Borough's 1990 operating and maintenance (O&M) costs given below, cover the DPW's collection and transportation to market of 1,470 tons of recyclable materials (508 tons of newspaper collected through the municipal curbside program, and 962 tons collected at the Recycling Depot), and the collection and processing of 2,387 tons of yard waste (1,424 collected at curbside and 963 collected at the drop-off site).

Private sector capital and O&M costs for the collection and processing of 5,645 tons of recyclables and 1,979 tons of organic waste are not available.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
2 Vacuums @ $2,500 each	$5,000	Composting	1974
Dump Truck @ 30% recycling and 30% composting	19,000	Recycling/Composting	1989
Roll-off Truck	78,000	Recycling/DO	1989
8 Roll-off Containers @ $2,500 each	20,000	Recycling/DO	1989
2 30-cubic-yard Roll-off Containers @ $3,000 each	6,000	Recycling/DO	1990
40-cubic-yard Roll-off Container	3,600	Recycling/DO	1990
Packer Truck*	Donated	Recycling	1990
Lumber and Paving Material for Enlarging Recycling Depot	4,000	Recycling/DO	1990
3 Self-Dumping Hoppers @ $700 each	2,100	Recycling/DO	1990
Hydraulic Tailgate	1,600	Recycling	1990
Lumber and Metal Beams for New Bins	2,200	Recycling/DO	1990

Note: Lincoln Park issued bonds at a rate of 6 percent for a 5-year period for the purchase of the roll-off vehicle. All other equipment has been paid in full out of the general DPW budget.
* Donated by a Lincoln Park resident, who formerly owned a garbage hauling company.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
2 Chippers @ $8,000 each	$16,000	Composting	1982
2 Used Balers @ $500 each	1,000	Recycling/DO	1990
30-cubic-yard Plastic Compactor*	14,000	Recycling	1990
Aluminum/Tin Separator	7,000	Recycling	1991

Note: All equipment, with the exception of the plastic compactor, has been paid in full out of the general DPW budget.
*Purchased with a grant from the Plastics Recycling Corporation of New Jersey.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered*	Per Ton Cost
Recycling Subtotal	**$98,485**	**1,470**	**$67**
Collection	$72,725	1,470	$49
Processing	7,760	1,470	5
Administration†	17,000	1,470	12
Education/Publicity†	1,000	1,470	1
Composting Subtotal	**$45,600**	**2,387**	**$19**
Collection	$38,775	2,387	$16
Processing	6,825	2,387	3
Administration†	0	2,387	0
Education/Publicity†	0	2,387	0
Recycling & Composting Total	**$144,085**	**3,857**	**$37**
Collection	$111,500	3,857	$29
Processing	14,585	3,857	4
Administration**	17,000	3,857	4
Education/Publicity	1,000	3,857	‡

Notes: There is no line item in the budget for the operation and maintenance of the recycling program. Collection and processing costs are estimated by the Deputy Recycling Coordinator, based on approximate time spent by DPW employees on recycling and composting.

An additional 82.9 tons of wood waste were recovered from the demolition of two houses in the Borough. The demolition was paid for through a grant from the U.S. Department of Housing and Urban Development.

*The 1,470 tons of material collected at the Borough Recycling Depot include 1,409 tons of recyclables and 61 tons of construction and demolition debris.

†Administration, education, and publicity costs cannot be broken down between recycling and composting programs.

‡Less than $1

**While only $17,000 is budgeted for administering the Borough's materials recovery program, at least $25,000 is spent. The Borough's Recycling Coordinator receives additional funding for his recycling responsibilities from other departments' budgets.

In 1990 Lincoln Park spent approximately $173 per ton for the collection, transportation and disposal of waste. Based on this figure and the estimated operating and maintenance cost of $37 per ton for the recycling and composting program, the Borough saved more than $500,000 in avoided disposal costs.

While the total cost of recycling collection increased $8,000 between 1988 and 1990, due to a large increase in tons recovered, the per ton cost actually decreased from $61 in 1988 to $49 in 1990. Similarly, the per ton cost of yard waste collection dropped from $46 in 1988 to $16 per ton in 1990, and the per ton cost of all recycling and composting programs declined from $68 per ton in 1988 to $37 per ton in 1990. According to Paul Sarames, the decreased cost is due primarily to the increased tonnage that has been collected at the drop-off center.

Materials Revenues: Approximately $10,000 in 1990

Source of Funding: State Tonnage Grant for $14,000.

Employees: 2 part-time Borough employees: the Borough Recycling Coordinator and Deputy Recycling Coordinator. DPW workers are also used on an as-needed basis.

Future Solid Waste Management Plans

The Borough expects to have the expanded Recycling Depot operational by November 1991. In the summer of 1991, the plastics compactor, purchased by the Borough with a grant from the Plastics Recycling Corporation of New Jersey, went on line. Lincoln Park is looking to secure new markets, particularly for plastics and to find new markets for tires.

In August 1992, Lincoln Park will begin to collect seven different recyclable materials at curbside from Borough households. Materials include newspaper, junk mail and magazines, corrugated cardboard, all plastic bottles, glass, aluminum and tin cans. Residents will segregate all materials including sorting glass by color. The Borough will contract with either their waste hauler or Morris County to provide this service, at a projected cost of $1.50 per household per month.

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Naperville, Illinois

Demographics

Jurisdiction:	City of Naperville
Population:	85,351 in 1990
Area:	30 square miles
Total Households:	31,000 (22,000 in single–family residences, 2,500 in two– to four–family buildings, and 6,500 in multi-unit buildings larger than four units)
Total Businesses and Institutions:	3,113 (3,019 businesses and 94 institutions)
Brief Description:	Naperville is an upper middle class suburb west of Chicago. Its economy is based on large businesses, scientific firms, and corporate headquarters. Local businesses include Bell Labs, Amoco Research, and Nalco Chemical Company. Due to corporate transfers, Naperville has a high turnover rate. An average of 1,200 new housing units are constructed each year. The City has a low unemployment rate (less than 5 percent); its median household income was $60,690 in 1991.

Solid Waste Generation and Recovery

	Residential* (Public-Service Area)	Commercial/ Institutional and C&D†	Self-Haul‡	Total MSW
	Annual Tonnages (1990)			
Recovered	**12,518**	**NA**	**1,619**	**NA**
Recycled	7,617	NA	1,619	NA
Composted	4,901	NA	NA	NA
Disposed	**26,502**	**NA**	**NA**	**NA**
Incinerated	0	0	0	0
Landfilled	26,502	NA	NA	NA
Generated	**39,020**	**NA**	**1,290**	**NA**
	Percent by Weight Recovered			
Recovered	**32%**	**NA**	**NA**	**NA**
Recycled	20%	NA	NA	NA
Composted	13%	NA	NA	NA

*Tonnages represent waste, recyclables, and compostables collected from one- to four-unit households and condominium buildings; these are served with municipal collection.

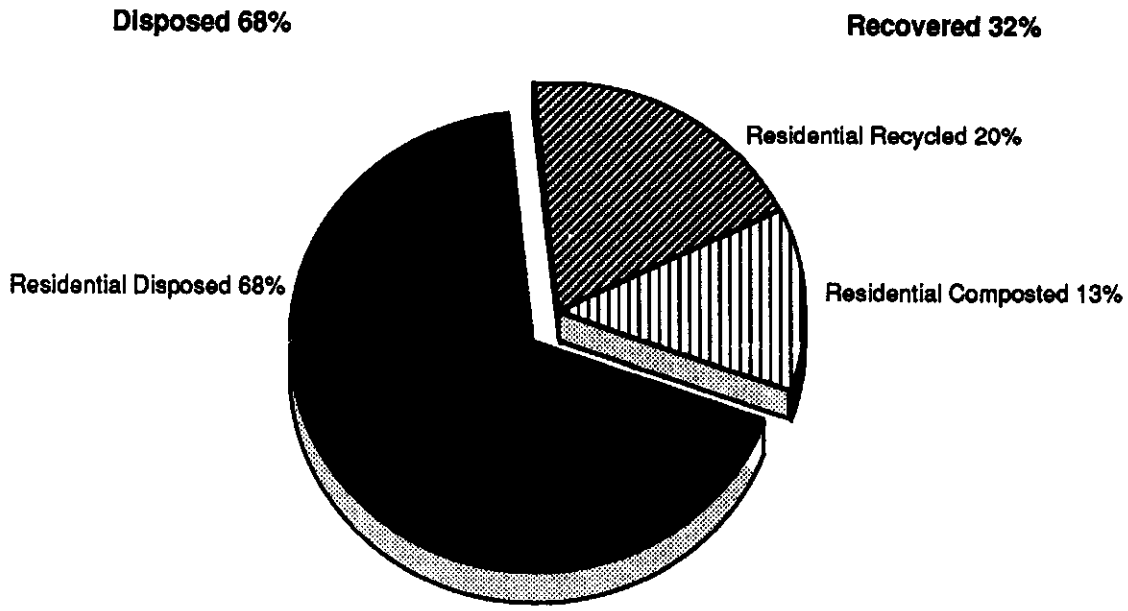
†Tonnages for commercial/ institutional waste disposed and recovered are not available. However, a number of businesses are recycling. Tonnages for C&D generated are not available. Using a County per capita construction and demolition debris generation figure of 2.3 pounds per day, we estimate that Naperville generated 35,826 tons of C&D in 1990. In 1990 the City asphalt pavement recycling program recycled an estimated 10,247 tons of asphalt. Through this "Heat-Scarify-Overlay" program, old pavement is removed, reprocessed, and relaid.

‡Recyclables recovered at the Naperville drop-off center from residents in multi-unit households, businesses, and some residents from unincorporated Naperville.

Landfill Tipping Fee: $7.35 per compacted cubic yard ($22.05 per ton) in 1989 and 1990, $9.15 per compacted cubic yard ($27.45 per ton) in 1991[1]

Refuse Collection and Disposal: The City contracts with Fox Valley Disposal (now called Fox Valley Recycling and Waste Services), a division of Waste Management, Inc., to collect residential refuse from one- to four-unit residences and condominium buildings. Residential refuse is hauled 8 miles to the Greene Valley landfill, owned by Du Page County Forest Preserve and operated by Waste Management, Inc. In 1990 Naperville paid Fox Valley $3,012,748.97 for collection of 26,502 tons of refuse and 526 tons of yard waste, about $111 per ton. This included a diversion credit of $266,595 paid to the City. In May 1991, the City negotiated its new refuse contract, based on a per household fee and volume collected, and is paying $2,399,00 for refuse collection only. Residents will pay $1.50 per bag of

Residential Waste Recovered and Disposed (Percent by Weight, 1990)



Note: Due to rounding, numbers may not add to total.

Refuse Collection and Disposal (cont'd):

yard waste set out. Beginning in 1990, residential refuse collection was reduced from twice a week to once a week. This has resulted in a reduced per household charge despite the addition of weekly yard waste collection. The City is divided into waste collection quadrants. Each quadrant receives three collections—refuse, recyclables, and yard waste—on the same day per week. In May 1986, during the second month of curbside recycling, 0.52 cubic yards of refuse were collected from the average Naperville household; in May 1990 (3 years into the recycling program) 0.29 cubic yards of compacted refuse—44 percent less—were collected from the average household.

All commercial and institutional waste, construction debris, and residential waste from buildings with over four units is collected by private haulers; the three major ones are Fox Valley Disposal, Rot's Disposal (owned by BFI), and Crown Disposal. Privately collected refuse is hauled to the County landfill, which has an estimated lifespan of 25 years.

Materials Recovery Overview

Goals and Legislative Requirements:

The Illinois Solid Waste Management Act of 1986 requires counties with over 100,000 residents to complete solid waste management plans by 1991, and to recycle 15 percent of their waste stream by 1994, and 25 percent by March 1997. Naperville is located in two counties, Du Page and Will, and may be required by the State to be part of one of these two counties' plans. Since July 1990, vehicle batteries, tires, and yard waste have been banned from Illinois landfills. Retailers of lead-acid batteries are required to accept used returned batteries when an individual purchases a new battery.

The City of Naperville has a long history of support for recycling and composting. Citizen interest in recycling began with Earth Day 1970. In 1971 the City provided a rent-free site for a recycling drop-off program. Known as the Naperville Reclamation Center, this drop-off site was operated by a nonprofit organization until the fall of 1979, when the center closed due to a decline in prices for old newspaper and other issues. Repeated requests from residents to restart the recycling program led the Mayor to approach the League of Women Voters. The League, along with the American Association of University Women and other community groups, formed a recycling task force, which resulted in the formation of the Naperville Area Recycling Center (NARC), a nonprofit organization with wide community support. In the spring of 1980, the Naperville Area Recycling Center opened the doors of its drop-off site.

In April 1981, NARC moved to a new site on 1 acre of land leased from the City. The City financed site development and equipment costs with a no-interest loan. The drop-off center first accepted tin, aluminum cans, glass containers, newspaper, and motor oil. Citizens worked closely with the NARC Board of Directors to increase the volume of recyclables collected. In 1982 center volunteers collected recyclable materials at curbside from a subdivision and brought them to the drop-off center. Participation in the program was nearly 40 percent. In April 1985, NARC began to collect recyclable materials twice monthly from two subdivisions, using a donated truck. The success of these two experiences led NARC to propose an expanded curbside program. In the fall of 1985, the City agreed to contract NARC for curbside collection of recyclable materials. In April 1986, NARC began curbside collection of fully segregated recyclables from about 6,000 households, or one-quarter of the City, making Naperville the first city in the State of Illinois to contract curbside recycling service. The program was expanded to include 13,000 homes in 1987 and 24,500 households—all the households in the City service area—in 1988. In 1988, 2,523 tons of recyclable materials were collected at curbside from the City's households. In 1989 approximately 4,900 tons were collected, and in 1990, 7,617 tons were collected. These tonnages represent an increase of 94 percent from 1988 to 1989 and an increase of 200 percent from 1988 to 1990. In May 1990, NARC switched from twice monthly collection to weekly collection of recyclables. Monthly collection of material increased from an average of 436 tons per month for the first 4 months of 1990, to an average of 750 tons per month for the subsequent 5 months.

When Naperville signed its last 5-year contract with its refuse hauler, NARC was just beginning a pilot curbside program. A clause in the contract stipulated that after 1 year the hauler, the recycling center, and the City would negotiate a rebate for the City from the hauler based on the volume of material diverted from the landfill by the recycling center. In 1990 Fox Valley paid Naperville a $35 per ton diversion credit for recyclable materials based on avoided tipping fees, trips to the landfill saved, and collection time saved. The value of the latter two was calculated by estimating the reduction in labor and vehicle costs. The City received a total of $266,595 in waste diversion credits from Fox Valley in 1990.

Beginning in 1990, Naperville reduced its refuse collection days from twice a week to once a week, and re-assigned contracted refuse workers to weekly collection of grass clippings and garden waste from

April through December, to comply with the State ban on landfilling yard debris. City crews continued to collect brush and leaves at curbside, as they had done in the past. The City promoted the change in collection schedules as a shift rather than a reduction in service.

In 1991 the City sought competitive bids for its curbside recycling contract. The contract was awarded to Resource Management, a division of DeKalb County Disposal, which proposed collection of commingled materials (including mixed paper) at a lower cost than NARC's collection program. NARC's costs had increased in the past year due to a switch from twice monthly to weekly collection. As tonnages recovered increased, NARC had to hire additional personnel and double its fleet of vehicles. In 1990 NARC switched from a two-person to a three-person crew to speed collection of materials and minimize the need for overtime pay. The switch from NARC to DeKalb County Disposal was troubling to many residents. NARC had initiated recycling in Naperville, working closely with citizens and community groups, and had been the sole provider of recycling services to the City for 10 years. The loss of the contract forced NARC to lay off a large percentage of its staff and consolidate its resources. It continues to run a recycling drop-off center and to collect recyclable materials from multi-unit buildings. Resource Management currently collects commingled recyclables from Naperville households in three sorts: newspaper, mixed paper, and all other materials. These recyclable materials are still considered clean and easily marketed. For example, in July 1991 only 0.58 percent of collected materials were rejected prior to processing. Under the new contract, an average of 940 tons per month of recyclables was collected at curbside, up from 750 tons per month during the same period (between April and September 1991) the year before. The City attributes this increase to the high publicity that recycling received as a result of the change in service provider, the new commingled set-out and an expansion in the types of mixed paper collected.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	April 1986 for one-quarter of the City; 1989 citywide
Service Provider:	The Naperville Area Recycling Center (NARC) under contract with the City. In May 1991, the City switched contractors, and Resource Management, a division of DeKalb County Disposal, began collecting recyclable materials.
Pick-up Frequency:	Weekly
Same Day as Refuse:	Yes
Households Served:	24,500 in 1990 (one- to four-family units and condominiums)
Mandatory:	No
Participation Rate:	75 to 80 percent (based on the actual number of serviced households that set out materials over an extended time period). Resource Management, the new hauler, estimates a set-out rate of 69 percent (based on the number of serviced households that set out material per collection day).

Materials Collected: Newspaper, high-grade paper, corrugated cardboard, boxboard (such as cereal and tissue boxes), magazines, glass bottles, aluminum cans, ferrous cans, scrap metal, HDPE, PET, clean PS plastic containers, and LDPE 6-pack plastic rings. Appliances and white goods are collected for a $15 fee. In 1991 Resource Management began collecting mixed paper, including junk mail, all types of paperboard (food containers, cereal boxes), and envelopes.

Set-out Method: NARC required segregated set-out of recyclables. All materials were separated by type and put in separate containers or bags. Newspaper was bundled separately. Glass was color-sorted and placed in separate containers. Aluminum was placed in one container, tin in another, and all plastics in another. High-grade paper was sorted and placed in separate containers. (Most high-grades are brought to the drop-off.) In the past (1985-86), NARC had offered recycling containers at cost ($5 each). By 1990 few customers were using these recycling containers.

Beginning in May 1991, materials were segregated in three categories: newspaper in one bundle, mixed paper in a second, and all other materials in a third. Residents may now purchase plastic 18-gallon recycling bins at a cost of $7.88 each from the City.

Collection Method and Vehicles: Three crew members collected recyclable materials in compartmentalized trailers pulled by 1-ton Ford trucks. The truck/trailer vehicles have a total of 22 separate compartments or spaces in which to place materials. Newspaper was placed in two 2-cubic-yard bins on the flatbed of the truck and in three additional bins in front of the axle; corrugated cardboard was placed in a fourth bin located in front of the axle; boxboard was placed in one bin behind the axle; and aluminum cans were placed in a second bin behind the axle. The truck contained two additional wire baskets equipped with bulk-lift bags for plastics. Clear and green glass were placed in separate metal bins, and brown glass was placed in a barrel. Tin was placed in barrels, and additional materials were placed in two other barrels. Six additional bags were on the truck to hold other materials, including high-grade paper, plastics, and overflow materials. NARC used nine truck/trailer vehicles for two routes per day to collect recyclables.

Economic Incentives: In 1990 the City received a waste diversion credit of $35 for each ton of recyclables collected. No direct economic incentive is offered to residents.

Enforcement: Not applicable. The City reports no significant problem with the scavenging of recyclables. While the City has a general anti-scavenging ordinance for refuse, it has not been applied to scavenging recyclables.

Annual Tonnage: 7,617 tons in 1990

Multi-unit Collection

NARC collected recyclable materials from a number of condominium buildings in the City. One three-story building, Cress Creek Condos, was able to eliminate one of its four garbage dumpsters by recycling. Residents brought three colors of glass, tin and aluminum cans, newspaper, and corrugated cardboard to recycling containers located in a screened and roofed trash disposal area outside the area. Glass, tin, and aluminum were placed in separate containers within a large wooden container with a lid; newspaper and corrugated cardboard were placed in a pull-out cart within the container. Used motor

oil was placed in plastic jugs and set on the floor of the recycling area. Tonnages collected from condominium buildings are included in figures listed above.

At a second high-rise complex, a separate enclosed recycling station housed recyclables. However, residents frequently placed garbage in recycling containers, so the recycling containers were removed from the separate site and placed near the refuse containers. NARC is no longer contracted by the City to pick up recyclables, but can be contracted privately by multi-unit buildings themselves for such pick-up. NARC will charge buildings by the pick-up, based on the time spent loading materials at the site and the mileage from the site to NARC's processing center. According to NARC, recycling can lower refuse collection bills if the refuse hauler charges the building on a per-dumpster basis rather than a flat fee. NARC has modified its processing system to color-sort glass and separate tin from aluminum, and will now allow residents of multi-unit buildings to commingle the three colors of glass and to mix tin with aluminum. Other private haulers such as Crown Disposal service apartment buildings not receiving City collection. These tonnages were not tracked.

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:	None
Service Provider:	NARC, Fox Valley Disposal (WMI), Rot's Disposal (BFI), BFI Aurora, Crown Disposal, and a few small haulers
Number Served:	Not available
Type Served:	Fox Valley services approximately 50 percent of the businesses that are receiving recycling collection. NARC serves restaurants and bars, and served municipal offices in 1990. They are currently working to set up a local Hilton Hotel with comprehensive recycling services, including placing recycling bins in the guest rooms.
Pick-up Frequency:	Varies. Crown does not usually service its customers with recycling and refuse collection on the same day.
Materials Collected:	NARC collects glass, high-grade paper, tin and aluminum cans, all plastic bottles, and corrugated cardboard. In 1991 it began to collect PET strapping. Crown collects newspaper, glass, aluminum, tin, and PET and HDPE plastic containers. Fox Valley collects corrugated cardboard, aluminum and tin cans, HDPE (milk, laundry, and bleach) and PET plastic containers, glass, newspaper, large quantities of clean PS, and white colored high-grade paper. Fox Valley will tailor a program to a business waste stream and will develop markets for new materials.
Set-out and Collection Method:	Varies. Crown accepts commingled materials placed in 96-gallon toters supplied by businesses. Crown can supply containers to businesses for a fixed fee. Toters are usually placed in outside refuse collection areas. Crown Disposal found that it collected an average of 15 percent more recyclables when it asked businesses to set out commingled materials than when it asked customers to separate materials into different containers. Crown uses dual-compartmentalized, side-loading trucks. Some businesses use dumpsters for corrugated cardboard.

Incentives: Businesses can sometimes lower refuse bills (when renegotiating contracts) through recycling by reducing the number of refuse cans they use or the frequency of pick-up. Some haulers will offer additional recycling service as part of standard refuse service but will not lower refuse fees for those that recycle. In 1990 NARC began charging commercial customers for recyclables collection.

Annual Tonnage: Not available

In 1984 NARC initiated its Commercial Outreach Program to encourage recovery of recyclable materials from commercial enterprises. NARC began to collect glass from restaurants and bars. In 1985 it added office paper and began to collect from municipal buildings. Prior to 1990, NARC offered pick-up of commercial recyclables free of charge. While NARC's contract with the City covered residential recycling only, the collection and processing infrastructure paid for under the contract helped support the commercial program, as did the sale of materials. In 1990 NARC began charging commercial customers a fee for recyclables pick-up based on mileage to and from the business and driver costs.

Drop-off Centers

Number and Type: One drop-off center, on which a Reynold's Aluminum buy-back is also situated.

Public or Private: NARC (a private nonprofit) operates the drop-off center on City-owned property leased from the City. Reynolds subleases a piece of land from NARC for its buy-back.

Sectors Served: Residents, particularly those in multi-unit buildings not serviced with curbside collection, Naperville businesses, and some residents from unincorporated Naperville

Materials Accepted: Newspaper, high-grade paper, corrugated cardboard, magazines, boxboard, glass containers, aluminum cans and foil trays, ferrous cans, all plastic, plastic six-pack rings, HDPE milk jugs and detergent bottles, PET beverage bottles and other plastic bottles, miscellaneous metal scrap, automobile batteries, and appliances

Annual Tonnage: 1,619 tons from NARC's drop-off

Processing and Marketing of Recyclables

The Naperville Area Recycling Center (NARC) processes all materials collected through its curbside and drop-off programs at its processing center, which it built on 1 acre of City-owned land. Opened in 1986, the processing site's construction was financed through no-interest loans NARC received from the City. The initial capital cost of the facility is estimated at $75,000, with capital improvements made in 1988, 1989, and 1990. The facility is designed to process 50 tons per day, and handled between 35 and 70 tons per day in 1990. In 1991 its throughput shrank to approximately 10 tons per day. The processing center is located approximately 10 miles away from the City's furthest collection routes.

The 3,000-square-foot center is only 8 feet high, and is equipped with a seven bay loading dock. Materials are emptied from vehicles with three rotating forklifts into trailers or directly onto processing equipment, such as balers, sorters, and granulators. Fifteen to twenty people work on

processing materials. Naperville has access to a large number of secondary materials markets, many of which are in Chicago or the surrounding area. Newspaper is loaded via conveyor directly into a semi-trailer and marketed loose to FSC Paper Company, a manufacturer of 100 percent recycled newsprint outside of Chicago in Alsip. Plastic is sorted on a custom-built sorting table. HDPE plastic containers are flaked and stored. PET containers are baled with a perforator flattener and stored. NARC processes plastic containers received from other programs with a Granu-tech granulator it purchased with a County grant. HDPE plastic is sold to Eagle Brook Plastics in Chicago for manufacture of plastic lumber or pelletizing and resale to plastic reprocessors. NARC sells PET plastic to the Plastic Recycling Alliance in Chicago. Clean polystyrene containers are stored. Six-pack rings are picked up by Illinois Tool Works, which approached Naperville in 1990 with plans to manufacture new six-pack rings made from 30 percent recycled LDPE rings. Corrugated cardboard is baled and sold to Ivex, in Joliet. Magazines are sold to FSC Paper Company. Paperboard is sold to Aurora Paperboard in Aurora, a manufacturer of book covers from recycled fibers, located just west of Naperville. Glass cullet is sold to Owens-Illinois in Streator. Aluminum cans and foil are sold to Reynolds Aluminum. Metal scrap is sold to Cozzi Iron & Metal in Chicago. Lead-acid batteries are sold to a broker. An estimated 2 to 5 percent by weight of materials collected at curbside are rejected as residue.

The new contractor brings recyclables to many of the same markets utilized by NARC. Mixed paper is sold to Aurora Paperboard.

Composting Activities

Naperville Department of Public Works crews have collected leaves and brush for composting twice a year for at least 15 years. Brush was collected in the spring and fall and chipped by City crews; leaves were collected in the fall and composted for use as a soil enhancer. End products were made available to residents free of charge if picked up, and for a small fee if delivered. Naperville added grass clippings and green garden waste to its curbside collection program in April 1990, 2 months before the State ban on landfilling yard waste became effective. In the summer of 1989, it conducted a pilot program to gauge residents' willingness to participate in a comprehensive yard waste collection program. Two sections of the City were selected for the pilot program. Residents in heavily landscaped areas were given 90-gallon wheeled collection carts for storage of yard materials. Residents in a newer landscaped neighborhood without subdivisions were given 30-gallon garbage cans. Residents responded positively to the source-separation program. In April 1990, contracted crews began weekly collection of grass clippings and garden waste from all households in the City service area. City crews collect leaves and brush in the spring, midsummer, and fall, on a published schedule.

Backyard Composting/Don't Bag It

Since the State of Illinois banned the landfilling of yard waste, Naperville and the County of DuPage have promoted backyard composting and "Don't Bag It" programs through pamphlets, videos, and newsletters. Program literature instructs residents to recycle grass clippings by leaving them on their lawns. "Grass clippings and leaves can be a wonderful natural nutrient that will reduce the amount of commercial fertilizers you need ...will reduce water loss from the lawn and lower soil temperature," claims Naperville's newsletter. Through a cartoon character named Y. Baggit, Du Page County instructs homeowners to mow their lawns with a sharp blade when lawns are dry. If no more than one-third of the length of the blade of grass is cut, Y. Baggit explains in a County brochure, homeowners will not have problems with thatch build-up (grassy material that resists decomposition).

Naperville's newsletter, "Napernews," details how to create a compost pile in one's backyard. It recommends layering green material (grass clippings) with dry material (leaves) and warns residents not to compost meat scraps or bones. There are no backyard composting demonstration sites.

Curbside Collection

Start-up Date:	1975 for brush and leaves, 1988 for Christmas trees, April 1990 for garden waste and grass clippings
Service Provider:	City crews collect brush and leaves; Fox Valley, the City's refuse hauler, collects grass clippings, garden waste, and Christmas trees.
Households Served:	24,500
Mandatory:	Residents must either set out yard waste for collection or compost materials in their backyard. State law bans landfilling of yard waste.
Materials Collected:	Leaves, brush, grass clippings, garden prunings, and Christmas trees
Set-out Method:	Leaves are set out loose at curbside. Other garden waste is placed in two-ply 30-gallon paper bags. No plastic bags are accepted. Brush is set out, untied, at curbside. Small garden trimmings can be placed in bags. Beginning in mid-1991, Naperville adopted a sticker program for the set out of leaves. Residents will need to pay $1.50 per bag of material set out.
Collection Vehicles & Method:	The City collects brush in a vehicle with an attached brush chipper. Three to four crew members are utilized per vehicle. Leaves are collected with leaf loaders and vacuum sweepers. Fox Valley collects Christmas Trees in a separate compactor truck.
Collection Frequency:	Brush and leaves are collected three times a year on a schedule that varies according to whether or not the neighborhood has mature landscaping and heavy tree growth. Most heavily landscaped and wooded areas receive a minimum of four pick-ups per fall season; less landscaped areas receive a minimum of three pick-ups per season; and least landscaped areas receive a minimum of two pick-ups per season. Grass clippings and garden trimmings are collected weekly April through December, on the same day as refuse collection.
Economic Incentives:	None
Tonnage:	An estimated 4,901 tons of leaves, yard waste, grass clippings, and Christmas trees in 1990

Compost Site

Fox Valley delivers grass clippings and yard trimmings to the 33-acre City compost site, located on the far southwestern part of the community adjacent to the wastewater treatment facility. The material is formed into windrows and mixed with some of the leaves and chipped brush brought to the site by City crews. Windrows consist of 25 percent green material (such as garden trimmings), 25 percent brush chips, and 50 percent leaves. City employees measure the internal temperature of the windrows daily, and windrows are turned when the temperature reaches or exceeds 160 degrees Fahrenheit. While windrows are frequently turned in the summer months (at least once per week), in the winter they are turned quite infrequently. City employees also monitor ambient air quality, wind speed and

direction, and other weather factors on a daily basis. The windrows will only be watered if they are especially dry. There have been a few complaints from neighbors about odor problems. Naperville has worked to mitigate this odor using neutralizing agents, perfumes, and commercially available odor masking agents.

City workers haul Christmas trees to the City's compost site. There the trees are chipped and stored. Residents may pick up chips to use as a landscaping mulch. In 1988 a total of 7,979 Christmas trees were collected; in 1989, 6,183 trees were collected; and in 1990, 7,591 trees were collected.

Amount and Breakdown of Materials Recovered

Material	Total* (Tons, 1990)
Newspaper	5,800
Corrugated Cardboard	900
High-grade Paper	40
Other Paper†	440
Glass	1,400
PET Plastic	10
HDPE Plastic	170
Other Plastic‡	6
Aluminum	180
Ferrous Cans/Scrap	230
Appliances/White Goods	30
Motor Oil	30
Subtotal MSW Recycled	**9,236**
Leaves§	2,600
Brush	1,700
Christmas Trees**	75
Other Yard Waste	526
Subtotal MSW Composted	**4,901**
Total MSW Recovered	**14,137**

*Tonnages listed above represent material collected through the residential curbside program and the drop-off center.

†Other paper includes 400 tons of boxboard and 40 tons of magazines collected from the residential sector.

‡Other plastic is 6-pack rings and clean PS.

§A total of 15,573 cubic yards of leaves were collected. Tonnage of leaves was estimated by the City.

**Tonnage of Christmas trees is based on a conversion factor of 20 pounds per tree. (Source: Garbage Reincarnation, Sonoma County, California)

Publicity and Education

Naperville advertises its recycling and composting programs through cable television, utility bill inserts, and in the City's newsletter, "Napernews." The Naperville Recycling Center (NARC) plays a very active role in promoting recycling activities in the City. Both NARC and City staff have made presentation in area schools. Tours of the NARC site were given in 1989 to 11 schools, 80 scout troops, and 17 organizations from various community organizations. These tours were discontinued for safety reasons. NARC sponsored a recycling expo at a public library and staged the play, "The Defeat of the Dump Monster."

Economics

Costs Cover: Capital costs cover equipment purchased by the City for the collection and processing of yard waste. Capital costs for recycling equipment are incurred by private haulers under contract with the City and are not available. Operating and maintenance costs represent 1990 contract and other fees paid to the Naperville Area Recycling Center (NARC) for the curbside collection and subsequent processing of 7,617 tons of recyclables. Contract fees paid to Fox Valley for the curbside collection of 526 tons of yard waste and 75 tons of Christmas trees are also listed below, as are the City's operating and maintenance costs, and capital costs, for the collection and processing of 4,300 tons of leaves and brush.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
2 Vacuum Sweepers @ 20% of use	NA	Composting	1975
J.D. Loader	$106,771	Composting	1980
4 Brush Chippers	58,089	Composting	1988, 1990, 1991
2 Leaf Loaders	46,305	Composting	1989 & 1990

Capital Costs: Processing

Item	Cost	Use	Year Incurred
Spreader Truck	NA	Composting	1977
Ford Dump Truck*	$48,675	Composting	1979
SCAT Windrow Turner	74,795	Composting	1990
IH Tractor	71,589	Composting	1990

Note: All equipment was paid for in full at the time of purchase except for the IH Tractor purchased in 1990. The tractor was purchased on a 4-year payment arrangement. Monthly payments of $1,491.44 are paid to the equipment vendor. The equipment will therefore cost the City a total of $71,589, 2 percent more than the market price of $70,079. These monthly payments have not been included in operating and maintenance costs.

*The dump truck is also used for street maintenance.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$918,894**	**7,617**	**$121**
Curbside Collection*	$554,333	7,617	$73
Processing*	325,561	7,617	43
Administration	32,000	7,617	4
Education/Publicity*	7,000	7,617	1
Composting Subtotal	**$521,180**	**4,901**	**$106**
Collection	$376,680	4,901	$77
Grass and Yard Waste†	58,400	526	111
Leaves and Brush‡	309,280	4,300	72
Christmas Trees§	9,000	75	120
Processing	134,000	4,901	27
Administration	8,000	4,901	2
Education/Publicity	2,500	4,901	1
Recycling & Composting Total	**$1,440,074**	**12,518**	**$115**
Collection	$931,013	12,518	$74
Processing	459,561	12,518	37
Administration	40,000	12,518	3
Education/Publicity	9,500	12,518	1

*Represents contract fee paid to NARC for curbside collection and processing of recyclables, and educational outreach, which totaled $896,894 in 1990. Of this, $7,000 was spent on education and of the remainder, an estimated 63 percent was spent on collection and 37 percent on processing. The contract fee paid to NARC consisted of a flat fee of $840,894.80 and four quarterly adjustment payments totaling $46,000. (The City gave NARC these additional payments as NARC was operating at a deficit.)

†Naperville paid Fox Valley a total of $3,012,749 for the collection of 26,502 tons of refuse and 526 tons of yard waste, which comes to about $111 per ton.

‡In fiscal year 1990, the City spent a total of $167,200 for the collection of leaves by City crews and $142,080 for the collection of brush.

§ Separate contract fee paid to Fox Valley for this collection service.

Materials Revenues: Revenue from the sale of recyclables is kept by the contractors. If revenue exceeded costs, a quarterly adjustment would be made, and the City would share the profit on a 50/50 percent basis.

Source of Funding: General fund. (The $35 per ton diversion credit that the City received from its refuse hauler for recycled tonnage was returned to the General Fund.)

Full-time Employees: 1 City employee. In 1990 NARC employed 27 drivers, 3 mechanics, and 20 processors.

Part-time Employees: 3 City workers at the composting site, and a few part-time public works employees collect yard waste.

Future Solid Waste Management Plans

The City is currently evaluating the option of a per container charge for household refuse. A per bag fee of $1.50 for yard waste set out was established in fiscal year 1991. Naperville believes that such measures may encourage residents to reduce their generation of household refuse. If the City does not implement the per container charge, it will continue to support recycling collection from its general fund.

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Endnote

[1]Naperville's conversion factor for compacted refuse is 1 cubic yard per 0.33 ton (667 lbs).

Perkasie, Pennsylvania

Demographics

Jurisdiction:	Borough of Perkasie
Population:	7,878 in 1990
Area:	2.7 square miles
Total Households:	3,900 in 1990 (3,500 single-family homes and 400 residences in multi-unit buildings, including approximately 150 condominium units)
Total Businesses and Institutions:	75 businesses (estimate from the Mayor of Perkasie) and 1 school
Brief Description:	Perkasie Borough is an isolated, largely residential area in Bucks County, Pennsylvania, located just outside Philadelphia. The Borough is considered a rapidly developing suburb of Philadelphia. The population and number of households are growing. There were 2,600 single-family homes in 1988, 3,200 in 1989, and an estimated 3,500 in 1990. Population increased 8 percent between 1988 and 1989, and jumped another 12.5 percent between 1989 and 1990.

Solid Waste Generation and Recovery

Annual Tonnages (1990)

	Residential*	Commercial/ Institutional	Total MSW
Recovered	**1,618**	**NA**	**NA**
Recycled	964	NA	NA
Composted†	654	NA	NA
Disposed	**1,515**	**NA**	**NA**
Incinerated	0	NA	NA
Landfilled	1,515	NA	NA
Generated	**3,133**	**NA**	**NA**

Percent by Weight Recovered

Recovered	**52%**	**NA**	**NA**
Recycled	31%	NA	NA
Composted	21%	NA	NA

Note: The tonnage of C&D debris is not tracked. This waste is disposed of by private haulers, as is waste generated by most businesses in the Borough. The tonnage of waste collected by private haulers is not available.

* Excludes waste generated by condominiums and apartments, which is collected by private haulers. Includes refuse and recyclables from 15 small businesses served by DPW refuse and recycling collection. 272 tons of bulky waste (including mattresses and furniture) are included, but tires and appliances, which are disposed of by a private hauler under a municipal contract, are not.

†Tonnage is based on estimated volumes of leaves, brush, and Christmas trees.

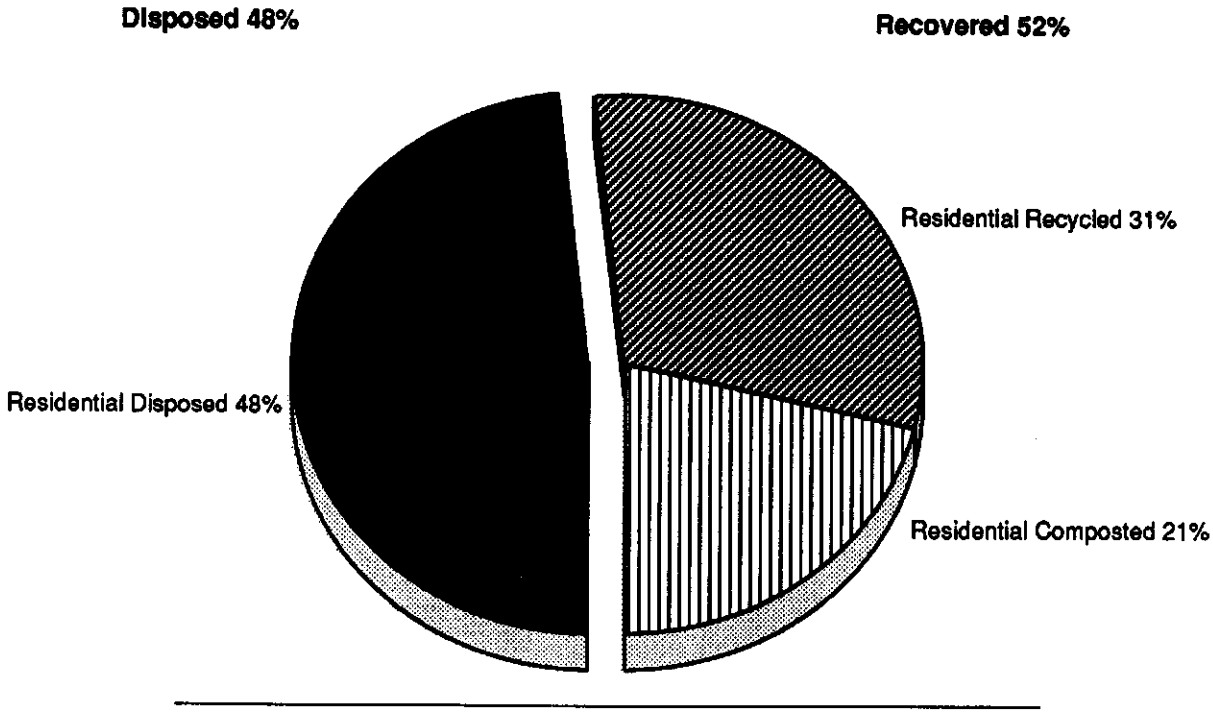
Landfill Tipping Fee: $8 per ton in 1980; $59 per ton in 1988; $65.50 per ton in 1989; $68.25 per ton in 1990 and 1991

Refuse Collection and Disposal: The Department of Public Works (DPW) collects refuse from residents and 15 small businesses. Businesses not served by the Borough, condominiums, and apartments over four units must contract with private haulers. The DPW collects approximately 80 percent of the total waste generated in the Borough. The Borough pays a private hauler $250 each month for collection of white goods and scrap metal. The DPW collects mattresses and furniture.

Effective January 4, 1988, all wastes collected and disposed by the Borough of Perkasie must be contained in special green 20- or 40-pound plastic bags sold by the Borough. Bags are sold at the Borough Hall during normal business hours, as well as at 10 local stores and markets for the convenience of residents. In 1990, the 20-pound bags sold for 80 cents; 40-pound bags sold for $1.50. In 1991 the prices went up to $1.00 and $1.75, respectively. The sale of these bags is exempt from Pennsylvania State sales tax. The per-bag fee program replaced a flat annual fee of $120 per residence for refuse collection and disposal.[1]

In 1990, the Borough incurred approximately $171,393 for the collection of 1,515 tons of refuse, including some bulky waste ($113 per ton).[2]

Residential Waste Recovered and Disposed (Percent by Weight, 1990)



Materials Recovery Overview

Goals and Legislative Requirements:

Participation in the Borough's recycling program became mandatory in October 1987. Residents are required to recycle aluminum beverage cans, glass, corrugated cardboard, magazines, and newspapers. The Borough is already in compliance with the 1997 goals of the Pennsylvania recycling bill passed on April 12, 1988. The law, entitled the Municipal Waste Planning, Recycling, and Waste Reduction Act, calls for planning procedures for the processing and disposal of municipal waste, and mandates recycling. It states that at least 25 percent of all municipal waste and source-separated materials in the Commonwealth must be recycled by January 1, 1997. Municipalities must schedule at least one day a month for the collection of at least three recyclable materials, and must provide containers to be used for sorting the refuse.

Perkasie began its curbside recycling program January 4, 1988, at the same time it instituted its per-bag fee program for refuse collection. The Borough has distributed 5-gallon buckets to residents living in single-family homes, to hold recyclable materials. The 1987 law does not mandate that private haulers offer per-bag fees or collection of recyclables to residents of condominiums and apartments. Neil Fosbenner, the Recycling Coordinator and Public Works Director, reports that no private haulers offer the per-bag rate at this time. Glass and aluminum cans are collected in a compartmentalized

trailer pulled by a pick-up truck. Wastepaper is collected in a packer truck. The Department of Public Works crew sorts glass from aluminum at the curbside. The Borough collects leaves and brush from residents in October and November for composting.

A private hauler collects bulky trash once a month and disposes of the white goods, scrap metal, and motorized appliances. Bulky waste is defined as anything that will not fit in a Borough bag. A household can set out only one such item per month. White goods and motorized appliances must have a tag attached for pick-up. Removal of appliances from the curbside cost nothing in 1988 and 1989, $5.00 per item in 1990, and $10 per item in 1991.

The Borough of Perkasie also runs a drop-off recycling center that is open 24 hours a day, 7 days a week. In October 1989, the Borough began a plastics recycling pilot program at its drop-off center. This program, which moved from pilot to permanent status in 1990, recovered 3.7 tons of HDPE and PET plastic beverage containers in 1989, and 12.8 tons in 1990. In January of 1991, the Borough began accepting steel cans on a voluntary basis at its drop-off center. The drop-off center also accepts aluminium, glass, newspaper, and corrugated cardboard.

The Borough collects leaves from residents in October and November for composting. Brush is collected on a monthly basis, year round. Before 1988, solid waste was collected twice a week. In January 1988, the Borough cut down solid waste collection to one day a week, and started collecting recyclables once a week, on a different day. Glass and aluminum are collected weekly. Newspaper, junk mail, and corrugated cardboard are collected once a month

In February 1990, the Borough of Perkasie won the *Highest Residential Recovery Rate* award from the *Record Setting Recycling Contest 1989*, sponsored by the Institute for Local Self-Reliance.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	January 1, 1988
Service Provider:	Public Works Department
Pick-up Frequency:	Glass and aluminum are collected weekly. Newspaper, magazines, junk mail, and corrugated cardboard are collected once a month.
Same Day as Refuse:	No
Households Served:	3,200 in 1989, 3,500 in 1990
Mandatory:	Yes (except for junk mail). However, condominiums, apartments, and businesses do not have to comply.
Participation Rate:	100 percent of households served. This participation rate is attributed to the per-bag refuse fee program.
Materials Collected:	Newspaper, magazines, junk mail, corrugated cardboard, glass, and aluminum cans
Set-out Method:	Newspapers are stacked and tied or put into paper grocery bags. Junk mail may be included with newspapers. Aluminum cans are put in bags or boxes. Paperboard, corrugated cardboard, and magazines must be sorted and bundled separately. Residents can either separate glass bottles and jars by color (clear, green, and amber) with metal caps and rings removed, or put them together in an open bucket (available through the Borough).

Collection Method and Vehicles:	Glass and aluminum are sorted at curbside and collected in a compartmentalized trailer pulled by a pick-up truck. One driver and three loaders pick up these two items. It takes them about five hours to service half of the Borough. Newspaper, junk mail, paperboard, and magazines are collected in one packer truck; a second collects corrugated cardboard. Two workers operate each packer truck. Waste paper collection takes 50 hours of labor a month.
Economic Incentives:	The per-bag disposal fee program encourages residents and businesses served by the Borough to generate less waste, thus providing a direct economic incentive to recycle.
Enforcement:	The Borough enforces fines of up to $300 for noncompliance with its set-out requirements for refuse, recyclables, and yard waste; no fines have been issued.
Annual Tonnage:	Not available

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:	None. The Borough of Perkasie does not mandate that businesses recycle or subscribe to the per-bag rate structure.
Service Provider:	Public Works Department
Number Served:	Approximately 15. The Borough will collect recyclable materials and refuse from any business requesting this service.
Type Served:	Small businesses
Materials Collected:	Newspaper, junk mail, corrugated cardboard, glass, and aluminum cans
Pick-up Frequency:	Glass and aluminum are collected weekly. Newspaper, magazines, junk mail, and corrugated cardboard are collected once a month.
Set-out and Collection Method:	Commercial establishments are served on the same day and with the same trucks as the residential sector.
Incentives:	The per-bag fee is a direct economic incentive to recycle.
Annual Tonnage:	Not available

Some private haulers of commercial waste are recovering corrugated cardboard from the waste stream for recycling; these tonnages are not available.

Drop-off Centers

Number and Type:	One drop-off center

Public or Private:	Public
Sectors Served:	Residential, commercial, and institutional
Materials Accepted:	Aluminum, glass, newspaper, corrugated cardboard, HDPE and PET plastic containers, and steel cans
Annual Tonnage:	Not available. The Borough estimates that approximately 50 percent of all material recycled and composted was collected through drop-off collection.

In 1990 the Borough erected a building behind the office at the drop-off center, to contain materials that previously had been stored in an open area. The drop-off center began accepting HDPE and PET plastic containers in June 1989, and steel cans in January 1991. An estimated 75 percent of Borough residents take their HDPE and PET plastic containers to the drop-off site. Perkasie is staffing the center in order to limit drop-off privileges to local residents only. Staff check labels on junk mail collected at the center to see who is using facilities. According to Neil Fosbenner, it is difficult to assess the success of this effort because some out-of-town residents may be tearing the address labels off their mail.

Processing and Marketing of Recyclables

Collection workers separate all glass and aluminum collected at curbside, put them into a compartmentalized trailer, and deliver them to the public works yard where vendors collect them. Liberty Recycling of Allentown, Pennsylvania, buys the unbaled plastic beverage containers and the tin and aluminum cans. The Borough had difficulty selling its paper in 1989 due to poor markets. It changed paper vendors three times that year in an effort to get the best possible price. The Borough paid vendors a total of $5,125 in 1989 and $10,073 in 1990 for its waste paper. Lloyd Nace of Pennsburg, Pennsylvania, pays for corrugated cardboard, but charges for the other waste paper.

Color-sorted glass is stored in the back of the yard. The Perkasie Fire Company sorts, cleans and crushes the glass for the Borough on the first and third Saturday of the month. The Fire Company uses its own equipment, performs the job with volunteer labor, and does not charge the Borough, but retains the proceeds from sale of the glass.

All the recyclables collected by the Borough are marketed. None are rejected as nonrecyclable.

Composting Activities

Curbside Collection

Start-up Date:	October 1989
Service Provider:	Public Works Department
Households Served:	3,500
Mandatory:	No
Materials Collected:	Leaves, brush, Christmas trees, and wreaths without wire

Set-out Method: Residents set out leaves loose at curbside. Tree and shrub trimmings and similar material must be cut in lengths not to exceed 4 feet, and must be securely tied with string or twine in bundles no more than 2 feet in diameter.

Collection Vehicles & Method: Department of Public Works employees vacuum leaves that residents have raked to the curbside into a 14-cubic-yard dump truck. Three to five workers spent a total of about 240 hours in 1990 collecting leaves. The Electric Department chips and collects brush at curbside, using a chipper pulled by one of its own vehicles—a bucket truck with a 6-cubic-yard special attachment for holding chips.

Collection Frequency: The Borough collects leaves from residents weekly from the last week of October through November. Residents must call for an appointment 48 hours in advance of the scheduled collection day for brush pick-up. Christmas trees and wreaths without wire are collected along with the regular recyclables in the first three weeks of January. Borough crews chip brush at curbside on the first Wednesday of each month.

Economic Incentives: The per-bag disposal fee program encourages residents to generate less waste, providing a direct economic incentive to set out yard waste at curbside for composting.

Composting Site

The Borough tried to initiate a yard waste materials collection program in May 1988, but cancelled the program in June of that year due to difficulty locating a site to compost the materials. Collection started up again in October 1989, when the Borough began windrowing leaves and brush at an organic farm 2 miles outside of Perkasie. In exchange for the use of the land, the farmer can use the compost materials on the farm. The piles are turned monthly with a Borough-owned backhoe. In 1990 the Borough began delivering some of its leaves to a landscaping company 2 miles away. The Borough does not weigh the yard waste materials collected, but it does keep a record of the number of loads recovered. In 1989 the Borough tipped 155 loads, or an estimated 380 tons, at the organic farm. This amount increased in 1990 to 189 loads, or an estimated 464 tons—almost quadruple the 120 tons estimated collected in May and June of 1988.[3] Neil Fosbenner attributes this dramatic increase to enforcement of the ban on burning, and collection of yard waste in the fall instead of the spring.

The Electric Department deposits the brush and other trimmings it chips at curbside in piles at a local park. Chipped Christmas trees and leaves are delivered to the same site. Residents take the chips free of charge. The Department collects approximately ten 6-cubic-yard loads of chipped brush every month, spending 48 hours per month (at $16.87 per hour).

Amount and Breakdown of Materials Recovered

Material	Residential (Tons, 1988)	Residential (Tons, 1989)	Residential (Tons, 1990)
Mixed Paper*	474.6	600.7	605.3
Corrugated Cardboard	–	–	118.5
Glass	224.7	216.1	215.6
Aluminum	10.0	10.7	11.4
Plastic Containers	–	3.7	–
PET Plastic	–	–	6.6
HDPE Plastic	–	–	6.1
Subtotal Recycled	**709.3**	**831.2**	**963.5**
Leaves	120	380	464
Brush†	NA	NA	180
Christmas Trees‡	–	–	10
Subtotal Composted	**120**	**380**	**654**
Total Recovered	**829.3**	**1,211.2**	**1,617.5**

Note: The 3.7 tons of plastic containers recycled in 1989 are PET and HDPE plastic. In 1990 the tonnage is broken down into these two types.

*Tonnages for 1988 and 1989 include corrugated cardboard.

†Tonnage, estimated by ILSR, is based on ten 6-cubic-yard loads per month and 4 cubic yards per ton.

‡Tonnage, estimated by ILSR, is based on 1,000 Christmas trees weighing an average of 20 pounds each.

Source Reduction

Refuse collection and disposal data in tons (excluding bulky waste collection and waste generated from apartments and condominiums) recorded from 1985 to 1990 are summarized below:

Year	Waste Landfilled	Waste Generated
1985	2,407	2,407
1986	2,585	2,585
1987	2,573	2,573
Average 1985-87	**2,522**	**2,522**
1988	1,308	1,868
1989	1,365	2,576
1990	1,243	2,861

This data show that the amount of waste landfilled in 1990 is one half the average amount of waste landfilled in the 3 years prior to implementation of the per-bag ordinance. Yet comparison of 1990 waste generation to the average generated between 1985 and 1987 shows an increase of 13 percent. Waste generation only significantly decreased in 1988 after implementation of the per-bag fee program. Adding recovered materials to the amount of waste disposed in 1988 gives a total waste generation figure of 1,868 tons (excluding bulky waste and waste generated in apartments and condominiums). A

comparison of 1988 municipal solid waste generation with the average generated from 1985 to 1987 indicates a 26 percent reduction by weight in municipal solid waste generated.

The Borough attributes this 26 percent source reduction to the following:

(1) Public awareness of waste generation and disposal problems, resulting in improved purchasing habits.

(2) Attrition of commercial customers not wanting to participate in the bag program. Commercial establishments are free to contract with private haulers. On this basis, attrition is responsible for at least 3.1 percent of the reduction in waste collected.

(3) Home burning—backyard, fireplace, and wood stoves. In 1988, the Borough did not enforce an ordinance banning backyard burning. Quantities of waste disposed by household burning in 1988 are unknown. No complaints of smoke or odor were received.

(4) Exporting waste from the Borough to nearby municipalities or depositing waste in commercial containers. However, only four such instances were reported in 1988. The names of the offenders were reported in the local newspaper. No illegal dumping was reported in 1989.

Adding materials recovered in 1990 to the total waste disposed in that year gives a total of 2,861 tons of waste generated (excluding all bulky waste and waste generated in condominiums and apartments). Comparing this figure with the 1988 and 1989 waste generation tonnages (excluding bulky waste and materials generated in condominiums and apartments) indicates a 53 percent increase over 1988 and a 11 percent increase over 1989.

The Borough attributes this increase in municipal solid waste generation to the following:

(1) The Borough collected refuse from 300 more households in 1989 than in 1988—a 23 percent increase—and from 300 more households in 1990 than in 1989. Thus, 35 percent more households were served in 1990 than in 1988.

(2) In 1989 the Borough began enforcing an old ordinance banning backyard burning.

(3) No illegal exportation of waste was reported in 1989, and there have been no problems in 1990 and 1991.

While the number of households served by the Borough has increased 35 percent, total waste generated in 1990 has only increased 13 percent over the average amount generated from 1985 to 1987.

Publicity and Education

Rules and regulations for the storage, collection, and disposal of refuse have been distributed to all residences. A brochure describing the program was mailed to all residents in December 1987.

Key Borough personnel made door-to-door visits in 1988 to provide information and answer questions about the overall program. In 1989 the Borough conducted public education through direct mailings, public meetings, newspaper articles and advertising, and radio broadcasts and advertising. In 1990 the Borough mailed another brochure describing its solid waste management system to all residents.

Economics

Costs Cover: Capital and operating and maintenance costs cover the collection and processing of 964 tons of recyclable materials through the curbside collection program and at the drop-off center. Operating and maintenance costs for the collection of an estimated 654 tons of organic waste are listed below; composting capital costs are not available.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
Recycling Trailer	$15,807	Recycling	1988
Modifications to Truck	600	Recycling	1988
Security Fence	500	Recycling	1988
Steel Barrels	400	Recycling	1988
Recycling Buckets	2,500	Recycling	1988

Note: All equipment has been fully paid off. No equipment was amortized.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
Conveyor	$500	Recycling	1990
Can Crusher	$6,200	Recycling	1990
Recycling Building	$44,982	Recycling	1990

Note: All equipment has been fully paid off. No equipment was amortized.

The following costs are representative of both refuse collection and recycling/composting. Perkasie does not separate costs incurred for the recycling program from costs incurred for regular trash pick-up. The programs use the same trucks and employees.

Refuse and Recycling Operating and Maintenance Costs (1988-90)

Item	1988	1989	1990
Collection Labor*	$54,586	$61,830	$76,139
Truck Expenses	6,349	4,220	4,742
Fuel	2,010	2,788	3,310
Bulky Stickers/Pails	1,400	1,080	75
Subtotal Shared Collection Costs	**$64,345**	**$69,918**	**$84,266**
Miscellaneous Supplies	2,572	1,741	918
Consulting Fees	4,312	534	3,050
Maintenance/Improvements	2,437	–	213
Brochures/Postage	–	–	1,106
Subtotal Shared Admin. Costs	**$9,321**	**$2,275**	**$5,287**
Total Shared Expenses	**$73,666**	**$72,193**	**$89,553**
Tipping Fees/Solid Waste	74,619	90,428	82,910
Bulky Trash Fees	2,400	2,350	21,308
Disposal Bags†	23,361	16,231	32,028
Subtotal Unshared Refuse Costs	**$100,380**	**$109,009**	**$136,246**
Paper Marketing	–	5,125	10,073
Bags for Aluminum Administration	1,263	1,728	–
Leaf Collection/Composting‡	NA	NA	10,884
Brush Collecting/Chipping‡	NA	NA	9,711
Administration§	NA	NA	2,665
Subtotal Unshared Recovery Costs	**$1,263**	**$6,853**	**$33,333**
Total Costs	**$175,309**	**$188,055**	**$259,132**

*Excludes costs for leaf and brush collection.

†The cost of the bags is not included as shared expenses because they are used solely for refuse collection purposes.

‡Represents labor costs only. Approximately 48 hours per month (at $16.86 per hour) are spent collecting brush, and 906.75 hours (at a total cost of $10,883.88) are spent collecting leaves.

§Based on estimated percentage of time spent on overseeing recycling and composting programs by DPW staff.

Although the costs to recycle are combined with the cost of regular trash collection, the breakdown of 1990 worker-hours (including time spent on leaf and brush collection) is as follows: 33 percent of worker-hours are spent handling solid waste (including bulky waste), 47 percent on handling recyclables, and 20 percent on compostables. In all, 8,028 hours were spent handling refuse, recyclable, and compostable materials in 1990.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$62,340**	**964**	**$65**
Collection*	$47,898	964	$50
Processing	10,073	964	10
Administration†	3,847	964	4
Education/Publicity‡	522	964	1
Composting Subtotal	**$25,399**	**654**	**$39**
Collection§	$23,556	654	$36
Processing	0	654	0
Administration**	1,623	654	2
Education/Publicity‡	220	654	0.3
Recycling and Composting Total	**$87,739**	**1,618**	**$54**
Collection	$71,454	1,618	$44
Processing	10,073	1,618	6
Administration†	5,470	1,618	3
Education/Publicity	742	1,618	0.5

*Estimate by ILSR staff based on 47 percent of shared collection costs, with the exception of labor costs, which are based on actual worker hours collecting recyclables.

†Based on 47 percent of shared administration costs for recycling, and 70 percent of the estimated $2,665 spent overseeing the recycling and composting programs.

‡Based on 47 percent of the $1,106 spent on brochures and postage for recycling, and 20 percent for composting.

§Estimate by ILSR staff based on 20 percent of shared collection costs, with the exception of labor costs, which are based on actual worker hours and costs associated with collecting Christmas trees, leaves, and brush.

**Based on 20 percent of shared administrative costs and 30 percent of the estimated $2,665 spent overseeing the recycling and composting programs.

Materials Revenues: $10,314 in 1990; $10,586 in 1989; $15,546 in 1988

Source of Funding: In 1990 the Borough received a $1,676 performance grant from the Pennsylvania Department of Environmental Resources, and a $30,319 recycling grant from the Commonwealth of Pennsylvania. These grants contributed to capital improvements made at the drop-off site. Costs incurred for administration, as well as program costs and capital improvement costs in excess of money received, are paid for by tax revenue. The Borough funds operating and maintenance for trash and recycling service through bag/pail sales ($194,362 in 1990), bulky waste stickers ($2,210 in 1990), and materials revenues ($10,314 in 1990).

Employees: The Public Works Department consists of nine full-time employees, including the superintendent and foreman, plus two part-time employees. Their job requirements include maintenance of all public right-of-ways and Borough-owned property in addition to the trash collection and recycling program. The equivalent of four full-time and one part-time employees work on recycling and composting alone.

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Endnotes

[1]Approximately 5 incidents of illegal dumping of waste were reported in 1990. These were mostly "theft of services" entailing residents placing refuse in dumpsters on private business properties.

[2]Total 1990 O&M costs for refuse, recycling, and composting were $256,467. Of this, $89,553 were shared costs between refuse and recycling services, and $136,246 were incurred for refuse alone. In 1990, 33 percent of total labor was spent on refuse collection. The $171,393 estimate for refuse collection and disposal is calculated by adding 33 percent of the shared costs (with the exception of labor costs) to labor costs for refuse to the $136,246 cost for refuse alone.

[3]Tonnage estimates are based on an average of 14 cubic yards per load, and a conversion factor of 350 pounds per uncompacted cubic yard.

Takoma Park, Maryland

Demographics

Jurisdiction:	City of Takoma Park
Population:	16,900 in 1990
Area:	2.2 square miles
Total Households:	7,036 (2,784 single-family households, 1,316 multi-family households in buildings containing 2 to 12 units, and 2,936 households in buildings with more than 12 units)
Total Businesses and Institutions:	243 businesses, 2 colleges and 1 hospital
Brief Description:	Takoma Park is a residential suburb of Washington, D.C. located in both Montgomery and Prince George's Counties, Maryland. Takoma Park is an official "Tree City, USA" and also an established nuclear free zone. Median household income in the Montgomery County portion of Takoma Park was $26,974 in 1986.

Solid Waste Generation and Recovery

	Residential*	Commercial/ Institutional†	Total MSW
Annual Tonnages (1990)			
Recovered	**2,476**	**4**	**2,480**
Recycled	1,270	4	1,274
Composted	1,206	0	1,206
Disposed	**4,414**	**NA**	**NA**
Incinerated	0	NA	NA
Landfilled	4,414	NA	NA
Generated	**6,890**	**NA**	**NA**
Percent by Weight Recovered			
Recovered	**36%**	**NA**	**NA**
Recycled	18%	NA	NA
Composted	18%	NA	NA

Notes: Residential waste generated includes bulky items such as furniture but does not include tires. Takoma Park does not track commercial waste and construction and demolition debris disposed and recycled in the City. However, it is not aware of any major recycling in these sectors.

From January through December 1991, Takoma Park recovered 3,256 tons of residential waste (1,461 tons of recyclables and 1,795 tons of yard waste) and disposed 3,799 tons of residential refuse. The recovery rate over this time period was 46%.

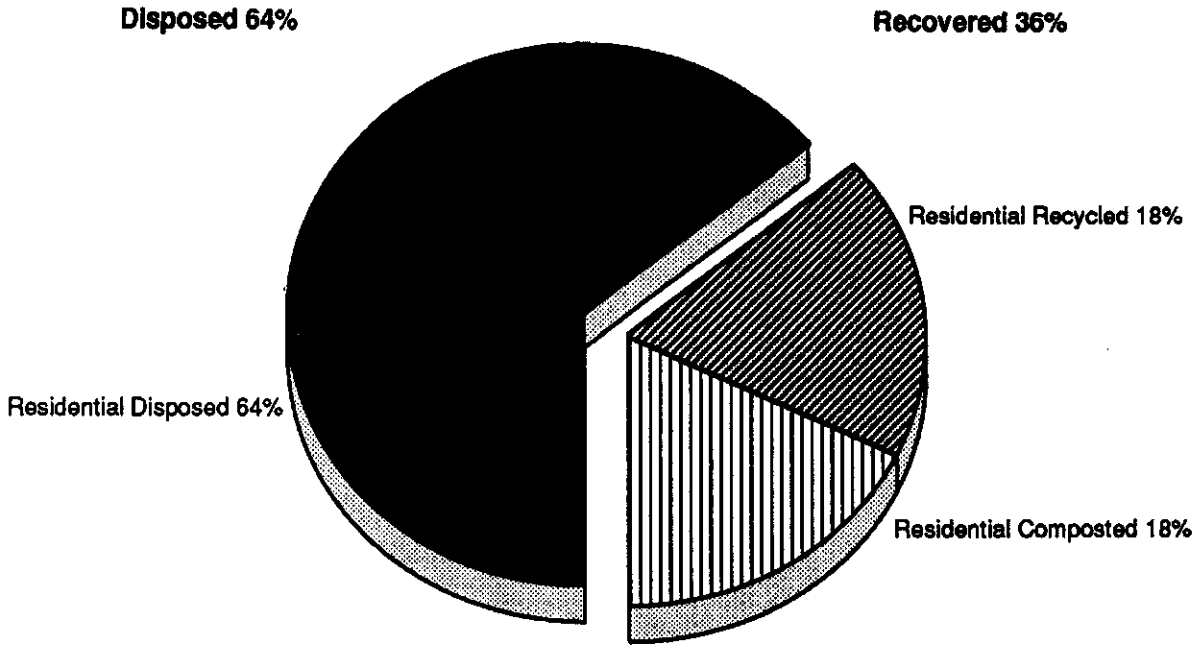
*Residential waste recovered, disposed, and generated does not include material collected from apartment buildings with more than 12 units.

†Commercial/institutional waste recycled includes newspaper, high-grade paper, glass, and aluminum cans collected from the two municipal office buildings.

Landfill Tipping Fee: $40 per ton in 1989, $52 per ton in 1990, $66 per ton in 1991 (based on the averaged cost of disposing refuse at two landfills)

Refuse Collection and Disposal: The Takoma Park Department of Public Works collects refuse from single-through 12-unit residences. Prior to September 1991, this collection service was offered twice a week. Due to increased recycling it is now offered once per week. More than 15 private haulers service residential buildings with more than 12 units, and businesses and institutions. N.Z.I. Construction collects municipally generated construction and demolition (C&D) debris under contract with the City. Two-thirds of municipally collected residential waste is disposed of at Montgomery County Transfer Station, 13 miles away where it is hauled to the Oak's Landfill; the remaining residential waste is hauled to Prince George's County's Brown Station Road Landfill, 15 miles away. In 1990 the City incurred $582,735 ($132 per ton) to collect and dispose of 4,414 tons of residential waste ($221,910 for landfill fees, $261,472 for labor, $30,600 for maintenance and fuel, $6,000 for vehicle insurance, and $62,753 for fringe costs).

Residential Waste Recovered and Disposed (Percent by Weight, 1990)



Materials Recovery Overview

Goals and Legislative Requirements:

In 1988 Maryland passed legislation requiring counties to develop recycling programs by 1994. The State also mandated that counties with populations under 100,000 recycle 15 percent of their waste stream, and those with populations over 100,000 recycle 20 percent by 1994.

In July 1990, Montgomery County passed legislation requiring the County to recycle 40 percent of its waste stream by 2000. In July 1989, Prince George's County established a voluntary recycling program with a goal to reduce its waste stream 35 percent by 1999. Prince George's County also required all owners of residences with three or more units to provide recycling opportunities to their tenants by July 1992. There are six such buildings located in the Takoma Park portion of Prince George's County. Although the County suggests that multi-unit buildings recycle newspaper, glass, aluminum and ferrous cans, and plastics, collection of these materials is not mandatory. All apartment buildings with 100 units or more must submit recycling plans to the Prince George's County Office of Recycling by July 1991.

Goals and Legislative Requirements (cont'd):

Takoma Park Ordinance 89-4, adopted in January 1989, requires persons who receive City trash service to separate newspaper, glass bottles, and aluminum cans for recycling collection. Phase Two, implemented in June 1990, requires the separation of tin cans, corrugated cardboard, grass clippings, leaves, and white goods. Phase Three, implemented in September 1991, amended the Ordinance to include HDPE and PET plastic beverage containers and mixed paper.

Residents in Takoma Park recycled newspaper at curbside in the early 1980's. Private haulers collected the paper at no cost to the City and brought it to the Silver Spring Recycling Center. Although the City Council passed a mandatory newspaper recycling ordinance in July 1986, this ordinance was not enforced.

In 1987, a City-appointed Revenue Advisory Committee suggested that the City expand its newspaper recycling program in order to reduce the impact of rising disposal costs. Later that year, the Mayor and City Council appointed a Recycling Task Force to explore options for a citywide program. The Task Force recommended that the City provide residents with recycling bins for weekly, mandatory curbside recycling. The City decided that the Public Works Department would collect recyclable materials, but to avoid hiring additional staff or reducing the number of refuse collection days, the processing and marketing of materials would be contracted out. The Public Works Department reorganized its Sanitation Division, reducing the number of refuse trucks and converting one of its three-person refuse crews to a recycling crew. In September 1988, the City hired a recycling coordinator to disseminate informational materials and coordinate upcoming recycling activities. On April 3, 1989, Takoma Park began its mandatory weekly curbside collection of newspaper, glass, and aluminum cans from 4,100 households. During the first year of the program, City residents recycled over 1,140 tons of materials, reducing Takoma Park's landfill bill by $49,200 from the previous year.

Six months after the program started, the City began to enforce its recycling law. Enforcement programs increased participation from 72 percent in 1989 to 88 percent in 1990. Phase Two of the recycling program, implemented in June 1990, expanded the program to include year-round collection of ferrous cans, corrugated cardboard, white goods, grass clippings, and leaves. Prior to Phase Two, only leaves had been collected during the fall months. In the fall of 1990, the City set up a drop-off site for HDPE and PET plastics and conducted mixed-paper drives every other month. Collection of these additional materials proved very successful. Following the recommendation of the Recycling Task Force, the City implemented Phase Three of the recycling program in September 1991. HDPE and PET plastics and mixed paper, including magazines, paperboard boxes, and junk mail, are now collected at curbside; refuse collection has been reduced to once a week; and the four sanitation crews are split equally between recycling and refuse collection. The City purchased an additional vehicle for the recycling route; one vehicle collects paper, and the second follows behind and collects glass, plastic, and cans.

Takoma Park also composts a large portion of leaves generated in the City. Leaves collected during the fall months are composted on a small pad in the Public Works Yard. Because there are many trees in Takoma Park, and there is a local ordinance prohibiting residents from chopping down trees larger than 26 inches in circumference four feet up the trunk, the City's trees generate a large quantity of leaves each fall. Weekly curbside collection of grass clippings and leaves was initiated in June 1990 as part of Phase Two of the recycling program. This yard waste is composted at the Washington Suburban Sanitary Commission Composting Facility in Prince George's County.

Takoma Park does not collect recyclables from buildings with more than 12 units, which house approximately 40 percent of its residents. Although the Takoma Park Recycling Task Force recommended various ways for the City to promote recycling in apartment buildings, the City does not have any legislation requiring multi-family recycling, and only a few apartment buildings have initiated recycling programs. (All Takoma Park apartment buildings are regulated under local rent-control laws; therefore, owners are generally unwilling to spend time or money initiating recycling

programs.) In Prince George's County, where recycling in multi-unit buildings will become mandatory in 1992, eligible apartment buildings can receive grants to offset capital costs for initiating a program. The City has not yet targeted its businesses or institutions for recycling.

In September 1991, Montgomery County opened a new intermediate processing center (IPC) in Gaithersburg, Maryland, operated by New England CRInc. The center will process approximately 100 tons per day of glass, aluminum and ferrous cans, and HDPE and PET containers, in one 8-hour shift. The facility will receive an estimated 140 tons of newspaper per day, which will be transferred to the Southeast Recycling Center in Silver Spring. Takoma Park will bring all municipally collected bottles and cans to the site. No tipping fee will be charged. Funding for the operation and maintenance of the IPC will be generated through materials revenues and a portion of the landfill tipping fees.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	April 1989
Service Provider:	Takoma Park Department of Public Works-Sanitation Division
Pick-up Frequency:	Weekly
Same Day as Refuse:	Yes, for many but not all parts of the city
Households Served:	4,100 households (2,784 in single-family residences and 1,316 in 2– to 12–unit buildings)
Mandatory:	In 1990 set–out was mandatory for newspaper, glass bottles, aluminum and ferrous cans, and corrugated cardboard. In 1991 the set-out of HDPE and PET plastic bottles and mixed paper became mandatory. White goods are collected as requested.
Participation Rate:	72 percent in 1989, 88 percent in 1990 (based on a count of set-outs and an average of recorded violations over a 6-week period)
Materials Collected:	Newspaper, glass, and aluminum cans were collected in 1989, and corrugated cardboard, ferrous cans, and white goods were added in June 1990. HDPE and PET plastic bottles and mixed paper (magazines, paperboard, junk mail, and high grade paper) were added in September 1991.
Set-out Method:	Residents place glass, aluminum cans, and ferrous cans in yellow 5-gallon containers provided by the City. (Beginning 1991, plastics were also placed in recycling containers.) Newspaper is tied or put in paper bags and placed alongside the recycling container. Corrugated cardboard is flattened, tape and staples are removed, and the cardboard is bundled. Mixed papers must either be bundled or placed in paper bags. In 1991 the City purchased 14-gallon containers to accommodate Phase Three of the program. Residents may pick one up free of charge at the DPW.

Collection Method and Vehicles:	Before implementation of Phase Three, a three-person collection crew placed newspaper and cardboard in the back compartment and commingled materials in the front of a Kann Sorter truck. As of September 1991, the City uses a 25-cubic-yard National Recycling vehicle for paper collection. Newspaper is placed in one 12-cubic-yard area, mixed paper in an 8-cubic-yard area, and corrugated cardboard in a 5-cubic-yard section. The Kann Sorter truck is used for commingled bottles, plastics, and cans. Residents must call the Public Works Department for pick-up of white goods, which are collected in a compactor truck.
Economic Incentives:	None
Enforcement:	The City's Recycling Coordinator randomly inspects residential refuse. If recyclable materials are found in refuse containers, a warning notice is issued. After two notices the coordinator may issue a $20 fine. Four fines have been issued.
Annual Tonnage:	1,265 tons in 1990: 1,232 tons of recyclables collected through the curbside program, and 33 tons of white goods collected on request

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:	None
Service Provider:	Federal Paper Stock (a private company) and Takoma Park's Building Maintenance Division
Number Served:	2
Type Served:	Municipal offices
Materials Collected:	White and colored high-grade paper, corrugated cardboard, newspaper, glass bottles, and aluminum and ferrous cans
Pick-up Frequency:	As needed (paper is collected when the containers are full)
Set-out and Collection Method:	Municipal workers separate high–grade paper in deskside containers; janitors empty bins into centrally–located Gaylord boxes. When these are full, Federal Paper Stock is contacted and sends four employees to sort the paper and put in mail bins. Takoma Park does not receive any revenues from the paper, and Federal Paper Stock does not charge the City for collection. Employees place glass and cans in bins located throughout the building. When the bins are full they are carried out to a central storage area and are picked up during the weekly residential recycling runs. Corrugated cardboard is separated and flattened and the Recycling Division collects it during the recycling runs.
Incentives:	None
Annual Tonnage:	4 tons in 1990

Drop-off Centers

Number and Type:	In 1990 one roll–off container (for plastics) and one tank (for oil) were located at the Takoma Park Public Works Yard. (In 1991, when the City began to collect plastic at curbside, it no longer offered the drop-off container.) Beginning in October 1990, the City would set up a drop–off site for mixed paper by locating a roll–off container in front of the City Municipal Building one weekend every two months.
Public or Private:	Public
Sectors Served:	Residential
Materials Accepted:	Motor oil, HDPE and PET beverage containers, and mixed paper for bimonthly collection
Annual Tonnage:	Three tons of plastic, and 2 tons of mixed paper in 1990; tonnages for motor oil are not included because it is burned as a fuel source.

In the fall of 1990, the City began bimonthly (once every two months) recycling drives for magazines, phone books, and junk mail. Residents could drop off commingled paper at a roll-off container located in front of the City Municipal Building. This program ended when the City's curbside collection of mixed paper was implemented in September 1991. The City also sponsors a used clothing drive twice yearly, in fall and spring. Volunteers box or bag the items. Clothes collected in the first drive, in fall 1990, were sent to "Quest for Peace" in Nicaragua. Clothes collected in subsequent drives went to local charities, such as Shepherd's Table and The Community for Creative Non-Violence.

Although the City does not collect batteries, the recycling office requests that they be dropped off during Montgomery County's and Prince Georges County's household hazardous waste collection days.

Processing and Marketing of Recyclables

Takoma Park contracts with private vendors to process and market the recyclable materials collected through its municipal curbside program. In 1990 City crews delivered newspaper, mixed paper, and cardboard to South East Recycling Corporation's 36,000-square-foot building in Silver Spring, Maryland. (Mixed paper is now delivered to Georgetown Paper Stock in Bladensburg, Maryland.) No tipping fee was charged. At this facility, twelve employees process materials for market. Newspaper is sent loose to Southeast Paper in Dublin, Georgia, and re-manufactured into newsprint. Corrugated cardboard is baled and sent to Richmond Recycling in Richmond, Virginia, where it is recycled into cardboard. Mixed paper is shipped to seven different markets. BFI hauled commingled glass and cans, first stored at the Public Works Department in a roll-off container, and HDPE and PET plastics collected at the drop–off site to Georgetown Paper Stock in Bladensburg, Maryland. The plastics were baled and sold to Polysource Inc. in Baltimore for further processing.

Takoma Park began to sell glass and cans to Eagle Maintenance Services in Capital Heights, Maryland in 1991. It contracted with Waste Management Inc. to deliver recyclables to the facility. In 1991 Eagle charged a $30 per ton tipping fee. This privately owned regional facility handles materials collected through many residential curbside programs. Materials are first unloaded onto the 50-foot by 100-foot tipping floor. Operators transfer the recyclables to a conveyor with a front-end loader. Fifteen employees process approximately 20 tons per day. Ferrous cans are first magnetically removed from the conveyor belt. Plastics, brought in by other curbside programs, are separated and baled. Green and brown glass are separated and dropped down a chute into Gaylord boxes. Aluminum and ferrous cans are densified into blocks. Glass is shipped to Owens Brockway in Clarien, Pennsylvania or Winston Salem, North Carolina. Aluminum cans are sold either through a broker or directly to

Reynolds Aluminum in Richmond, Virginia. Ferrous cans are stored until a large enough volume is generated for market. One percent of glass collected is broken by the time it reaches the IPC. An estimated 11 percent by weight of recyclable materials are rejected during processing and subsequently landfilled.

In September 1991, Takoma Park began to haul 2 tons of glass, plastic, and aluminum and ferrous cans daily to Montgomery County's new IPC in Gaithersburg, Maryland, 13 miles from the City. The IPC, operated by New England CRInc., employs West German Bezner technology. It was built to process 140 tons per day of newspaper and 100 tons per day of commingled recyclables in one 8-hour shift. The IPC employs 24 people with 10 employees sorting recyclable materials. The capital cost of the plant was $8.5 million, including building construction and machinery. The County pays CRInc. a flat fee of $844,000 per year for processing recyclables (newsprint in addition to food and beverage containers) at the IPC, plus additional monthly payments. In the first year of operation, the County will pay an estimated $2.3 million to CRInc., equivalent to $37 per ton (assuming 240 tons processed each of 260 days). Materials revenue is shared between CRInc. and the County: CRInc. receives 25 percent of gross revenue, and the County receives 75 percent. As an incentive to use local and regional markets, CRInc. is responsible for 25 percent of the cost of transporting processed materials to market. If CRInc. exceeds its projected residue rate of 10 percent of recyclables (excluding paper) it will have to pay the landfill tipping fee for disposing of all residue. Takoma Park avoids paying both hauler and tipping fees, since the City self-hauls all materials and the processing center does not charge a tipping fee. The IPC accepts residential recyclables only, and will be funded through recyclable materials revenues and landfill tipping fees.

Composting/Mulching Activities

Backyard Composting

The Recycling Office publishes flyers on backyard composting, organizes annual workshops on backyard composting led by the Cooperative Extension Service, and has produced a backyard composting demonstration video for Takoma Park cable television. In 1990 the City's Recycling Coordinator surveyed residents to determine how many intended to set out yard waste at curbside for the upcoming Phase Two of the program; 11 percent of respondents claimed that they were already composting yard waste in their backyards.

Curbside Collection

Start-up Date:	Prior to 1980 for fall leaf collection, June 1990 for weekly collection of grass clippings and leaves
Service Provider:	Takoma Park Public Works Department
Households Served:	4,100
Mandatory:	Yes, for leaves and grass clippings
Materials Collected:	Leaves, grass clippings, and Christmas trees

Set-out Method:	Grass clippings and leaves are set out in trash cans or in 30-gallon paper bags that residents can purchase at area stores. Yard waste in plastic bags will not be picked up. In the fall months, leaves can be raked loose to the curbside. Christmas trees are set out at curbside.
Collection Vehicles & Method:	A 3-person crew loads bags of grass clippings and leaves into compactor trucks. Four 5-person crews collect loose leaves in the fall. One individual drives the truck, one prepares leaves for vacuuming, one operates the vacuum, and two workers rake leaves into the vacuum. Leaves are then blown into a leaf collection box pulled behind the vacuum loader.
Collection Frequency:	Bagged grass clippings and leaves are collected each Wednesday year-round. Loose leaves are collected from November through January. Christmas trees are collected each Wednesday during January.
Economic Incentives:	None
Annual Tonnage:	1,206 tons in 1990

Composting/Mulching Site

Leaves collected during the fall program are brought to the City's compost site. All leaves are piled on an asphalt compost pad and turned a maximum of three times per year. Odor problems have arisen due to poor aeration of piles. Finished compost is moved to a site on an adjacent hill where residents can take it free of charge. Since January 1989, Christmas trees have been collected and ground. The resulting mulch is free to Takoma Park residents.

Bagged yard waste (grass clippings and leaves) is taken to the Washington Suburban Sanitary Commission Composting Facility in Prince George's County. The 44-acre County-owned site is operated by Maryland Environmental Services (MES). No tipping fee is charged. Yard waste is shredded and windrowed. Finished compost will be bagged and marketed through garden shops. The City is not aware of the amount of yard waste rejected and disposed.

Amount and Breakdown of Materials Recovered

Material	Residential (Tons, 1990)	Commercial/ Institutional (Tons, 1990)	Total (Tons, 1990)
Newspaper	771.76	0	771.76
Corrugated Cardboard	17.45	0	17.45
High-grade Paper	0	4.25	4.25
Mixed Paper	2	0	2
Commingled*	445.53	0	445.53
Glass*	NA	0	NA
HDPE and PET Plastic*	NA	0	NA
Aluminum Cans*	NA	0	NA
Ferrous Cans*	NA	0	NA
Appliances/White Goods†	33.35	0	33.35
Textiles	NA	NA	NA
Subtotal MSW Recycled	**1,270.09**	**4.25**	**1,274.34**
Leaves (Loose)‡	1,000	0	1,000
Bagged Yard Waste	200	0	200
Christmas Trees	6	0	6
Subtotal MSW Composted	**1,206**	**0**	**1,206**
Total MSW Recovered	**2,476.09**	**4.25**	**2,480.34**

Notes: Tonnages figures above represent recyclables collected, including any contaminants brought to processors.
Takoma Park does not track construction and demolition debris, but believes that there is no recovery of C&D in the City.
*Glass, plastic, and aluminum and ferrous cans are collected commingled; a tonnage breakdown is not available.
†A small amount of residential scrap metal is included with white goods.
‡The City Recycling Coordinator estimated leaf tonnage based on the number of full truck loads of leaves multiplied by the number of days leaves were collected. An estimated conversion factor of 500 pounds per cubic yard was used.

Publicity and Education

Takoma Park actively promotes its residential recycling and composting programs. Programs featuring the City's recycling program, environmental shopping, and backyard composting have been featured on the "The Green Show," aired on a local cable television channel. The Recycling Office also writes news articles on its recycling program in the municipal newsletter. Forty volunteers and the Recycling Office distribute brochures and flyers to city residents. The Recycling Office also sets up recycling displays at fairs and other events.

Along with the Takoma Park Housing Providers Association, the City hosted a meeting on how to establish recycling programs in apartment buildings. The Takoma Park Recycling Task Force sent all city apartment building managers a survey inquiring about their waste disposal method and their support for a recycling program. However, the City does not provide financial assistance to multi-family housing owners who want to set up programs.

Economics

Costs Cover: The City of Takoma Park pays for all capital and operating and maintenance costs for the collection of 1,232 tons of recyclable materials collected at curbside, 33 tons of white goods, and 1,206 tons of yard waste and Christmas trees. Costs for drop-off collection of 3 tons of plastics, 2 tons of mixed paper, and processing of recyclables consist of contract fees paid to haulers and processors. Operating and maintenance costs for yard waste collection include weekly collection of bagged grass and leaves by sanitation employees and fall vacuum leaf collection by the Streets and Parks Division with some additional temporary labor.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
3 Compactor Trucks* @ 10% recycling and 10% compost collection	$258,883	Rec/Comp	1983-1987
5,000 6-Gallon ROPAK Recycling Buckets @ $2.29	$11,450	Recycling	1988
Kann Curb Sorter Truck	38,000	Recycling	1988
400 7-gallon ROPAK Recycling Buckets @ $2.19	876	Recycling	1989
1,500 14-gallon Buckhorn Recycling Bins @ $3.65	5,475	Recycling	1991
1,500 7-gallon ROPAK Recycling Buckets @ $2.10	3,150	Recycling	1991
NR-250 Recycling Truck	41,699	Recycling	1991
5 Leaf Vacuums	63,695	Composting	1983-1990
4 15-cubic-yard Leaf Collection Boxes @ $3,000	12,000	Composting	1989 & 1990

Note: The City has completely paid for all equipment.
*These trucks are also used for refuse collection and were owned prior to implementation of the City's recycling program.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
2 Glass Crushers @ $3,600*	$7,200	Recycling	1990
Densifier*	25,000	Recycling	1990
Front-end Loader*	21,000	Recycling	1990
Forklift*	10,000	Recycling	1990
2 Conveyors @ $35,000*	70,000	Recycling	1990
Magnetic Head*	8,000	Recycling	1990
Wood Chipper†	4,950	Composting	1980
Backhoe @ 20% of time†	45,000	Composting	1990

*Equipment was purchased and is owned by Eagle Maintenance Services. The City has completely paid for all other equipment.
†Owned by the City prior to implementation of composting.

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$182,360**	**1,270**	**$144**
Curbside Collection	$122,130	1,265	$97
Drop-off Collection and Processing*	830	5	166
Processing Curbside Recyclables†	17,600	1,265	14
Administration	36,800	1,270	29
Education/Publicity	5,000	1,270	4
Composting Subtotal	**$108,400**	**1,206**	**$90**
Collection	$91,700	1,206	$76
Processing	2,700	1,206	2
Administration	13,000	1,206	11
Education/Publicity	1,000	1,206	1
Recycling & Composting Total	**$290,760**	**2,476**	**$117**
Collection	$213,830	2,476	$86
Processing‡	21,130	2,476	9
Administration	49,800	2,476	20
Education/Publicity	6,000	2,476	2

Notes: Numbers may not add up to total due to rounding.
Of the total O&M costs for recycling collection, $95,200 was spent on collection crew labor costs. (Collection crews earn $11 per hour.)
*Represents $500 in hauling and processing fees for mixed paper, and $330 in hauling fees for plastic.
†Cost represents (1) $16,100 paid to BFI for hauling plastic, glass, and cans to processors, and (2) $1,500 hauling fees for scrap metal.
‡ Includes $830 for hauling and processing recyclables collected at drop-off.

Materials Revenues:	$350 was paid to Takoma Park for scrap metal. No revenues were generated through the curbside recycling or composting programs.
Source of Funding:	A State grant paid for the Kann Curb Sorter recycling vehicle. City taxes cover all other expenses.
Full-time Employees:	13. Three Sanitation Division employees collect recyclables, 9 employees collect grass clippings and leaves weekly, and 1 Recycling Coordinator administers the recycling and composting programs.
Part-time Employees:	21. One half-time supervisor manages 10 employees during fall leaf collection, and 10 temporary employees.

Future Solid Waste Management Plans

In winter 1991, the Recycling Office will write a City procurement policy. The Recycling Task Force will be looking into implementing recycling in the commercial and institutional sectors and increasing recycling in multi-unit buildings. The City's FY 1991 budget includes funds for several pilot apartment buildings slated to begin in the winter of 1992. The funds will be used toward the purchase of recycling bins, production of flyers, and technical assistance from the City's Recycling Coordinator. Prince George's County plans to expand composting operations at the Washington Suburban Sanitary Commission Composting Facility.

The Washington Suburban Sanitary Commission Composting Facility is expanding its operation and is allowing Takoma Park to include brush and branches with its weekly yard trimmings collection. The City plans to begin collecting brush and branches in February 1992. By the end of 1991, Montgomery County plans to have regulations in place to require businesses to recycle.

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West Linn, Oregon

Demographics

Jurisdiction:	City of West Linn
Population:	16,557 in 1990
Area:	7 square miles
Total Households:	6,165 (5,240 single residences and 925 multi-unit dwellings)
Total Businesses and Institutions:	379 businesses (including home businesses such as Avon distributors) and 6 institutions (five schools and one nursing home)
Brief Description:	West Linn is a suburban commuter community in the Portland metropolitan area with a growing population and a small commercial sector. The only industrial establishment is a paper mill. The 1988 per capita income of Clackamas County, in which West Linn is located, was $16,961; the 1989 median household income was $30,111.

Solid Waste Generation and Recovery

	Residential/ Comm/Inst*	Deposit Containers†	Total MSW‡	Construction & Demolition§	Total Waste
Annual Tonnages (1990)					
Recovered	**3,398**	**519**	**3,917**	**593**	**4,510**
Recycled	1,846	519	2,365	NA	NA
Composted	1,552	0	1,552	NA	NA
Disposed	**3,988**	**0**	**3,988**	**1,384**	**5,371**
Incinerated	0	0	0	0	0
Landfilled	3,987	0	3,987	1,384	5,371
Generated	**7,386**	**519**	**7,905**	**1,977**	**9,881**
Percent by Weight Recovered					
Recovered	**46%**	--	**50%**	**30%**	**46%**
Recycled	25%	--	30%	NA	NA
Composted	21%	--	20%	NA	NA

Note: Tonnage figures include waste disposed and recovered from 60 households on the outskirts of West Linn. The tonnage of tires recovered is not tracked and is thus excluded from the above figures.

*Excludes deposit containers. Residential waste cannot be separated from commercial/institutional waste. Both sectors are serviced by the same hauler. Ed Druback, former Recycling Coordinator, estimates that 13 percent of MSW disposed is commercial/institutional waste and 87 percent is residential waste.

† Represents glass, plastic, and aluminum beverage containers recycled as a result of the State bottle bill.

‡ MSW recycled includes bulky items such as white goods. MSW generated is based on Ed Druback's estimate that 80 percent of total waste generated is MSW.

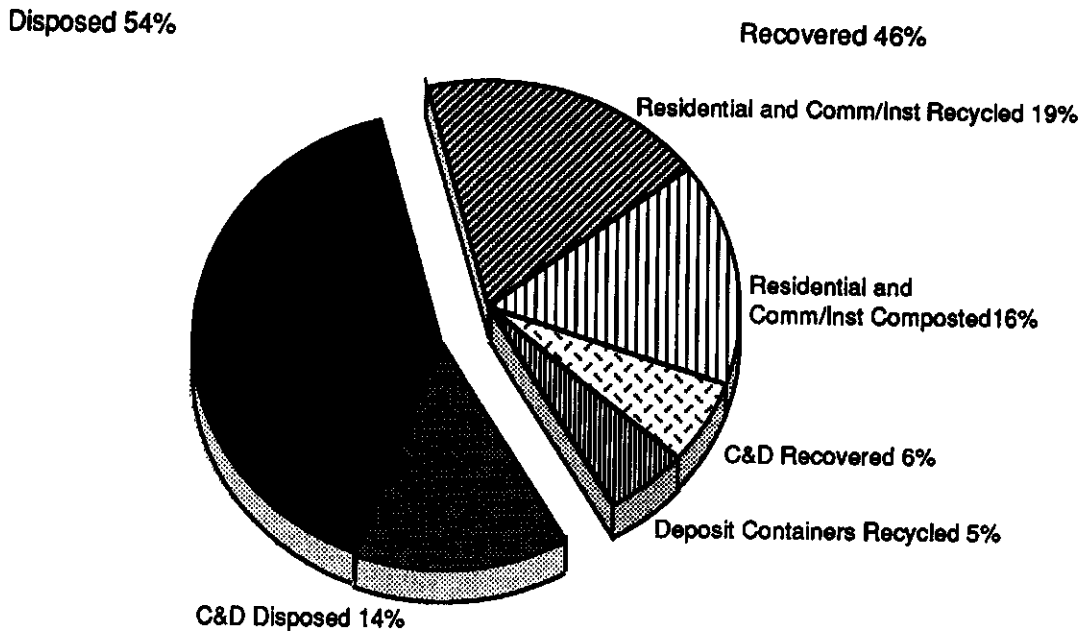
§ Ed Druback estimates that of the total waste generated in West Linn, 20 percent is construction and demolition debris. Of the estimated 1,977 tons of C&D generated, he estimates that 30 percent is recovered. The actual tonnage of C&D debris recovered and generated is not tracked.

Transfer Station Tipping Fee: $19.90 per ton in 1987, $45.75 in 1988, $55.75 in 1990, and $68.00 as of July 1, 1991

Refuse Collection and Disposal: The City has a franchise agreement with West Linn Disposal, a private hauler, for collection of residential and commercial solid waste. The franchise agreement entitles West Linn Disposal to be the only municipal solid waste hauler in the City, and requires the hauler to pay the City a flat yearly fee for this privilege. Keller Drop Box has a franchise agreement to collect C&D debris in drop boxes.

The Portland Metropolitan government (Metro) operates the area's only general purpose transfer station, and has authority over solid waste planning and disposal. West Linn retains control over local refuse collection. Waste generated in West Linn is transported to a transfer station owned by Metro, located within 2 miles of the City. Metro then transports the waste from the transfer station to a privately owned landfill in Arlington, Oregon, 140 miles away.

Total Waste Recovered and Disposed (Percent by Weight, 1990)



Refuse Collection and Disposal (cont'd):

West Linn Disposal incurred a cost of approximately $144 per ton for refuse collection and tipping fees in 1990. The costs of transporting the refuse to the landfill and the landfill's operation costs are covered by the transfer station tip fee.

Landfill tipping fees have increased significantly in recent years and are expected to continue to rise. Metro is considering other options for waste disposal. At this time, West Linn has decided not to utilize the new municipal waste composting facility, which opened in the Portland Metro region in 1991, because of its distance from the City. West Linn prefers to concentrate on recovering its discarded material through source-separation recycling and composting programs.

Refuse is collected from residents once a week. Most businesses and institutions have their refuse collected once a week, but some need it picked up 3 times a week. West Linn Disposal charges businesses according to size of refuse receptacle and the number of times that it gets picked up a week. Businesses and institutions can also sign up for monthly and on-call collection.

Refuse Collection and Disposal (cont'd):

West Linn Disposal charges residents by volume for collection of their refuse. Weekly collection of one 32-gallon container of refuse costs $13.70 per month. Collection of two containers costs $27.40 per month. Residents can choose a reduced rate of $11.55 per month for weekly pick-up of a 20-gallon mini-can. Currently, only about 25 households, mostly senior citizens, have chosen this option.

In addition to the flat fee for the franchise, West Linn Disposal must pay the City a monthly fee for each household according to the number of cans the household sets out: $0.95 per month for one 32-gallon can, $3.60 for two cans, $6.25 for three cans, $8.70 for four cans, and $11.35 for five cans. The hauler pays a slightly lower amount for every 20-gallon mini-can. The City uses this money to fund its recycling activities (drop-off center, publicity/education). According to Ed Druback, the City's former Recycling Coordinator, total waste disposed increased from 5,164 tons in 1989 to 5,371 tons in 1990 due to population increase. The amount of waste disposed per person per day has actually decreased.

Materials Recovery Overview

Goals and Legislative Requirements:

In 1983 the State of Oregon adopted the Recycling Opportunity Act, which requires cities with more than 4,000 people to set up either a curbside program or a drop-off center for recyclable materials. Cities must also inform each person about the opportunity to recycle and encourage them to source-separate recyclables. In September 1988, the Oregon State Environmental Quality Commission identified yard debris as a principal recoverable material in the Metro region. Local governments were required to submit plans to the Department of Environmental Quality (DEQ) describing the opportunities they would offer residents to recover yard debris. DEQ approved West Linn's plan in April 1989. Oregon Senate Bill 66 sets a 50 percent State recycling goal to be met by 2000, and a 45 percent goal for jurisdictions that compost mixed waste to be met by 1995; only 5 percent of the waste stream may be diverted through MSW composting for the purpose of meeting the 45 percent goal.

In the early 1980's, the Portland Metropolitan government (Metro) proposed building a garbage incinerator in a town adjacent to West Linn. In response to citizens' concerns, the West Linn City Council withdrew its support for the incinerator and instead established a Solid Waste Reduction Task Force to recommend ways to reduce the City's solid waste output by 50 percent. In June 1983, the Task Force presented 15 recommendations, including implementation of a curbside collection program.

Each recommendation fell into one of four general categories: (1) implementing programs, (2) education and promotion, (3) funding, and (4) supervision. The primary goal of these recommendations was to provide a quality service that was constant in the types of materials collected and the days of collection. Another goal was to support the service with sufficient promotion, education, and staff time to guarantee its success.

In July 1983, West Linn Sanitary, the franchised solid waste hauler, began offering free curbside collection of residential recyclable materials including newspaper, corrugated cardboard, kraft paper, three colors of glass, tin, and motor oil. In December 1984, West Linn Sanitary began placing multimaterial recycling collection boxes at multi-unit buildings in the City. By the end of 1986, just

under 90 percent of all residents living in complexes of ten or more units received collection of recyclables. Since 1987 the hauler has been serving the multi-unit buildings in the course of collection from single residences on the same routes. By March 1985, the hauler began collecting corrugated cardboard and bulk quantities of other materials from commercial sources. The only institutions that recycle are schools, which recycle paper. Curbside recycling service is provided to all residents and all commercial establishments in West Linn, whether or not they are customers of the hauler.

The City of West Linn operates a drop-off center for recyclables once a week at its composting site. The truck that collects recyclables at curbside picks up the same types of materials from the drop-off center. In addition to these materials, the center accepts magazines, white and colored ledger paper, computer paper, HDPE plastic milk jugs, and polystyrene. Leaves and yard debris are accepted for composting. The City sponsors two clean-up days a year, one in the fall and one in the spring. Any recyclable materials collected from the clean-up days are taken to the drop-off and composting site; from there, they are sent to local brokers. The Lions Club of West Linn has placed large trailers for newspapers at three shopping centers. The Boy Scouts and other groups have four smaller drop boxes for newspapers across the City. These groups collected 240 tons of newspaper in 1990.

The State of Oregon has had a beverage container deposit system since 1972. West Linn's former Recycling Coordinator reports that 519 tons of aluminum, glass, and PET plastic beverage containers were returned for deposit refund to grocery stores in the City in 1990. This tonnage represents 22 percent of municipal solid waste recycled in the City.

Residents have three options for recycling appliances: (1) to haul them for no fee to the drop-off center during the twice-yearly City clean-up days, (2) to haul them for no fee to the regional transfer station any day of the year, and (3) to call West Linn Disposal, which collects appliances in a flat-bed truck for a $10.00 fee. Similarly, residents may dispose of tires by taking them to the drop-off center during the semiannual clean-up days, or by hauling them to the regional transfer station. The tires are taken to Waste Recovery Systems. The company burns 85 percent of the tires for fuel and 15 percent of them are retreaded.

In April 1989, West Linn Sanitary was bought out. The new owner changed the name of the company to West Linn Disposal. Tonnages recovered were 6 percent higher in 1989 than in 1987—an increase that Ed Druback, West Linn's former Recycling Coordinator, attributes to the new owner's aggressive recycling activities. In April 1990, West Linn Disposal began providing 14-gallon buckets to residents for source separation of recyclable materials. Tonnages of recyclables (excluding deposit containers) increased by 28 percent between 1989 and 1990, from 1,445 tons to 1,852 tons. Ed Druback believes this increase was due to the buckets, because items collected in the buckets (tin cans and glass) increased significantly while the other materials did not. Another contributing factor could be population growth.

In December 1990, the City of West Linn initiated a 12-month pilot program to recycle mixed paper, funded by a $24,000 Metro Grant. Five hundred families participated in the program on a volunteer basis. Each family received a plastic bag for storage of mixed paper (magazines, high-grade paper, colored paper, corrugated cardboard, paperboard, and phone books). Mixed paper is collected with the rest of the curbside material and brought to the drop-off center, where it is dumped on a conveyor belt. Three people who are required to do community service separate and recover three different grades of paper; a paid employee oversees them. The costs for recovering mixed paper are less than the costs for disposing of it. In the first 8 months of the program, 79.5 tons of mixed paper were recovered. Dennis Koellermeier, the Director of Public Works in West Linn, reports that this mixed paper was contaminated with mixed waste (including envelopes with plastic windows, plastic in general, and trash), making it difficult and time consuming to separate. He does not think that the program will continue after the trial period ending in December 1991 because of the contamination levels (about 10 percent of paper was contaminated) and the minimal profit associated with this low-grade paper.

The League of Oregon Cities has commended the West Linn recovery program for reducing waste disposal costs and improving the overall quality of life of the community.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	1983
Service Provider:	West Linn Disposal, the City's hauler, provides curbside collection of recyclable materials as part of its franchise agreement with the City.
Pick-up Frequency:	Weekly for all materials except appliances, which are collected on an on-call basis
Same Day as Refuse:	Yes
Households Served:	6,165 in West Linn in 1990 (5,240 single-family households and 925 households in multi-unit dwellings); recyclable materials are also picked up from 60 houses on the outskirts of West Linn.
Mandatory:	In July 1983 it became mandatory for the City's refuse hauler to offer collection of newspaper, corrugated cardboard, kraft paper, glass, tin, aluminum, and motor oil in accordance with State law. Resident participation is voluntary.
Participation Rate:	86 percent of all single-family households (estimated by counting the number of stops in a month)
Materials Collected:	Newspaper, corrugated cardboard, kraft paper, three colors of glass, tin, aluminum, and motor oil. PET and HDPE plastics were collected beginning in the summer of 1991.
Set-out Method:	Materials are bagged or bundled separately and placed at least 5 feet from nonrecyclables. Newspaper is placed in one bag on the bottom of the 14-gallon container, each color of glass in a separate bag, and tin and aluminum in a third. The bags of glass, tin, and aluminum are placed on top of the newspaper.
Collection Method and Vehicles:	West Linn has two vehicles for pick-up of recyclables: a modified 16-cubic-yard garbage truck equipped with ten bins for recyclables and a 3-cubic-yard compactor for plastic attached, and a Kahn curbsorter, purchased in 1991 and also equipped with a 3-cubic-yard compactor. One worker operates the Kahn Curbsorter, while two—a driver and a collector—operate the modified garbage truck. The bins on the garbage truck have a capacity of 1/2 to 2 cubic yards and can be removed with a forklift. Appliances are collected in a flat-bed truck.
Multi-Unit Collection:	Beginning in December 1984, West Linn Disposal began collecting recyclable materials, including newspaper, corrugated cardboard, glass containers, tin cans, and motor oil, from multi-unit buildings. Residents set out materials in separate 14-gallon buckets or other containers, placing them in outdoor shelters. Beginning the summer of 1991, residents set out material in 14-gallon buckets only. Multi-unit buildings in West Linn range from 4 units to 135 units and cannot be higher than 2 stories. The participation rate is unknown because materials are picked up collectively from the shelters. West Linn Disposal wants residents of multi-unit housing to set out their recyclable materials in the 14-gallon containers, just as single-family households do.

Economic Incentives:	The variable can rate is an economic incentive for residents to generate as little waste as possible and to recycle as much as possible. West Linn Disposal does not charge for picking up recyclables.
Annual Tonnage:	The tonnage of residential recyclables collected at curbside is not available. In 1990 West Linn Disposal collected 1,338 tons of recyclables from both the residential and commercial sectors.

Commercial & Institutional Curbside/Alley Recycling

Legislative Requirements:	West Linn Disposal is required to pick up recyclable materials from businesses and institutions within the city limits of West Linn.
Service Provider:	West Linn Disposal
Number Served:	33 businesses recycle corrugated cardboard, and 50 businesses recycle one or more of the following materials: newspaper, corrugated cardboard, kraft paper, mixed paper, three colors of glass, tin, motor oil, and PET and HDPE plastic containers.
Type Served:	Large businesses, such as grocery stores; small businesses, including lawyers' and dentists' offices, and institutions including churches and a preschool
Pick-up Frequency:	Weekly, except for high-grade computer and ledger paper, which is collected on an on-call basis with the weekly cardboard route. Weekly collection of corrugated cardboard is separate from collection of the newsprint, cans, and bottles.
Materials Collected:	Corrugated cardboard, newspaper, kraft paper, mixed paper, three colors of glass, tin, motor oil, and PET and HDPE plastic containers
Set-out and Collection Method:	Corrugated cardboard is bundled, bagged, or baled (supermarkets). Other materials are source-separated into 14- or 40-gallon containers depending on the volume produced. The large producers of corrugated cardboard, such as the supermarkets, have their own compactors. A 20-cubic-yard packer truck is used for the weekly collection of corrugated cardboard. The other recyclable materials are collected along the residential curbside collection routes free of charge.
Incentives:	Businesses can save money by reducing the volume of refuse generated.
Annual Tonnage:	Approximately 98 tons of corrugated cardboard at curbside

Drop-off Center

Number and Type	One drop-off center known as the Recycling Depot, open on Saturdays
Public or Private:	Public
Sectors Served:	Residential and commercial/institutional. Residents and 35 businesses self-haul their recyclables to the drop-off center. Some people from outside of West Linn bring their materials to the drop-off center, and according to Ed Druback, this tonnage is negligible.

Materials Accepted:	Newspaper, corrugated cardboard, kraft paper, three colors of glass, aluminum, ferrous cans, motor oil, leaves, brush, magazines, white and colored ledger paper, computer paper, HDPE plastic milk jugs (#2), garbage bags (#4), and polystyrene (#6), Christmas trees
Employees:	One full-time and one part-time employee operate the drop-off site.
Annual Tonnage:	240 tons of recyclables were collected by civic groups at drop boxes throughout the City and 1,552 tons of organic waste were collected at the West Linn Recycling Depot.

Processing and Marketing of Recyclables

Materials collected through the curbside program are unloaded from the 10-bin truck with a forklift. Since materials are separated at curbside, the hauler usually delivers them directly to K&B Recycling, a buy-back center that has processed materials since 1984. However, West Linn Disposal does not have a binding contract with K.B. Recycling, so it often sells its recyclable materials to processing facilities that offer better prices. K.B. Recycling, located 10 miles from West Linn, processes 167 tons of materials every day. Of this amount, an estimated 2 percent by weight is rejected as nonrecyclable.

The K.B. Recycling Facility pays West Linn Disposal for all materials it delivers except mixed paper. Eight to ten people separate different grades of paper from three conveyor belts. A magnetic sorting system separates ferrous from nonferrous cans; another separates tin from plastic. Ten people work in the rest of the facility, performing various processing or administrative tasks.

The City markets the materials collected at its drop-off center and receives any revenues. Many of the scrap buyers are located in Oregon and Washington, but mixed paper is marketed overseas to Taiwan and South Korea. The Environmental Learning Center at Clackamas Community College grinds the City's HDPE plastic milk jugs and polystyrene with a granulator free of charge. Students deliver the polystyrene to Denton Plastics, where it is manufactured into items such as flower pots. The HDPE is delivered to Partek in Vancouver, Washington. The Environmental Learning Center retains any revenue from plastic sales. Much of the polystyrene received at the drop-off center is reused for insulation and foam packaging pellets.

Composting Activities

In 1983 it was estimated that yard debris constituted 25 percent of the total waste generated in West Linn. Based on recommendations made by the Solid Waste Reduction Task Force, the City encouraged home composting, arranged for the franchised solid waste hauler to provide on-call collection of yard debris, and set up a drop-off/composting site for yard debris. In cooperation with the private hauler, the City made set-out of yard debris for disposal more expensive than set-out for composting.

Backyard Composting

Since 1984 West Linn has offered 2-hour seminars on how to compost at home, taught four times a year by the staff of the local community college. Attendance has dropped off in recent years. It is estimated that 15 to 20 percent of all yard debris was composted in backyards in 1990.

Curbside Collection

Start-up Date:	May 1985
Service Provider:	West Linn Disposal
Households Served:	5,300 households (multi-unit buildings are not served)
Mandatory:	The State of Oregon recognizes yard waste as a recyclable material and requires West Linn to offer a curbside collection program for yard waste or an acceptable alternative. It is not mandatory that residents comply.
Materials Collected:	Leaves, brush, and Christmas trees.
Set-out method:	Leaves must be bagged (less than 60 lbs.) and brush must be bundled (not to exceed 3 feet by 4 feet).
Collection Vehicles and Method:	One worker with a pick-up truck collects leaves and brush together.
Collection Frequency:	On-call, year-round
Economic Incentive:	It is more expensive to set out yard waste for disposal than to set it out for composting.
Tonnage:	West Linn Disposal, estimates that less that 4 tons of yard waste was composted in 1990.

West Linn Disposal offers year-round on-call collection of source-separated yard debris for a nominal charge: $3.50 for each bag of leaves (not to exceed 60 pounds) and $7.50 for each bundle of brush (not to exceed 3 feet by 4 feet). This is less than the charge for refuse collection but more expensive than self-hauling yard waste to the composting site. West Linn Disposal claims that the curbside service is rarely used.

Composting Site

The City's 0.9-acre drop-off center for yard waste is open on Saturdays, from February through November. Materials accepted include leaves, grass clippings, brush, wood waste except for lumber, and all the materials collected at curbside. West Linn residents tend to haul their yard waste to the drop-off center, because doing so costs less ($0.50 per bag of leaves and $3.00 per cubic yard of brush) than having the private hauler pick up these materials. On Saturdays there is a person who supervises people dropping off yard waste and collecting fees for the composting service.

All wood material is ground in a tub grinder and composted into four windrows. Two people turn the pile every 6 weeks using a front-end loader. The finished product is ready in 6 months. The composted material is sold to residents for $5 per cubic yard or 50 cents per 3 cubic feet bagged in recycled feed bags. It is also used by the City in parks. The City also sponsors a yearly Christmas tree drop-off program. The Christmas trees are chipped. An estimated 2 percent of yard waste collected is rejected as noncompostable, usually because it is lumber. This material is turned away by a monitor at the composting site. The tonnage of yard waste is estimated using a conversion factor of 250 pounds per cubic yard.

In September 1987, Oregon's Environmental Quality Commission adopted rules requiring all jurisdictions in the area to develop a recycling plan that provides either curbside collection or drop-off centers for yard debris. The State has banned the burning of yard waste unless the resident is unable to transport the material due to location or because he/she fits into an extremely low income bracket.

Amount and Breakdown of Materials Recovered

Material	Total (Tons, 1987)	Total (Tons, 1989)	Total (Tons, 1990)
Newspaper	616	840	1,107
Corrugated Cardboard	103	413	483
High-grade Paper	2	3	3
Magazines	0	5	9
Phone Books	0	0	2
Glass	80	129	174
Aluminum Cans	0	0	0
PET Plastic	0	0	0
HDPE Plastic	0	0	1
Motor Oil	7	15	20
Tires	0	4	0
Appliances		10	5
Ferrous Cans	18	26	43
Scrap Metal	19	0	0
Subtotal Recycled	**845**	**1,445**	**1,847**
Yard Waste	1,100	1,454	1,507
Christmas Trees	23	26	45
Subtotal Composted*	**1,123**	**1,480**	**1,552**
Subtotal Recovered	**1,968**	**2,925**	**3,404**
Deposit Containers	400	495	519
Total MSW Recovered	**2,368**	**3,420**	**3,923**

*The tonnages of compostable material were converted based on 200 pounds per cubic yard in 1987 and based on 250 pounds per cubic yard in 1989 and 1990. This change in conversion factors caused the tonnages to appear to increase significantly when actual volumes did not change that much.

Material	Residential (Tons, 1990)*	Commercial/ Institutional (Tons, 1990)	Other† (Tons, 1990)	Total (Tons, 1990)
Newspaper	1,085.93‡	20.63	–	1,106.56
Corrugated Cardboard	168.56	314.40	–	482.96
High-grade Paper	0	2.84	–	2.84
Phone Books	1.69	0	–	1.69
Magazines	9.17	0	–	9.17
Glass	174.39	0	384.06	558.45
PET Plastic	0	0	41.52	41.52
HDPE Plastic	1.20	0	–	1.20
Aluminum Cans	0	0	93.42	93.42
Ferrous Cans	42.63	0	–	42.63
Appliances/White Goods	5.40	0	–	5.40
Motor Oil	17.56	2.00	–	19.56
Subtotal MSW Recycled§	**1,506.53**	**339.87**	**519.00**	**2,365.40**
Leaves and Brush	1,429.25	77.58	–	1,506.83
Christmas Trees	44.87	0	–	44.87
Subtotal MSW Composted**	**1,474.12**	**77.58**	–	**1,551.70**
Total MSW Recovered	**2,980.65**	**417.45**	**519.00**	**3,917.10**
Total C&D Recovered††	–	–	**593.00**	**NA**
Total Materials Recycled	**1,512.53**	**339.87**	**NA**	**NA**
Total Materials Composted	**1,474.12**	**77.58**	**NA**	**NA**
Total Materials Recovered	**2,980.65**	**417.45**	**1,112.00**	**4,510.10**

* Includes recyclables collected at curbside from 50 small businesses and recyclables delivered to the drop-off site from 35 small businesses. This represents a small portion of recyclables collected at curbside and at the drop-off site.

† The glass, plastic, and aluminum tonnages included in this category are collected as a result of the bottle bill.

‡ This includes 240 tons of newspaper collected by the Boy Scouts and the Lions Club.

§ Of the 2,365 tons recycled, 1,338 tons were recycled by West Linn Disposal, 51 tons were collected at the West Linn Recycling Depot, 519 tons were collected as bottle bill tonnages, 240 tons were collected by civic groups, and 217 tons were self-hauled to end users by commercial businesses.

**The former recycling coordinator estimates that commercial/institutional waste is 5 percent of total MSW composted.

†† Ed Druback estimates that 30 percent or 593 tons of the C&D generated is recovered. Specific breakdowns of materials are not available.

Publicity and Education

Residential

The State's Recycling Opportunity Act requires that municipalities send out notices of their recycling programs every 6 months. The former Recycling Coordinator, Ed Druback, believes that the success of West Linn's recycling program is due to more aggressive programs than the State requires.

Promotional activities have included direct mail fliers, utility bill inserts, City newsletter features, stickers placed on garbage lids, yard signs, buttons, handbooks distributed through Welcome Wagon (an organization sponsored by local businesses to orient newcomers to various businesses and their services), and an exhibit booth at the City fair. The program has a commercial on the local cable television channel, and program staff have given presentations to all kindergarten through fifth grade classes.

Citizen input has also contributed significantly to the success of West Linn's materials recovery program. The original Solid Waste Task Force polled the residents on the type of materials recovery program they wanted, and shaped the programs accordingly. The City recognizes individuals and organizations that support recycling through a Certificate of Appreciation awards program.

Commercial

The City directs extensive publicity encouraging recycling at businesses and community groups, much of it through "The Most Livable City Program," which began in June 1991. At the request of a business or community group, a City staff person visits the organization to perform a waste audit. Kit Seeborg, the Program Director, designs a program to reduce, reuse, and recycle a large portion of the organization's waste stream based on the waste audit findings. The City of West Linn encourages these businesses and community groups to meet waste reduction "standards," which include implementing recycling, procuring recycled products, and promoting waste reduction to clientele. If the organization meets these standards developed by the City staff, it is labeled a "Model Business" or "Model Community Group." The Models are mentioned in advertisements paid for by the City of West Linn, and may also refer to themselves as "Models" in their own advertising. So far, 2 commercial buildings and 11 businesses have been participating in the program, which, according to Kit Seeborg, will be expanding a great deal in the future. This is a voluntary program sponsored by the City and funded by a "1% for Recycling" grant from Metro.

Economics

Costs Cover: The capital and operating and maintenance costs given below cover (1) the curbside and drop-off collection of 1,338 tons of recyclables from households and businesses, (2) the collection and processing of 51 tons of recyclable material and 1,552 tons of yard waste at the municipal Recycling Depot. Curbside collection costs are incurred by West Linn Disposal, and drop-off costs are incurred by the City.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
16-cubic-yard, 10-bin Recycling Truck	$14,000	Recycling	1985
3-cubic-yard Compactor†	10,000	Recycling	1990
20-cubic-yard Packer Truck @ 20% of use	20,000	Recycling	1990
5,300 14-gallon Collection Containers‡	15,794	Recycling	1990
Kann Curbsorter with a 3-cubic-yard Compactor§	70,000	Recycling	1991

*West Linn Disposal purchased and owns the trucks.

†Donated by the Council for Solid Waste Solutions to West Linn Disposal.

‡Paid for from a grant from Metro.

§The Council for Solid Waste Solutions is leasing this truck with the compactor to West Linn Disposal for $1 per year as long as the company continues to collect and recycle plastic.

Capital Costs: Processing

Item	Cost	Use	Year Incurred
Front-end Loader @ 20% of use	$40,000	Recycling	1985
Composting Equipment	10,000	Composting	1985
Land Improvements	22,000	Composting	1985
Tub Grinder/Power Unit	33,000	Composting	1989
2 Drop Boxes* @ 3,250 each	6,500	Recycling	1990
Drop Box†	Donated	Recycling	1990
Sorting Conveyor‡	2,000	Recycling	1990

Note: Since the front-end loader is only used for recycling on Saturdays, the recycling program only paid 20 percent of its total cost of $40,000. The Public Works Department paid the remaining 80 percent. The recycling program also receives in-kind labor from other departments, and occasionally has inmates from correctional facilities work several hours at the drop-off center.

*Paid for through a grant from Metro

†Donated by the Environmental Learning Center

‡Donated by Metro as long as it is used for recycling purposes

Annual and Per Ton Operating and Maintenance Costs (1990)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**NA**	**1,389***	**NA**
Curbside Collection and Processing†	$0	1,338	$0
Drop-off Collection and Processing‡	NA	51	NA
Administration/Education§	45,000	1,389	32
Composting Subtotal	**NA**	**1,552**	**NA**
Curbside Collection**	$0	0	$0
Drop-off Collection and Processing	NA	1,552	NA
Administration/Education§	15,000	1,552	10
Recycling & Composting Total	**$109,464**	**2,941**	**$57**
Curbside Collection and Processing	$0	1,338	$0
Drop-off Collection and Processing‡	49,464	1,603	31
Administration/Education	60,000	2,941	20

*This tonnage includes the 1,338 tons of residential and commercial/institutional tonnages collected at curbside and 51 tons collected at the drop-off site, but excludes the 240 tons of newspaper collected by civic groups.

†It cost West Linn Disposal, the City's private hauler, $153,109 in 1990 to collect 1,388 tons of recyclables. This is equivalent to $114 per ton. Of this, $114,348 was spent on labor.

‡In1990, $47,464 was budgeted for the collection and processing of 1,552 tons of compostable materials and 51 tons of recyclables collected at the municipal recycling depot. The cost for collection processing of recyclable materials is included in composting costs as no breakdown was available. An additional $2,000 from grant monies was spent on recycling in the last 3 months of 1990. This cost is included under recycling and composting total.

§In 1990, $60,764 was budgeted for an estimated 75 percent of the recycling coordinator's time, which was spent on recycling administration, education and publicity and 25 percent on composting.

**Although on-call collection of leaves and brush is available, Ed Druback and West Linn Disposal say that the service is very rarely used because it is much more expensive than self-hauling these materials to the drop-off center.

Materials Revenues: West Linn Disposal (the City's private hauler) received $22,500 in materials revenues from October 1990 to September 1991. In 1989 the City received $16,000 from sales of composted materials, and West Linn Disposal earned $21,700 from sales of recyclable materials. In 1987 the City earned $10,000 from sales of composted materials.

Source of Funding: Funding for the City comes from several sources: income from sales of compost; franchise fee paid by the solid waste hauler ($6,000); surcharge on multiple-can customers of the solid waste hauler; and general funds. General funds supplied 8 percent of the total recycling budget in fiscal year 1987 and 18 percent in 1988 but none in 1989, 1990, and 1991.

Funding for West Linn Disposal's recycling program comes from revenues received for refuse collection in West Linn and in four other jurisdictions that also have variable can rates.

Full-time Employees: 3 employees of West Linn Disposal for the curbside program

Part-time Employees: 3 (2 employees at the drop-off center on Saturdays and 1 employee at the compost site during the week)

Future Solid Waste Management Plans

The State has mandated a solid waste management hierarchy of reduce, reuse, recycle, recover, and, as a last resort, landfill. Oregon has several laws that encourage recycling, including bottle bill legislation, a requirement that local jurisdictions provide the "opportunity to recycle" to all residents, and a law requiring that metropolitan Portland develop a regional plan to achieve the maximum extent of solid waste reduction that is economically feasible.

Gladstone and Oregon City, Oregon are planning to join the City of West Linn in a joint venture. In the future these three cities will have one contract with West Linn Disposal for curbside collection, reducing costs for all of them. They will also use the same promotional materials. In October 1991, the City of West Linn laid off Ed Druback, who had served as the City's Recycling Coordinator for 6 years. According to Druback, the City terminated the position because there was no need for a Recycling Coordinator.

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References

Solid Waste & Recycling in West Linn, Oregon, City of West Linn, Oregon, March 1989.

Ed Druback, Former Recycling Coordinator for West Linn, West Linn, Oregon, personal communication, 1990 through 1991.

West Palm Beach, Florida

Demographics

Jurisdiction:	City of West Palm Beach
Population:	62,530 in 1990
Area:	44 square miles
Total Households:	24,442 (18,306 single- through three-family residences and 6,136 households in buildings of four or more units)
Total Businesses and Institutions:	2,778 (2,732 businesses and 46 institutions)
Brief Description:	The City of West Palm Beach is a middle-income residential community, located west of the oceanside resort Palm Beach. It contains a large retirement population and numerous restaurants, hotels, and shopping malls. Although West Palm Beach is the largest city in Palm Beach County, its population has increased only 8 percent since 1980 compared to a 50 percent increase countywide. The County's 1990 population was 863,518.

Solid Waste Generation and Recovery

Annual Tonnages (April 1990 to March 1991)

	Residential	Commercial/ Institutional	Total MSW	Construction & Demolition	Total Waste
Recovered	**15,244**	**174**	**15,418**	**0**	**15,418**
Recycled	2,810	174	2,984	0	2,984
Composted	12,434	0	12,434	0	12,434
Disposed*	**54,470**	**50,830**	**105,300**	**11,966**	**117,266**
Incinerated	21,573	21,857	43,430	0	43,430
Landfilled	32,897	28,973	61,870	11,966	73,836
Generated	**69,714**	**51,004**	**120,718**	**11,966**	**132,684**

Percent by Weight Recovered

Recovered	**22%**	†	**13%**	**0%**	**12%**
Recycled	4%	†	2%	0%	2%
Composted	18%	0%	10%	0%	9%

Notes: Waste generated includes bulky items such as furniture and tires.

Numbers may not add up to total due to rounding.

Tonnage recovered by private buy-back centers and scrap yards is not included.

*Prior to October 1990, all waste generated in the City was landfilled. Bulky items are currently landfilled, but residential and commercial waste is now incinerated. The SWA estimated 43 percent of MSW waste disposed from April 1990 through March 1991 was incinerated. Residential waste landfilled also includes 4,299 tons of refuse-contaminated yard waste collected and disposed.

†Less than 1%.

Incinerator/Landfill Tipping Fee:

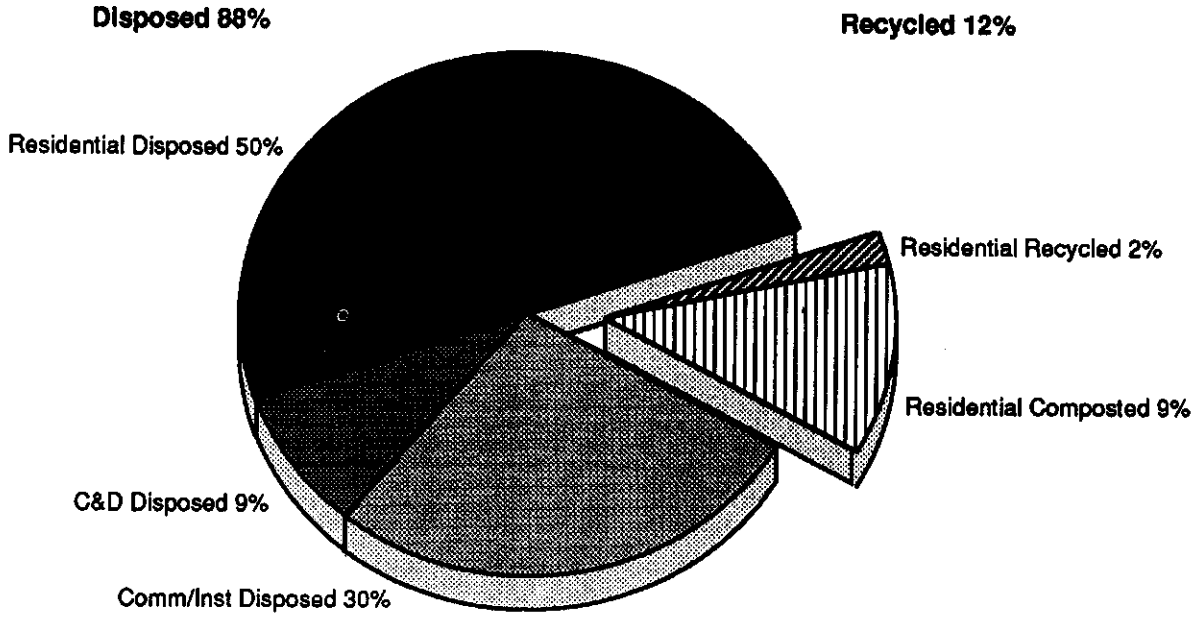
$26.50 in 1988, $47.00 in 1989, $83.50 in 1990, $88.50 in 1991. (Landfill and incinerator tipping fees are identical.)

Refuse Collection and Disposal:

The City of West Palm Beach collects all refuse from the residential, commercial, and institutional sectors. Residential refuse is collected two times per week. In 1990, the SWA estimated that each household generates 1.64 tons of refuse per year. Based on this waste generation value, the SWA charged a flat rate of $137 per household per year (the product of 1.64 times the tipping fee, $83.50). In 1990 the cost of refuse disposal, including the assessed cost charged to residents, totalled $102 per ton. Waste Management Inc., under contract with the City, collects all construction and demolition (C&D) debris. Until October 1990, waste was disposed at the Dyer Boulevard Landfill. Municipal waste is now incinerated at the North County Regional Resource Recovery Facility in West Palm Beach. Bulky items and incinerator ash are disposed at the 1,300-acre landfill site, next to the incinerator.

In 1962 West Palm Beach passed a local ordinance, Chapter 13, which places the responsibility for refuse collection exclusively on the City, and requires private haulers to submit proposals to collect recyclable materials in the City.

Total Waste Recovered and Disposed (Percent by Weight, 1991)



Note: Due to rounding, numbers do not add to percent disposed and percent recovered.

Materials Recovery Overview

Goals and Legislative Requirements:

In 1988 Florida passed the State Solid Waste Management Act, which required counties to establish recycling programs by July 1, 1989, and established a State recycling and composting goal of 30 percent by 1994. According to the Act, construction and demolition debris must be segregated from the solid waste stream and disposed at a separate permitted disposal site. Yard waste, white goods, C&D, and tires cannot account for more than half of the waste recycled. The Solid Waste Management Act prohibits the landfilling of tires, motor oil, lead-acid batteries, and white goods. Yard waste may not be disposed in lined landfills after January 1992.

The Solid Waste Authority (SWA) of Palm Beach County, created in 1974 by the Florida State Legislature, is responsible for managing Palm Beach County's solid waste. In the 1980's, the SWA reviewed landfill sites and waste incinerator options, but because of Florida's ground water concerns, it took 7 years to site a new landfill. Large bond payments and operating costs for the North County incinerator and landfill, and for the interim recycling processing center, caused tipping fees to nearly double from $47 per ton in 1989 to $83.50 per ton in 1990. Because of high disposal costs and legislative requirements, recycling, composting, and source reduction have recently become a focus of the SWA.

In 1989 West Palm Beach initiated a pilot curbside recycling program. The City collected glass, aluminum and ferrous cans, newspaper, and HDPE and PET plastic containers in a modified refuse truck from 200 single-family residences. Shortly afterwards, the City added 288 residences to the collection route, and the SWA of Palm Beach County assumed control of collection. By April 1991, all single-family through three-family households were serviced with weekly collection of recyclables. In 1991 households in single-family residences paid $1.70 per month for this service, and households in buildings with more than three units paid $1.35 per month. This fee, which reflects collections costs only, is charged in residents' utility bills, and is paid to the SWA.

The SWA is expanding its program to include more multi-unit residences and commercial establishments. Thirty restaurants and bars in West Palm Beach are participating in a 1-year pilot recycling program.

In September 1990, West Palm Beach began to haul its yard waste to the County landfill for mulching. (Previously, yard waste had been landfilled.) Leaves, grass clippings, and brush set out at curbside by City residents are collected by the City's Bulk Waste Division, ground, and used for landscaping purposes on the new landfill site.

The City contracts with Waste Management Inc. to collect all construction and demolition (C&D) debris generated in the City. Waste Management Inc. began to recycle a portion of this C&D in April 1991. Construction and demolition debris recycled includes concrete, asphalt, wood waste, and metals.

The SWA finances its incinerator, landfill, and intermediate processing center bond payments through tipping fees and an annual residential waste stream assessment. In 1991 per capita county waste disposed was calculated at 1.64 tons per year, down from 1.86 tons per year in 1990. The 1991 tax bill will reflect this reduction.

In 1991, The National Recycling Coalition awarded the SWA the "Beth Brown Boettner Award" for outstanding government leadership.

Recycling Activities

Residential Curbside Recycling

Start-up Date:	April 1990
Service Provider:	Solid Waste Authority of Palm Beach County
Pick-up Frequency:	Weekly
Same Day as Refuse:	Yes
Mandatory:	No
Households Served:	18,306 single- through three-family residences. In March 1991, 888 four-plex garden apartments were added.
Participation Rate:	79 percent in 1990 (based on average monthly set-out rate multiplied by 1.5)
Materials Collected:	Newspaper, glass, aluminum cans, HDPE and PET plastic food and beverage containers, phone books, and white goods

Set-out Method:	Single-family residents commingle all recyclable materials (with the exception of white goods) in an 18-gallon rectangular bin provided by the City. Newspaper and phone books are placed on one side of the bin. Phone books are set out with recyclables 6 weeks each year. Garden apartment tenants place recyclables in 95-gallon containers adjacent to garbage dumpsters.
Collection Method and Vehicles:	The driver places newspaper and phone books on one side and commingled materials on the other side of a 30-cubic-yard Labrie recycling truck. Materials collected from garden apartments are loaded separately onto flat-bed trucks. All residents can set out white goods on yard waste collection days or arrange with the Department of Public Works for pick-up. City crews collect white goods with lightning loader trucks.
Economic Incentives:	None
Enforcement:	Not applicable
Annual Tonnage:	2,526 tons commingled recyclables from April 1990 through March 1991

The SWA implemented a curbside phone book recycling program in fall 1990 to coincide with the distribution of new telephone books. Inserts placed in the new phone books inform residents of the approaching collection process. During a 6-week period, phone books will be picked up at curbside along with other recycled materials. Residents can also bring their phone books to SWA drop-off sites.

Commercial & Institutional Curbside/Alley Recycling

	Public Collection	**Private Collection**[1]
Legislative Requirements:	None	
Service Provider:	Solid Waste Authority	Waste Management Inc.
Number Served:	30	8
Type Served:	Restaurants and bars	Restaurants, supermarkets, and office buildings
Materials Collected:	Glass, HDPE and PET plastic food and beverage containers, and corrugated cardboard	Corrugated cardboard (initiated January 1991) and high-grade paper (begun April 1991 for office buildings)
Pick-up Frequency:	Varies; most recyclables are collected twice per week.	Weekly
Set-Out and Collection Method:	Businesses segregate glass and plastic in 95-gallon containers supplied by the SWA. Cardboard is set out in 4-cubic-yard containers. The SWA loads the recyclables onto a flat-bed trailer equipped with a lift and a digital scale. Cardboard is collected in a truck compactor.	Businesses store cardboard in 2-, 4-, or 8-cubic-yard dumpsters supplied by Waste Management. Businesses store high-grade paper in a 96-gallon toter also supplied by WMI.

Incentives:	The service was free to participating businesses during the 1-year pilot.	
Tonnages:	160 tons (114 tons of glass and plastic plus 46 tons of cardboard from September 1990 through January 1991)	14 tons collected from January through March 1991

In August 1990, the SWA initiated a 1-year restaurant/bar recycling pilot program. Most of the participating bars and restaurants are located in West Palm Beach. At the conclusion of the study, the SWA will provide each participant with a cost analysis showing how recycling can enable businesses to reduce disposal costs through such measures as choosing smaller dumpsters or decreasing disposal frequency. The SWA will continue recycling pick-up service for a fee, which will vary based on the type and size of container used.

In 1987 the SWA began its "Cash for Cans" aluminum recycling program in West Palm Beach schools. The igloo collection program is offered countywide; two-thirds of West Palm Beach's public schools participate. The SWA covers all expenses, and schools retain revenues. The schools notify the SWA when containers are full. Between April 1990 and March 1991, 4 tons of aluminum cans were collected through the program.

In April 1991, West Palm Beach implemented an office paper recycling program in all City offices. Each employee receives a desk container for high-grade and computer paper. Janitors bring the paper to centrally located bins, and City crews bring the materials directly to a local vendor.

Drop-off Centers

Number and Type:	8 (The SWA operates three drop-off centers and one igloo; Palm Beach Metals, Reynolds Aluminum, United Metals and Iron, and Liberty Scrap Metal each operate one buy-back center.)
Public or Private:	Public and private
Sectors Served:	Residential and commercial/institutional. Most materials brought to the SWA drop-off centers are from the residential sector.
Materials Accepted:	Newspaper, corrugated cardboard, high-grade paper, telephone books, aluminum cans, glass, and HDPE and PET plastics are collected at the three Solid Waste Authority sites in the city. The SWA collects commingled glass, aluminum cans, and plastic at an igloo located at a recreation area. Aluminum cans and ferrous metals are collected at the four private buy-back centers. In addition to these materials, Palm Beach Metals accepts newspaper, corrugated cardboard, high-grade paper, glass, and HDPE and PET plastics. Motor oil is accepted at the North County incinerator/landfill and at several service stations in the City. The SWA Hazardous Waste Facility accepts lead-acid batteries.
Annual Tonnage:	Four tons were collected at the four SWA drop-off sites. West Palm Beach does not track private sector tonnages.

In December 1990, the SWA set up recycling igloos at parks and recreation centers throughout the County, into which park patrons deposit commingled glass bottles, aluminum cans, and plastic beverage containers. One igloo, located at the Curry Boat Ramp in West Palm Beach, is emptied as needed, usually on a monthly basis; tonnages recovered are low.

Processing and Marketing of Recyclables

In 1989 Goodwill Industries processed the first recyclables collected through County curbside programs at the old transfer station in West Palm Beach. Commingled materials were hand-sorted. However, this facility proved too small to handle the increasing volumes collected. In 1990 the SWA built an open, unwalled 15,000-square-foot interim processing facility at the Dyer Boulevard Landfill in West Palm Beach. While the SWA did not charge a tipping fee, haulers were charged $83.50 per ton for highly contaminated loads, which comprised about 2 percent of the total.

The interim facility, which served the entire County, was designed to process 50 tons per day; it processed approximately 150 tons per day. The facility operated two 8-hour shifts a day, 312 days a year. Eight SWA employees and up to 25 day-laborers hand-separated newspaper and commingled materials on the first shift, and newspaper only on the second. Glass was color-sorted and broken rather than crushed to prevent injury to employees from glass chips blowing in the open pavilion. Aluminum was flattened and blown into a trailer for transporting. Plastic was sorted by resin type and baled. Although some newspaper was baled, most was marketed loose. Approximately 7 percent by weight of material accepted at the facility was disposed of as residue.

A new Materials Recovery Facility (SWA/MRF), owned by SWA and operated by Resource Recycling Technologies/Empire Technologies (RRT), opened in April 1991. The new facility cost $6.3 million; their cost was incurred in May 1991. The SWA pays RRT $26 per ton to process all recyclable materials collected through its curbside and drop-off programs throughout the County. The SWA/MRF is highly automated, with 18 employees processing 220 tons per day on one 8-hour shift. The facility was designed to process 540 tons per day in two shifts per day. The SWA delivered 2,526 tons of materials collected from West Palm Beach to the facility in fiscal year 1991. Less than 4 percent by weight of materials entering the SWA/MRF are disposed of as residue, largely because the facility has secured a market for mixed glass cullet broken in the course of processing. The cullet is used as a drainage material, roadbase, or concrete additive.

Many recycled materials are marketed in Florida or elsewhere in the southern United States. Corrugated cardboard is re-manufactured into cardboard containers at Container Corporation in Jacksonville, Florida and at two manufacturing companies in Georgia. Newspaper is sent to Georgia, sold to local brokers, or made into insulation at Suncoast Insulation in Tampa, Florida. High-grade paper is processed into drywall by National Gypsum in Jacksonville, Florida, recycled into toilet paper by Fort Howard in North Carolina, or shipped overseas by local brokers. Until April 1991, Owens Brockway in Florida accepted all colors of glass; currently, however, it accepts only flint. The SWA sells green and brown bottles to a broker in Miami. Aluminum cans are sold to Reynolds Aluminum in Miami. HDPE and PET plastics are sold to Wellman Plastics in Johnsville, South Carolina. Brass and copper are recovered from the white goods; freon is removed and discarded at a hazardous waste site; and the scrap is sold to Miami River Recyclers, along with some scrap metal separated from refuse loads prior to incineration. Motor oil is re-refined and used as a lubricant. Batteries are recycled at the SWA Hazardous Waste Facility.

Composting Activities

Curbside Collection

Start-up Date: September 1990

Service Provider: City of West Palm Beach, Residential Bulk Waste Division

Households Served: 18,306 single- to three-family residences

Materials Collected:	Leaves, grass clippings, brush, wood waste, and Christmas trees
Mandatory:	No
Set-out Method:	An estimated 50 percent is set out loose at curbside; the other 50 percent is set out bagged.
Collection Vehicles and Method:	Up until July 1991, City employees collected yard waste in three 20-cubic-yard compactor trucks using five cranes. Two employees operated each crane truck. (In July 1991, the City switched to one-person-operated cranes.) The Residential Bulk Waste Division collects Christmas trees and brings them to six SWA drop-off sites in the City.
Collection Frequency:	Twice per month, year-round. In July 1991, West Palm Beach began weekly yard waste collection.
Economic Incentives:	None
Annual Tonnage:	An estimated 16,733 tons of yard waste and Christmas trees were collected at curbside from September 1990 to March 1991.

Composting/Mulch Site

City crews bring yard waste and Christmas trees to a 5-acre plot operated by SWA at the North County landfill. Municipalities throughout the County also deliver yard waste to the site. No tipping fee is charged. Yard waste is ground in a tub grinder and used as a mulch for landfill management, including road bed stabilization, side slope erosion control, landfill cover, and "Xeriscape" landscaping (planting of native shrubs and trees requiring minimal moisture). Although yard waste mulch is not available to residents, Christmas tree mulch is available free of charge. In 1990 the mulch operation costs the SWA $20 per ton.

West Palm Beach made an agreement with the neighboring Town of Riviera to have Riviera compost 70 percent of its yard waste for $25 per ton. Although West Palm Beach will receive finished compost free of charge, the City has not determined how the compost will be distributed. The SWA opened its 32-ton-per-day compost facility in October 1991 and contracted International Process Systems to co-compost yard waste and dewatered sewage sludge. The County charges a tipping fee of $37 per ton for clean yard waste. The finished compost from this process is used by the County, or sold to construction sites, parks, and sports facilities. Composting at the Riviera facility costs the City of West Palm Beach $12 less per ton in tipping fees.

Amount and Breakdown of Materials Recovered

Material	Residential (Tons, 1990-91)	Commercial/ Institutional (Tons, 1990-91)	Total (Tons, 1990-91)
Newspaper	2,029	0	2,029
Corrugated Cardboard	0	61	61
Glass	290	112	402
PET and HDPE Plastic	105	1	106
Aluminum Cans*	57	0	57
Appliances/White Goods	274	NA	274
Batteries	2	NA	2
Other†	53	0	53
Subtotal MSW Recycled	**2,810**	**174**	**2,984**
Christmas Trees	30	0	30
Yard Waste‡	12,404	0	12,404
Subtotal MSW Composted	**12,434**	**0**	**12,434**
C&D Recovered§	0	0	0
Total MSW Recovered	**15,244**	**174**	**15,418**

Notes: Figures provided above represent tonnages collected from April 1990 through March 1991.

West Palm Beach collects motor oil, lead-acid batteries, and white goods; however, tonnages are only tracked on a County level. Tonnages for white goods and batteries listed above are based on per capita figures.

The SWA requires that 90 percent of the ferrous cans processed at the incinerator, be retrieved for recovery. These tonnages are not included.

Tonnages from private buy-back centers and scrap yards are not available.

Although 67 tons of tires were collected and burned, this tonnage is not considered recycled and is excluded.

Between April 1990 and March 1991, the SWA collected 2,526 tons of recyclables from the residential sector through its curbside program. Four tons were recovered from the residential sector through the Cash for Cans program and another 4 tons were recovered through the SWA drop-off sites.

*Includes aluminum can tonnages recovered from the "Cash for Cans" program.

†Includes materials, such as ferrous cans, that are not designated for recycling, but are commingled with designated materials in collection containers, and recycled.

‡Although West Palm Beach collected 16,703 tons of yard waste for mulching from April 1990 through March 1991, 4,299 tons were contaminated with bulky items or refuse and landfilled. The City applies a conversion factor of 600 lbs. per per cy to convert yard waste from volume to weight.

§C&D was not recycled in West Palm Beach prior to April 1991.

Source Reduction Initiatives

The SWA promotes solid waste source reduction concepts through school curricula and "environmental shopping" brochures. It distributes these brochures, including an "Environmental Shoppers List" of products that use recycled materials in their packaging, in free reusable canvas shopping bags. Residents can pick up the bags at the SWA's main office.

Publicity and Education

The SWA is responsible for recycling education and publicity programs in West Palm Beach. It uses direct mail, newspaper ads, videos, workshops, and meetings to promote its programs. Its "Multi-Family Recycling Guide" informs apartment building managers how to implement recycling in their buildings. In addition, the SWA maintains a recycling hotline and publishes a quarterly recycling newsletter.

The SWA leads processing center tours, gives school group presentations, provides teachers with recycling curricula, including a "Recycling Study Guide," and offers a selection of eight recycling videos. Revenues generated from the "Cash for Cans" aluminum can recycling program are used to fund field trips and classroom science and arts projects.

The SWA has published an "Office Paper Recycling Guide" to encourage commercial recycling; however, businesses must locate their own brokers. To publicize the pilot restaurant and bar program and increase recovery rates, the SWA and Southeast Glass cosponsor a promotional program. Each month they award cruise tickets to the business with the highest recovery rate increase over the previous month.

Economics

Costs Cover:

Operating and maintenance (O&M) costs listed below cover the City's costs to collect and process 2,526 tons of residential recyclables collected at curbside and the City's costs to collect 16,703 tons of yard waste (of which 4,299 were landfilled) from April 1990 to March 1991. City costs for the collection of 30 tons of Christmas trees are not available.

West Palm Beach charges single-family residences $1.70 per month and multi-family residences $1.35 for curbside collection of recyclables. This fee is paid to the SWA and used to fund the SWA's collection expenses. West Palm Beach pays for the yard waste collection, and some recycling and composting administrative O&M costs.

The County pays for curbside recycling vehicles, processing of recyclables and yard waste, publicity and education, and most administrative costs. The County also covers all expenses to recover materials from the pilot restaurant and bar program (160 tons), the City's "Cash for Cans" program (4 tons) and from the SWA's West Palm Beach drop-off sites (4 tons). Costs for these programs are not included.

Capital Costs: Collection

Item	Cost	Use	Year Incurred
18,306 18-gallon Bins @ $3.99*	$73,040	Recycling	1990
147 44-gallon Containers @ $35	5,145	Recycling	1990
74 95-gallon Containers @ $65†	4,810	Recycling	1990
26 4-cubic-yard Containers @ $380 †	9,880	Recycling	1990
4 Labrie Trucks @ $83,965†	335,860	Recycling	1990
Flat-Bed Truck (40% of time)†	29,410	Recycling	1989
4-cubic-yard GMC Truck Compactor†	80,054	Recycling	1990
15 20-cubic-yard Compactor Trucks @ approx. $32,000	480,000	Mulching	1978-89
5 Cranes	NA	Mulching	1975
10 20-cubic-yard Lightning Loader Trucks with self-contained Crane @ $47,356	473,560	Mulching	1991

Notes : West Palm Beach's capital equipment costs are paid off in full. Each year an average of 20 percent of a vehicle's value is set aside, based on its depreciation value. At the estimated lifetime of the vehicle, a new vehicle is purchased.

*Residential bins were purchased by West Palm Beach through grant funding from the SWA.

†Purchased and owned by the SWA. All other equipment is owned by the City of West Palm Beach. SWA equipment was financed through grant monies and has been paid off; it was amortized on a 5-year straight line depreciation basis.

County Capital Costs: Processing

Item	Cost	Use	Year Incurred
2 Bobcats	$29,292	Recycling	1987 & 1990
Bobcat Grapple Attachment	1,771	Recycling	1989
Toyota Forklift	16,438	Recycling	1989
Bobcat Sweeper Attachment	1,593	Recycling	1989
Ramp Master	8,294	Recycling	1989
2 Vertical Balers @ $6,800	13,600	Recycling	1989
2 Pallet Jacks @ $395	790	Recycling	1989
4 Glass Breakers @ $2,985	11,940	Recycling	1989
Interim IPC Buildings	100,353	Recycling	1989
Thirman Scale	3,800	Recycling	1989
5 Conveyor Belts	99,297	Recycling	1989 & 1990
2 Aluminum Can Crushers	14,948	Recycling	1989 & 1990
Horizontal Baler	71,910	Recycling	1990
1 Large Glass Breaker	6,775	Recycling	1991
Front-end Loader with attached Hydraulic Top-clamp Rake	250,000	Mulching	1988
R.S.I. Tub Grinder	175,000	Mulching	1990
Fuel Harvester Tub Grinder	135,000	Mulching	1990

Note: All equipment, purchased and owned by the SWA, was financed through grant monies and has been paid off; equipment was amortized on a 5-year straight line depreciation basis.

Annual and Per Ton Operating and Maintenance Costs (April 1990 to March 1991)

	Cost	Tons Covered	Per Ton Cost
Recycling Subtotal	**$408,774**	**2,526**	**$162**
Collection*	$374,641	2,526	$148
Curbside Collection	374,641	2,526	148
Drop-Off Collection	0	4	0
Processing‡	0	2,526	0
Administration	34,133	2,526	14
Education/Publicity**	0		0
Composting Subtotal	**$693,091**	**16,703**	**$41**
Collection†	$623,091	16,703	$37
Processing‡	0	12,404	0
Administration	70,000	16,703	4
Education/Publicity**	0	16,703	0
Recycling & Composting Total	**$1,101,865**	**19,229**	**$57**
Collection	$997,732	19,229	$52
Processing	0	19,229	0
Administration	104,133	19,229	5
Education/Publicity**	0	19,229	0

Notes: Costs listed above represent the City's operating and maintenance costs only. The City of West Palm Beach does not incur any costs for processing or composting. Numbers may not add to totals due to rounding.

*Collection costs represent $373,442 collected from 18,306 single-family residences over 12 months at a cost of $1.70 per household per month, plus $1,199 collected from 888 garden apartments over the last month in this collection period at $1.35 per unit per month, totalling $374,641. The per household fee charged by the SWA represents the actual cost of collecting the recyclable materials. Drop-off collection programs are County funded and costs are not included in the above table.

†Costs for Christmas tree collection are not available. Of the 16,703 tons of yard waste collected, 4,299 tons were contaminated and disposed. Thus, the City actually spent $50 per ton of yard waste recovered.

‡Processing recyclables costs the SWA $26 per ton; composting costs the SWA $20 per ton.

**The County SWA pays for publicity/education programs. From April 1990 through March 1991, the SWA spent $46,898 ($0.75 per resident) on these programs.

Materials Revenues: The SWA retains all revenues generated from the sale of recycled materials. In fiscal year 1990, revenues from the sale of all County-collected commingled materials totalled $1,267,714, and white goods and other scrap metal revenues totalled $190,470.

Source of Funding: West Palm Beach funds its program through City taxes and State grants. (In 1991 the City received $155,000 in State grants.) The SWA covers expenses through recycling revenues and incinerator tipping fees. The collection program is funded through the $1.70 per household fee.

Full-time Employees: 37 (30 City employees collecting yard waste, 4 County employees collecting residential recycled materials, and 3 County employees processing yard waste)

Part-time Employees: 3 (1 full-time City employee working part-time on administration of recycling and yard waste collection programs and 2 full-time County employees spending approximately 40 percent of their time in West Palm Beach, collecting recyclables from the commercial sector)

Future Solid Waste Management Plans

By September 1991, the SWA plans to bring on board 3,000 additional households in multi-unit residences. Later that fall, it will add corrugated cardboard to the materials collected through its curbside program. In July 1991, the SWA contracted with a consulting firm to set up multi-unit collection programs. Some apartment buildings will receive 18-gallon recycling bins; others will place commingled glass, aluminum, and plastics in 95-gallon containers beside the garbage dumpsters. Newspaper will be set out in separate 95-gallon containers. The City has purchased additional containers for the service.

In fall 1991, the SWA will pay for the installment and 1-year operation of a recycling system, to be located in an apartment building in West Palm Beach.2 The system, developed by Hi-Rise Recycling Systems Inc., is designed for apartment tenants who use refuse chutes. Residents will push a button corresponding to the material to be disposed (newspaper, aluminum and ferrous cans, three colors of glass, or refuse) and send the particular material down the chute. A wheel at the bottom of the chute, housing the designated bins, will rotate to the item selected. The system costs approximately $20,000, including installation and electronics costs of $8,000, and hook-up charges of $625 for each floor.

The SWA plans to build a County C&D recycling plant at its existing bulky waste landfill. Waste Management has received a permit for a yard waste composting facility and is seeking a permit for a C&D landfill and recycling facility. In September 1991, when the pilot restaurant and bar program ends, the SWA plans to offer the service to businesses for a fee based on the type, size, and frequency of of service.

Despite extensive plans to further develop the SWA's recycling and composting operations, budget constraints may limit program expansion. In 1991 the SWA was forced to cut its general budget by $10 million. To help cover costs, it will keep revenues generated from the "Cash for Cans" program, require that all pilot projects be self-funded, and place more of the responsibility for refuse collection costs on cities. West Palm Beach must trim its general budget by $1 million in 1991. As a consequence, no funding will be made available for a proposed recycling coordinator position.

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Endnotes

[1]Information on WMI's collection services was obtained from Doug McCoy. (General Manager, Waste Management Inc., West Palm Beach, Florida). Personal communication, July 1991.

[2]Shantzis, Mark (President, Hi-Rise Recycling Systems Inc., West Palm Beach, Florida). Personal communication, July 1991.

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