DOUGLAS/JEFFERSON COUNTIES REGIONAL SOLID WASTE MANAGEMENT PLAN

FINAL REPORT

Submitted to

DOUGLAS/JEFFERSON COUNTIES
SOLID WASTE PLANNING COMMITTEE
c/o Douglas County
Department of Public Works

By

FRANKLIN ASSOCIATES, LTD.
Prairie Village, Kansas

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INTRODUCTION

The Douglas/Jefferson County region is located in northeastern Kansas, just one county west of the Missouri line and two counties south of Nebraska. The region shares its borders with seven Kansas counties; the eighth (Miami county) just touches the southeastern corner of Douglas County. Osage, Shawnee and Jackson Counties are immediately west of the region; Atchison County is to the north; Leavenworth and Johnson Counties are on the east; and Franklin County is on the south.

Douglas County, which is separated from Jefferson County to the north by the Kansas River, has a total area of approximately 474 square miles, or 303,360 acres, including 4 cities and 9 townships. Farming is a major element of the Douglas County economy, with 47 percent of the acreage being cultivated. The principal farm activities include corn, soybeans, wheat, and livestock production. A variety of industries, the University of Kansas, Haskell Indian Nation University, Baker University, and recreation (e.g. the Clinton reservoir) are also important parts of the Douglas County economy.

Jefferson County contains approximately 552 square miles, and has 8 cities and 12 townships. Diversified farming is the major element of the Jefferson County economy. Recreation, associated primarily with the Perry reservoir, is also a major economic sector.

PHYSICAL CHARACTERISTICS OF THE REGION

Douglas County Features

The Kansas Geological Survey reported in 1941 that Douglas County lies partly on sedimentary rock of the Pennsylvanian age. The Kansas River valley and its tributaries are basically alluvial material. The southern part of the county contains massive formations of limestone. The county is underlain with a rock shelf, with the exception of the erosion due to the Kansas River and its tributaries. This rock shelf has a thin layer of soil cover. The only parts of the county that contain deep soil are the Kansas and Wakarusa River valleys.

Jefferson County Features

As in Douglas County, rocks of late Pennsylvanian age constitute the bedrock in Jefferson County. [1] This bedrock crops out in sharp ridges and along bluffs and steep valley walls, especially in the western part of the county bordering the Delaware River valley and in the southern part of the county bordering the Kansas River valley. The bedrock is overlain with sand and gravel, with varying thicknesses of soil. The deep soils are found in the Kansas and Delaware River valleys.

A prominent feature of Jefferson County's landscape is the Perry reservoir, which is 12 to 13 miles in length and is used for flood control and recreation. The lake was created by a dam across the Delaware River about 3 miles north of the southern edge of the county.

Transportation

Highways. Federal and State paved highways provide rapid transportation through the region, connecting the major cities, and connecting the region with major population centers nearby. Interstate 70 is an east-west turnpike that connects Lawrence to Topeka and Kansas City. U.S. 59 runs north and south through the region, just east of the center of both counties, connecting with Ottawa to the south and Atchison to the north. U.S. highways 40 and 24 provide alternate routes to the turnpike. U.S. 56 is an east-west highway through Baldwin City that crosses the southern part of Douglas County.

Major paved state highways in the region include K-10, which is a four-lane highway from Lawrence to Kansas City and K-4, which runs northeast through Jefferson County, from Topeka to Nortonville.

Load Limits on Rural Roads. The rural areas of both counties have a network of county and local roads, some of which are paved, but most are low type bituminous or gravel roads. Many of the local roads of both counties have bridges or culverts with load limits that restrict the type of trucks that can be used for solid waste collection and transportation.

Douglas County has 57 posted bridges and culverts and Jefferson County has 137. Most of the load limits are for 15 tons or more. However, each county has 14 bridges or culverts throughout the rural areas with limits of 5 tons or less. The number of posted bridges, and the load limits, in each county are shown in Table 1-1.

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[1] Winslow, John D. "Geohydrology of Jefferson County." State Geological Survey. The University of Kansas. 1972.

Table 1-1

NUMBER OF BRIDGES AND CULVERTS
IN DOUGLAS AND JEFFERSON COUNTIES
WITH LOAD LIMITS

Limits	Douglas County		Jefferson Co.
(Tons)	Bridges	Culverts	Bridges
3	2	7	5
4		1	4
5	3	1	5
6	1	2	6
7		2	3
8		1	6
9		4	9
10	10		8
12	1		5
13		1	2
15	21		35
18			1
20			48
Totals	**38**	**19**	**137**

Source: Douglas County Public Works Department.
Jefferson County Engineer.

POPULATION

The Douglas/Jefferson County region as a whole is growing rapidly. According to official U. S. Census data, the region has experienced a 17.9 percent increase in population in the decade of the 1980s, growing from 82,847 in 1980 to 97,703 in 1990. This growth rate is about 250 percent higher than the State of Kansas as a whole, and 75 percent higher than the rate for the entire United States.

The two-county study region consists of 12 incorporated cities and 21 rural unincorporated townships. Well over 90 percent of the land area is in the unincorporated townships, and the townships contain about 20 percent of the region's population. Over 60 percent of Jefferson County's population lives in the unincorporated rural areas.

Populations of the region's cities and townships are shown in Table 1-2. Two-thirds of the region's population lives in the largest city, Lawrence, which had a 1990 population of 65,608. The second and third largest cities in the region (Eudora and Baldwin City) have populations of about 3,000 each.

Table 1-2

POPULATION OF DOUGLAS AND JEFFERSON COUNTIES

	1980	1990	Growth (%)	
Douglas County	Population	Population	10 years	Annual
Baldwin City	2,829	2,961	4.67	0.46
Eudora	2,834	3,006	6.07	0.59
Lawrence	52,738	65,608	24.40	2.21
Lecompton	576	619	7.47	0.72
Unincorporated	8,663	9,604	10.86	1.04
Total Douglas	**67,640**	**81,798**	**20.93**	**1.92**
Jefferson County				
McLouth	700	719	2.71	0.27
Meriden	707	622	-12.02	-1.27
Nortonville	692	643	-7.08	-0.73
Oskaloosa	1,092	1,074	-1.65	-0.17
Ozawkie		403	NA	NA
Perry	907	881	-2.87	-0.29
Valley Falls	1,189	1,253	5.38	0.53
Winchester	570	613	7.54	0.73
Unincorporated	9,350	9,697	3.71	0.37
Total Jefferson	**15,207**	**15,905**	**4.59**	**0.45**
Total two counties	**82,847**	**97,703**	**17.93**	**1.66**
Kansas	**2,364,236**	**2,485,600**	**5.13**	**0.50**
United States	**226,549,010**	**249,632,692**	**10.19**	**0.98**

Source: U.S. Bureau of the Census.

The 1980s population growth rates for each of the municipalities in the region are also shown in Table 1-2. Lawrence leads with a growth of almost 25 percent for the 10-year period, while some of the smaller cities in Jefferson county and some rural townships lost population in the same period. The average annual growth rate for the region was 1.66 percent for the 10-year period, with most of the growth occuring in Douglas County and more specifically in the City of Lawrence, which experienced a 2.2 percent average annual growth rate.

HOUSING

A summary of the region's households, according to the 1990 census, is shown in Table 1-3. About 10 percent of the population lives in group

Table 1-3

HOUSEHOLDS OF DOUGLAS AND JEFFERSON COUNTIES
1990

	Population			Housing Units			
Douglas County	Total	In hhs	Grp Qtrs	Total	Occupied	Vac rate	Per/hh
Baldwin City	2,961	2,292	669	961	902	6.1	2.54
Eudora	3,006	2,905	101	1,136	1,083	4.7	2.68
Lawrence	65,608	57,690	7,918	25,893	24,513	5.3	2.35
Lecompton	619	619	0	221	212	4.1	2.92
Unincorporated	9,604	9,462	142	3,571	3,428	4.0	2.76
Total Douglas	**81,798**	**72,968**	**8,830**	**31,782**	**30,138**	**5.2**	**2.42**
Jefferson County							
McLouth	719	719	0	297	280	5.7	2.57
Meriden	622	622	0	248	238	4.0	2.61
Nortonville	643	594	49	263	239	9.1	2.49
Oskaloosa	1,074	988	86	417	388	7.0	2.55
Ozawkie	403	403	0	176	168	4.5	2.40
Perry	881	881	0	376	354	5.9	2.49
Valley Falls	1,253	1,052	201	484	436	9.9	2.41
Winchester	613	529	84	211	198	6.2	2.67
Unincorporated	9,697	9,696	1	3,842	3,477	9.5	2.79
Total Jefferson	**15,905**	**15,484**	**421**	**6,314**	**5,778**	**8.5**	**2.68**
Total two counties	**97,703**	**88,452**	**9,251**	**38,096**	**35,916**	**5.7**	**2.46**

Source: U.S. Bureau of the Census.

quarters and 90 percent lives in households. Group quarters in the region include dormitories, nursing homes, and other group housing where there are 10 or more unrelated persons living in a unit.

In 1990, there were 31,782 housing units in Douglas County and 6,314 in Jefferson County, for a total of 38,096 in the region. The vacancy rate was 5.7 percent, leaving 35,916 occupied housing units, with an average of 2.46 persons per occupied unit. The average household sizes in Douglas County is 2.42, compared to 2.68 in Jefferson County.

A large majority of the region's residents live in single family households, as shown in Tables 1-4 and 1-5. About 78 percent of the households of Douglas County and 99 percent of households in Jefferson County are in buildings with 1 to 4 units per structure. Seven percent of Douglas County households and 16 percent of Jefferson County households live in mobile homes.

Table 1-4

HOUSING CHARACTERISTICS OF DOUGLAS COUNTY 1990
(Includes vacant housing)

	1-4 Units/ Structure	>4 Units/ Structure	Mobile Homes	Totals	Percent SF (1)	Percent Multi-fam
Cities						
Eudora	911	41	184	1,136	96.4	3.6
Lawrence	17,386	6,963	1,544	25,893	73.1	26.9
Lecompton	144	0	77	221	100.0	0.0
Baldwin City	784	92	85	961	90.4	9.6
City totals	19,225	7,096	1,890	28,211	74.8	25.2
Townships						
Clinton	125	0	11	136	100.0	0.0
Eudora (2)	330	0	26	356	100.0	0.0
Grant	157	0	13	170	100.0	0.0
Kanwaka	353	0	34	387	100.0	0.0
Lecompton (2)	297	0	40	337	100.0	0.0
County totals	**22,476**	**7,096**	**2,210**	**31,782**	**77.7**	**22.3**

(1) Housing with less than 4 units/structure. Includes mobile homes.
(2) Excludes the city contained within the township.

Source: U.S. Bureau of the Census.

This information on housing is useful for solid waste management planning because of the type of collection provided. Haulers normally provide individual curbside trash service to residents living in housing with one to four units per structure. A different type of collection service is used for group quarters and for multi-family housing, where residents place their waste into centralized storage containers.

POPULATION PROJECTIONS

According to Census Bureau estimates, the population of Douglas County is expected to continue to grow through the years of primary interest to this study. The last population projection available was made by the Kansas Division of the Budget in 1992. At that time, it was estimated the population would grow to 88,786 by the year 1995, 95,849 by 2000, and 102,503 by 2015.

The Lawrence/Douglas County Planning Office estimates that in the 20 year projection period Lawrence's population will grow at a higher rate than the balance of the county. Lawrence's share of the county's population is expected to increase from 80.2 percent in 1990 to 81 percent in 2015. Eudora will also benefit from significant population increases, largely due to its location on K-10 Highway. Its share of the population is expected to increase from 3.7 percent in 1990 to 4.5 percent in 2015.

Table 1-5

HOUSING CHARACTERISTICS OF JEFFERSON COUNTY 1990
(Includes vacant housing)

	1-4 Units/ Structure	>4 Units/ Structure	Mobile Homes	Totals	Percent SF (1)	Percent Multi-fam
Cities						
McClouth	244	9	44	297	97.0	3.0
Meriden	200	0	48	248	100.0	0.0
Nortonville	238	0	25	263	100.0	0.0
Oskaloosa	380	0	37	417	100.0	0.0
Ozawkie	172	0	4	176	100.0	0.0
Perry	253	21	102	376	94.4	5.6
Valley Falls	391	40	53	484	91.7	8.3
Winchester	178	0	33	211	100.0	0.0
City totals	2,056	70	346	2,472	97.2	2.8
Townships						
Delaware (2)	259	0	26	285	100.0	0.0
Fairview	372	0	113	485	100.0	0.0
Jefferson No. 10 (2)	191	0	20	211	100.0	0.0
Kaw	408	0	96	504	100.0	0.0
Kentucky (2)	171	0	52	223	100.0	0.0
Norton (2)	99	0	9	108	100.0	0.0
Oskaloosa (2)	243	0	53	296	100.0	0.0
Ozawkie (2)	221	0	79	300	100.0	0.0
Rock Creek (2)	516	9	78	603	98.5	1.5
Rural	178	0	42	220	100.0	0.0
Sarcoxie	297	0	60	357	100.0	0.0
Union (2)	215	0	35	250	100.0	0.0
Township totals	3,170	9	663	3,842	99.8	0.2
County totals	**5,226**	**79**	**1,009**	**6,314**	**98.7**	**1.3**

(1) Housing with less than 4 units/structure. Includes mobile homes.
(2) Excludes the city contained within the township.

Source: U.S. Bureau of the Census.

Jefferson County is projected to grow from 15,905 in 1990 to 16,486 in 1995, 16,746 in 2000, and 17,897 in 2015. The projected populations for the two counties are shown in Table 1-6 and Figures 1-1 and 1-2. The projections show a slower growth for Jefferson county in the next 20 years; however, a new bridge over the Kansas River (Rte K-4) to be completed in the next two years, which will provide direct access to eastern Topeka, may increase Jefferson County's growth appreciably.

EMPLOYMENT

Employment in the region is diversified, with a work force of 37,785 employed in Douglas County and 3,030 employed in Jefferson County in 1992, excluding most self-employed persons (e.g., farmers) and domestic

Table 1-6

POPULATION PROJECTIONS

	Douglas	Jefferson	Total
1980	67,640	15,207	82,847
1985	74,719	15,556	90,275
1990	81,798	15,905	97,703
1995	88,786	16,486	105,272
2000	95,849	16,746	112,595
2005	100,419	17,220	117,639
2010	102,015	17,622	119,637
2015	102,503	17,897	120,400
2020	103,243	18,012	121,255

Source: Kansas Population Projections 1995-2030, Kansas Division of the Budget, September 1992.

service workers. Table 1-7 shows the number of persons employed in the region by type in 1992. The government is the largest single employer in both counties, followed by services.

Of interest for estimating waste generation is total employment as a percent of the population of the region. Figure 1-3 shows employment data for the region in comparison to state and national data.

Douglas County has an employment rate comparable to the state and national levels of 45 percent of the population. Government and retail sales employment are higher than the national or state averages. Manufacturing employment is about average, at 6.5 percent of the population, and wholesale employment is below average.

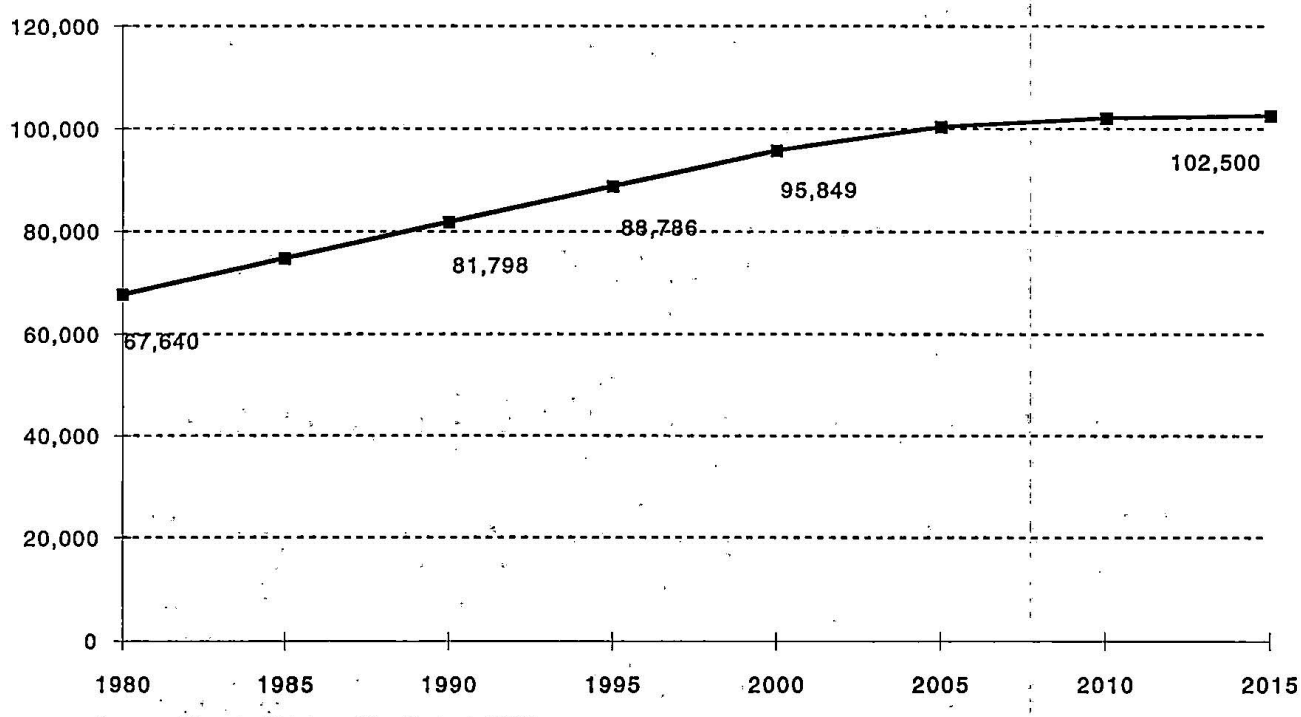
Jefferson County per capita employment is below the national and state levels in all categories except government workers. Self-employed persons (e.g., farmers), are not included in these data.

SWM PLANNING IN ADJOINING COUNTIES

The counties adjacent to Douglas and Jefferson Counties were surveyed for the potential to expand the planning region. Following is a summary of the status of planning in those counties.

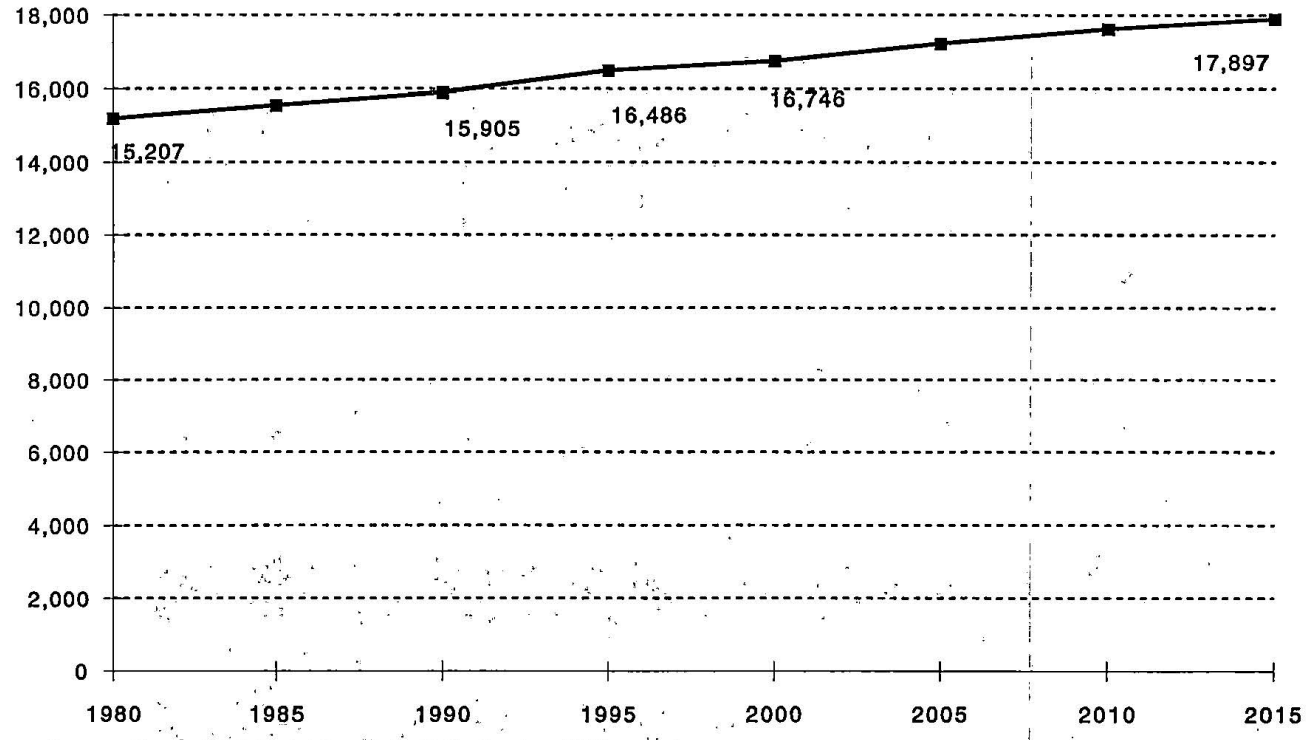
Leavenworth County, east of the planning region, has recently submitted its SWM plan to KDHE for review. Solid waste, except for residential waste from the City of Leavenworth, is managed by private haulers. There are no MSW landfills in the county. About 23 percent of the MSW is taken to the Hamm landfill in Jefferson County, and the remainder is taken to Johnson and Wyandotte Counties.

Figure 1-1
DOUGLAS COUNTY POPULATION PROJECTION



Source: Kansas Division of the Budget, 1992.

Figure 1-2
JEFFERSON COUNTY POPULATION PROJECTION



Source: Kansas Division of the Budget, September 1992.

Table 1-7

EMPLOYMENT IN DOUGLAS AND JEFFERSON COUNTIES *
1992

Number of Employees

	U.S.	Kansas	Douglas Co.	Jefferson Co.
Ag. fishing	593,518	5,351	187	31
Mining	650,554	10,954	66	110
Const.	4,500,006	45,832	1,399	139
Manuf.	18,162,480	188,356	5,524	102
Transp.	5,517,458	58,519	1,102	74
Wholesale	6,094,175	63,870	726	55
Retail	19,672,221	201,376	8,107	373
Finance	6,905,698	62,947	1,453	90
Services	30,653,593	268,888	7,544	596
Government	18,833,000	217,700	11,660	1,460
Other	51,167	315	17	0
Totals	**111,633,870**	**1,124,108**	**37,785**	**3,030**
Population	255,078,000	2,515,000	84,525	16,135

Employment as a percent of population

	U.S.	Kansas	Douglas Co.	Jefferson Co.
Ag. fishing	0.23	0.21	0.22	0.19
Mining	0.26	0.44	0.08	0.68
Const.	1.76	1.82	1.66	0.86
Manuf.	7.12	7.49	6.54	0.63
Transp.	2.16	2.33	1.30	0.46
Wholesale	2.39	2.54	0.86	0.34
Retail	7.71	8.01	9.59	2.31
Finance	2.71	2.50	1.72	0.56
Services	12.02	10.69	8.93	3.69
Government	7.38	8.66	13.79	9.05
Other	0.02	0.01	0.02	0.00
Totals	**44**	**45**	**45**	**19**

* Excludes most self-employed persons.
Sources: U.S. Department of Commerce, Woods & Poole, 1994.

Johnson County's draft SWM plan is being reviewed by county officials. Most of Johnson County's MSW is disposed in the large-capacity Johnson County landfill.

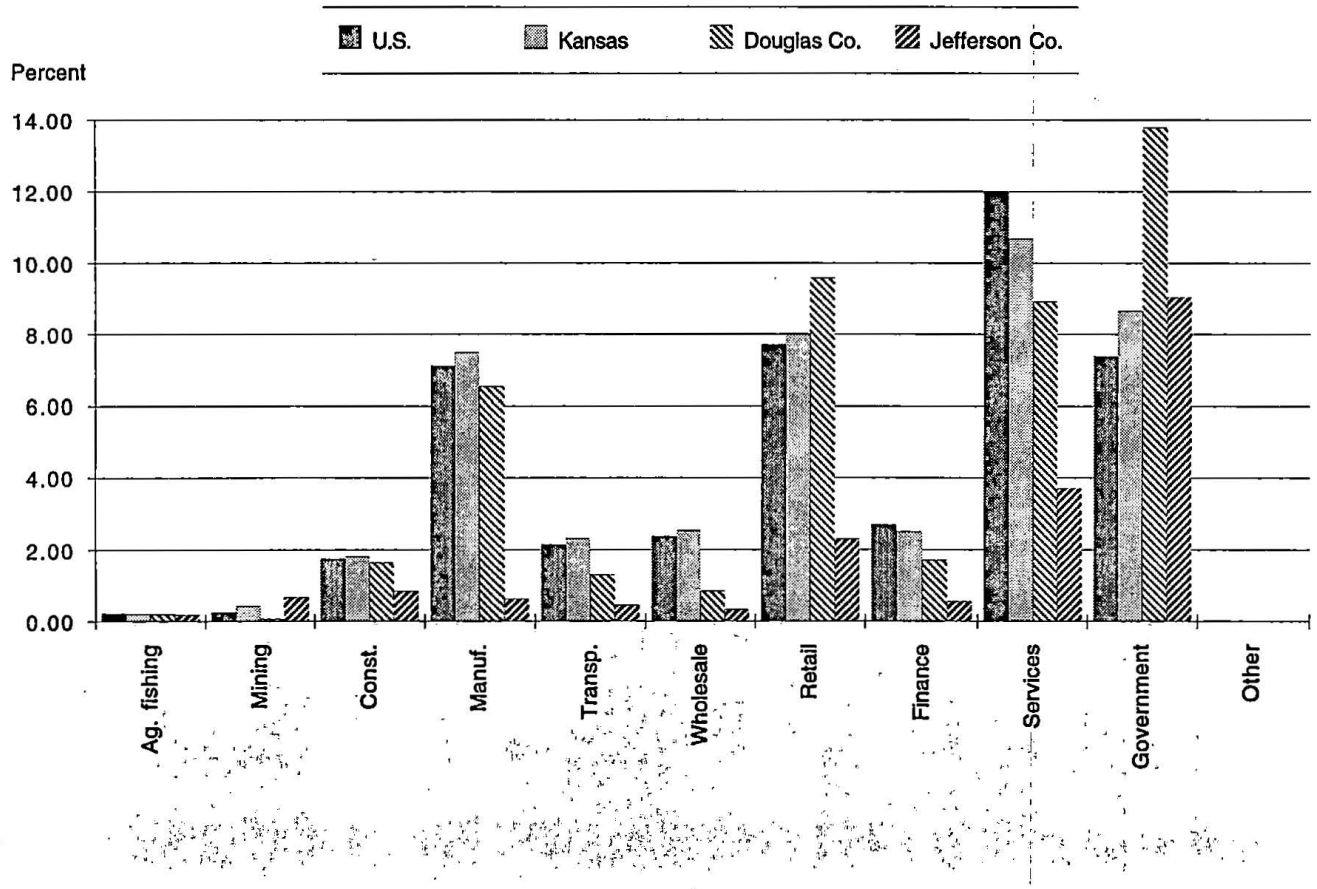
Miami, Franklin, and Osage Counties are all part of a six county planning region that also includes Coffey, Anderson, and Linn Counties. The region expects to submit its SWM plan to KDHE in April or May of 1995. All of the landfills in the region, except one in Coffey County have been closed. The other five counties each have transfer stations. Waste from Osage and Franklin Counties is being hauled to the Hamm landfill in Jefferson County.

Shawnee County is in the final stages of SWM planning. Most MSW from the county is taken to the large-capacity Rolling Meadows landfill north of Topeka.

Jackson County is waiting for approval from KDHE on their 10-year solid waste management plan. To comply with Federal regulations, the county landfill was closed. Currently Waste Management is hauling the county's solid waste from a temporary transfer station to the Rolling Meadows landfill in Shawnee County. Jackson County is seeking a permit from KDHE for a permanent transfer station.

The landfill in Atchison County is open only for disposal of brush and yard trimmings. A transfer station is operated at the site with final disposal reported to be at the Johnson County landfill in Johnson County.

Figure 1-3
EMPLOYMENT AS PERCENT OF POPULATION



Chapter 2

SOLID WASTE CHARACTERIZATION

INTRODUCTION

Waste characterization includes the identification of quantity, composition, and sources of the solid waste generated, recovered, and disposed in the two-county region. Knowledge of the waste characteristics will be useful as background information for setting waste management goals and for evaluating recycling and disposal options in the steps that follow in this planning project.

A combination of methods was used to characterize the wastes generated in Douglas and Jefferson Counties. In addition to using the weight and volume data from local sources such as the City of Lawrence Sanitation Department, private haulers, recyclers, and industrial generators, a modification of the material flows methodology developed by Franklin Associates to estimate national MSW for the USEPA (2-1) was used to estimate specific components of MSW generated in the region.

The material flows method uses published production data for the materials and products in the waste stream, with modifications for imports, exports, and product lifetimes. The flow of products (including packaging materials) have been traced to different sectors of the economy and waste generation rates established. These rates were applied to Douglas and Jefferson Counties, using local population and employment data.

Current (1995) recovery for recycling and composting was estimated based on materials recovered in 1994 by the City of Lawrence and other public and private recycling programs. Recovery estimates also include materials recycled by generators who have their own recovery programs.

Waste disposal is the difference between waste generated and waste recovered for recycling or composting.

Wastes included in this solid waste management planning effort include the following:

- Municipal solid waste (MSW)
- Construction and demolition debris (C&D)
- Nonhazardous industrial process waste
- Municipal Wastewater Treatment Sludge
- Combustion Residue
- Household hazardous waste in MSW
- Old Vehicles

- Street sweepings
- Trees and brush

Current quantities of solid waste generated, recovered, and disposed from the two counties in the study region were developed. MSW generation over the 20-year planning period was estimated as well. Trends in materials use were factored into the MSW composition projections. These projections provide the basis for planning solid waste management activities for the next 20 years.

MUNICIPAL SOLID WASTE

The municipal solid waste stream consists of the waste generated from residential and non-residential sources. Residential sources include single family as well as multi-unit housing, such as apartments. Non-residential sources include retail and wholesale businesses, industries (excluding process wastes), and institutions such as hospitals, prisons, and schools (including dormitories).

MSW is composed of durable goods such as appliances, furniture, rugs, and tires (but excluding automobiles and other mobile equipment); nondurable goods such as newspapers, books, magazines, and office paper; containers and packaging, such as beverage containers, corrugated boxes, and bags and sacks; food and yard wastes; and other miscellaneous materials.

Generation of MSW

Three terms are in common usage in the characterization of solid wastes. "Generation" refers to the waste that would be available for disposal, if there were no recovery for recycling. "Recovered" material represents the material removed from the generated waste stream for recycling or composting prior to disposal.

"Discards" are the wastes remaining for disposal after recovery of recyclables and compostables. Discards, or generation less recovery, represent the waste quantities collected for final disposition, such as landfilling, landspreading, or incineration. Since none of the Douglas/Jefferson County wastes are incinerated at this time, discards are the wastes that are land disposed, although some waste is littered or stored, and some is disposed on site.

A combination of material flows data and local weight or volume data was used to estimate the quantity and composition of the Douglas/Jefferson County solid waste.

Material Flows. In addition to using the local weight or volume data, a modification of the material flows methodology used to estimate national MSW for the U. S. EPA was used to estimate most of the recyclables generated in the region. This method is particularly useful for estimating the generation of old newspapers, corrugated containers, magazines, office papers, and containers and packaging.

The material flows methodology uses published data on product consumption. The flows of products (including packaging materials) are traced to different sectors of the economy and waste generation rates are established. These generation rates were applied to this region using local population and employment data.

Newspapers circulation in each county is documented by audits for advertising purposes (2-2). Other statistical sources reveal the pounds of newsprint per issue of the newspaper (2-3). Using these two data sources and adjusting for other local uses of newsprint, such as flyers, inserts, church bulletins, etc., the total tonnage of old newspapers generated in Douglas/Jefferson County was obtained.

The number of magazine subscriptions sold into Douglas/Jefferson County by each of the 25 leading magazines in the country are documented (2-2). The estimated old m agazine generation is obtained from the ratio of total circulation in Douglas and Jefferson Counties to circulation in the United States for the 25 magazines and the total tonnage of magazines generated in the United States.

Phone book distribution data and actual weights of the major telephone directories used in the region were used for estimating the tons of directories generated.

Beverage container generation was estimated, using midwest per capita sales data for beer, soft drinks, bottled water, milk, fruit beverages, and wine and spirits. Container mix for each of the beverages and average container weights were applied to calculate the total weight of each beverage container material. Beer and soft drink consumption estimates for Douglas County were adjusted upward to account for the higher than average number of college age persons in the county.

Douglas/Jefferson Counties employment data in industries that generate corrugated containers, such as grocery stores, were used to estimate corrugated container generation. Employment in government and private offices determined the estimate for office paper generation. Other MSW components adjusted for local employment conditions include major appliances and furniture, and clothing and footwear. Diaper generation is assumed to be proportional to the number of persons below the age of five.

Local Hauler Data. Actual weights of waste collected from residences and businesses in Lawrence were used to adjust the generation rates obtained from the material flows analysis.

A complication that arises when comparing the results of the material flows method with local empirical data is that the material flows method estimates *generation* of wastes, while empirical data report *discards* and *recovery*.

Recovery was obtained by surveying the recycling centers in the county, the major industries and those commercial establishments that commonly participate in recycling. These establishments include grocery stores, department stores, etc., who typically recover corrugated containers, and banks and large offices who often recover office paper.

Estimating Method Description

The following steps describe the detailed process that was used to estimate the quantity and composition of MSW generated. A separate method was used for each county.

Douglas County

1. Develop waste components generation, starting with national per capita data for most components (adjusted later), but using local industry and demographic (including employment) data for:
   - Newspapers
   - Office papers
   - Magazines
   - Directories
   - Corrugated containers
   - Beverage containers
   - Diapers
   - Yard waste

2. Divide each component in (1) into residential and nonresidential, using the percentages from the 1994 EPA MSW Update Report.

3. Develop a separate waste generation table, by component, for Douglas County outside Lawrence, as follows:

   a. For residential components, use total Douglas County per capita rates, except for yard waste, which is estimated at

1/2 of Lawrence's (weighed) per capita rate in the cities and zero in the unincorporated areas.

b. For nonresidential components, use per capita rates developed for Jefferson County for small towns, except for newspapers, office papers, magazines, directories, corrugated containers, beverage containers, and diapers, which are all calculated separately according to (1) above. Assume no nonresidential or yard waste in the rural areas.

c. Add residential and nonresidential components to get total generation in Douglas County outside Lawrence.

4. Develop Lawrence components generation table as follows:

a. Start with the same residential per capita rates used for Douglas County towns outside Lawrence (except for yard waste which is weighed in Lawrence). Then increase all components (except those calculated using local data) by a factor that equates the total estimated MSW less recovery with the MSW actually collected for discard in Lawrence. The factor turns out to be 1.055.

b. For nonresidential generation, subtract 3 (b) nonresidential quantities from the total for the County, and then increase by the 1.055 factor.

c. Final adjustment for abnormal percentage of Lawrence population in group quarters.

Jefferson County

1. Develop waste components generation using national per capita data for most components and local data for the following:

Newspapers
Corrugated containers
Office papers
Magazines
Directories
Containers
Diapers

Yard waste assumed to be 1/2 of the Lawrence per capita rate (city populations only).

2. Divide each component in (1) into residential and nonresidential fractions, using percentages from the 1994 MSW Update Report.

3. Adjust nonresidential component estimates by the ratio of non-farm per capita employment in Jefferson County to national

non-farm per capita employment. No adjustments for the components whose estimates were developed in (1) above.

4. Develop town and rural MSW generation by assuming all nonresidential waste and all yard waste is generated in towns. Rural areas are assumed to generate no commercial waste or yard waste.

Quantity and Composition of MSW Generation

The total MSW generation from Douglas County is estimated at 74,938 tons per year in 1995, or 205 tons per day (average), as shown in Tables 2-1 and 2-2. This is equivalent to 4.62 pounds per capita per day (pcd). This calculation is based on total population, including the student population living in dormitories. Generation is estimated at 5.05 pcd in Lawrence, 4.48 pcd in the other Douglas County cities and 1.85 pcd in the unincorporated areas of the county. Per capita generation is lower in the areas outside Lawrence because of the lower per capita commercial and industrial activity and less yard waste collected by the homeowners.

Approximately 54 percent of generation in Douglas County is from residential sources, and 46 percent originates in commercial establishments and institutions.

Tables 2-3 and 2-4 summarize the MSW generation data for Jefferson County. Total MSW generated in Jefferson County is estimated at 8,486 tons per year in 1995, or 23.2 tons per day. This equates to 2.82 pcd; 4.47 in the cities and 1.76 pcd the rural areas. The lower rate for the rural areas is primarily due to the absence of commercial waste.

The components of the MSW stream for Douglas and Jefferson Counties are listed in Tables A-1 through A-4 of Appendix A. The detailed estimates of 40 components are listed by source, i.e., residential vs. nonresidential. Separate compositions are shown for Douglas and Jefferson Counties in Tables A-1 and A-2. Douglas County MSW is further broken down into Lawrence and outside Lawrence in Tables A-3 and A-4.

Table 2-1
ESTIMATED DOUGLAS COUNTY
MSW GENERATION PER YEAR 1995

	Population	Generation		
		Residential	Nonresidential	Total
		tons	tons	tons
Baldwin City	3,214	1,301	1,326	2,627
Eudora	3,263	1,321	1,347	2,668
Lawrence	71,213	34,094	31,482	65,576
Lecompton	672	272	277	549
Unincorporated	10,424	3,518	0	3,518
Totals	88,786	40,506	34,432	74,938
Percent		54%	46%	100%

Source: Franklin Associates, Ltd.

Table 2-2
ESTIMATED DOUGLAS COUNTY
MSW GENERATION PER DAY 1995

	Residential		Nonresidential		Total	
	tpd (1)	pcd (2)	tpd (1)	pcd (2)	tpd (1)	pcd (2)
Lawrence	93.4	2.62	86.3	2.42	179.7	5.05
Other Cities	7.9	2.22	8.1	2.26	16.0	4.48
Rural	9.6	1.85	0.0	0.00	9.6	1.85
Total County	111	2.50	94	2.12	205	4.62

(1) tons per day
(2) pounds per capita per day

Source: Franklin Associates, Ltd.

Table 2-3
ESTIMATED JEFFERSON COUNTY
MSW GENERATION PER YEAR 1995

	Population	Generation		
		Residential tons	Nonresidential tons	Total tons
McLouth	745	292	316	608
Meriden	645	253	274	527
Nortonville	666	261	283	544
Oskaloosa	1,113	436	472	908
Ozawkie	418	164	177	341
Perry	913	358	388	746
Valley Falls	1,299	509	551	1,060
Winchester	635	249	270	519
Unincorporated	10,051	3,233	0	3,233
Totals	16,485	5,755	2,731	8,486
Percent		68%	32%	100%

Source: Franklin Associates, Ltd.

Table 2-4
ESTIMATED JEFFERSON COUNTY
MSW GENERATION PER DAY 1995

	Residential		Nonresidential		Total	
	tpd (1)	pcd (2)	tpd (1)	pcd (2)	tpd (1)	pcd (2)
Cities	6.9	2.15	7.5	2.33	14.4	4.47
Rural	8.9	1.76	0.0	0.00	8.9	1.76
Total County	15.8	1.91	7.5	0.91	23.2	2.82

(1) tons per day
(2) pounds per capita per day

Source: Franklin Associates, Ltd.

Recovery and Disposal of MSW

Table 2-5 summarizes the estimated recovery of MSW in Lawrence, Douglas County outside Lawrence, and in Jefferson County. Recovery was obtained from the various recycling programs in the county, as described in

the Chapter 3. Over 19,000 tons, or 26 percent of the Douglas County MSW is currently being recovered for recycling or composting. The City of Lawrence recovers 29 percent of the MSW generated compared to 6 percent outside of Lawrence. Recovery in Jefferson County is about 3 percent of generation. Recovery estimates for the 40 MSW categories are shown in Table B-1 of Appendix B.

Table 2-5
ESTIMATED MUNICIPAL SOLID WASTE RECOVERY FOR RECYCLING/COMPOSTING (1995)

	Tons			Percent of MSW Generated
	Recyclables	Yard Trimmings	Total	
Lawrence	10,340	8,512	18,852	29%
Outside Lawrence	516	0	516	6%
Total Douglas County	10,856	8,512	19,368	26%
Total Jefferson County	258	0	258	3%

Source: Franklin Associates, Ltd.

MSW Generation Projections

MSW generation for Douglas and Jefferson Counties was projected through the year 2015. It should be emphasized that projections are not necessarily predictions. Any changes in solid waste management practices, particularly source reduction, as a result of this planning effort or the Kansas state plan may affect the amount of waste generated in the future. Projections made here assume a scenario determined to be most likely, based on available information.

Population is the factor that most directly affects the generation of MSW. That is, more poeple produce more waste. However, based on historical data, the generation per person is also increasing. Factors that affect per capita generation rates include changing lifestyles, employment patterns, the local and national economies, and any changes in education and legislation.

Per capita generation projections for the Douglas and Jefferson County region are derived from projected national trends. It is expected that trends for this region will generally parallel those of the nation. For example, it is likely that the national trend toward more plastics and paper consumption and decreased usage of glass will apply to the region. Yard waste generation is assumed to stay at the current levels even though the population is expected to rise. Increased efforts to encourage back yard composting and leaving grass clippings on the lawns are expected to reduce the per capita generation of yard wastes.

Tables C-1 and C-2 in Appendix C summarizes the projections of the forty components of the Douglas and Jefferson County municipal waste stream. The total generations for the two counties are shown in Figures 2-1 and 2-2. It is estimated that by 2015, MSW generation in Douglas County will increase from 205 tons per day (74,938 tpy) to 260 tons per day (94,825 tpy), a 27 percent increase. Total MSW generation in Jefferson County is projected to increase from 23 tons per day (8,485 tpy) in 1995 to 28 tons per day (10,163 tpy) in 2015, a 20 percent increase).

Figure 2-1
PROJECTED MSW GENERATION IN DOUGLAS COUNTY

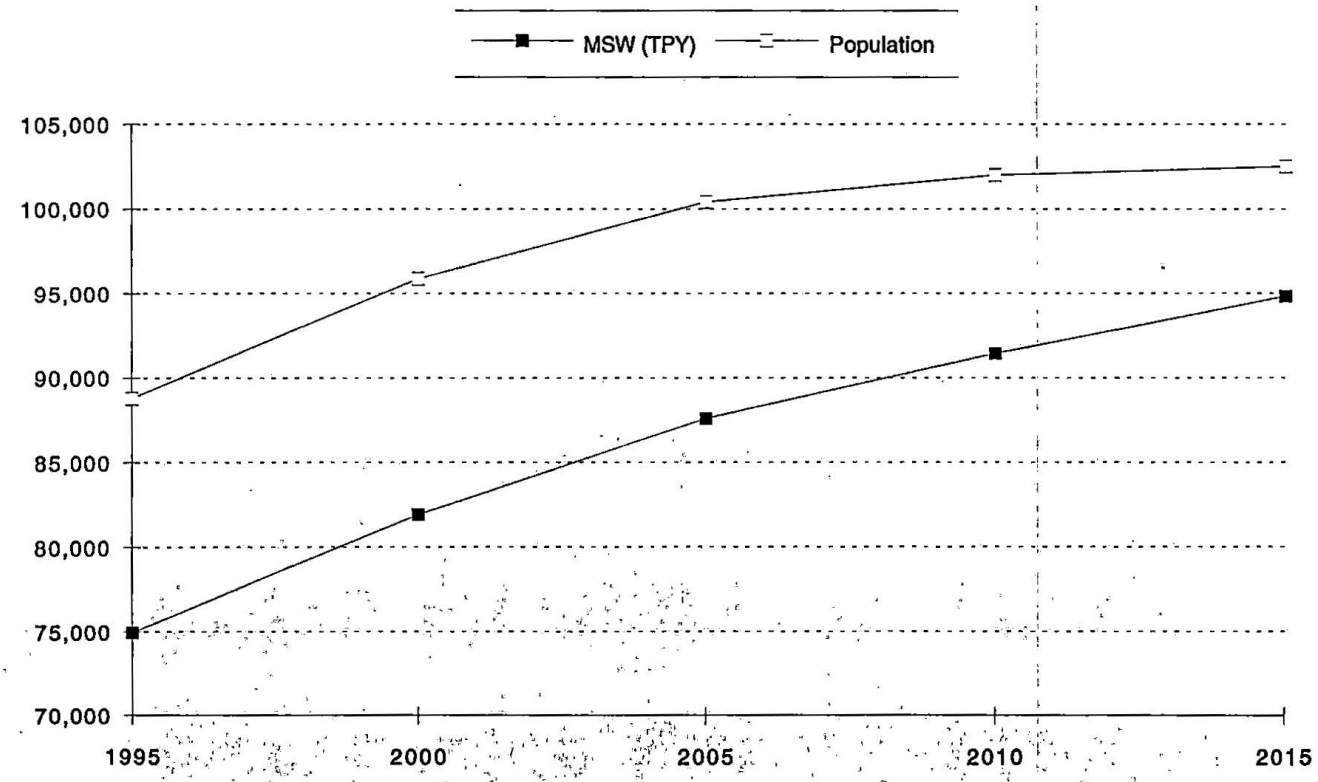
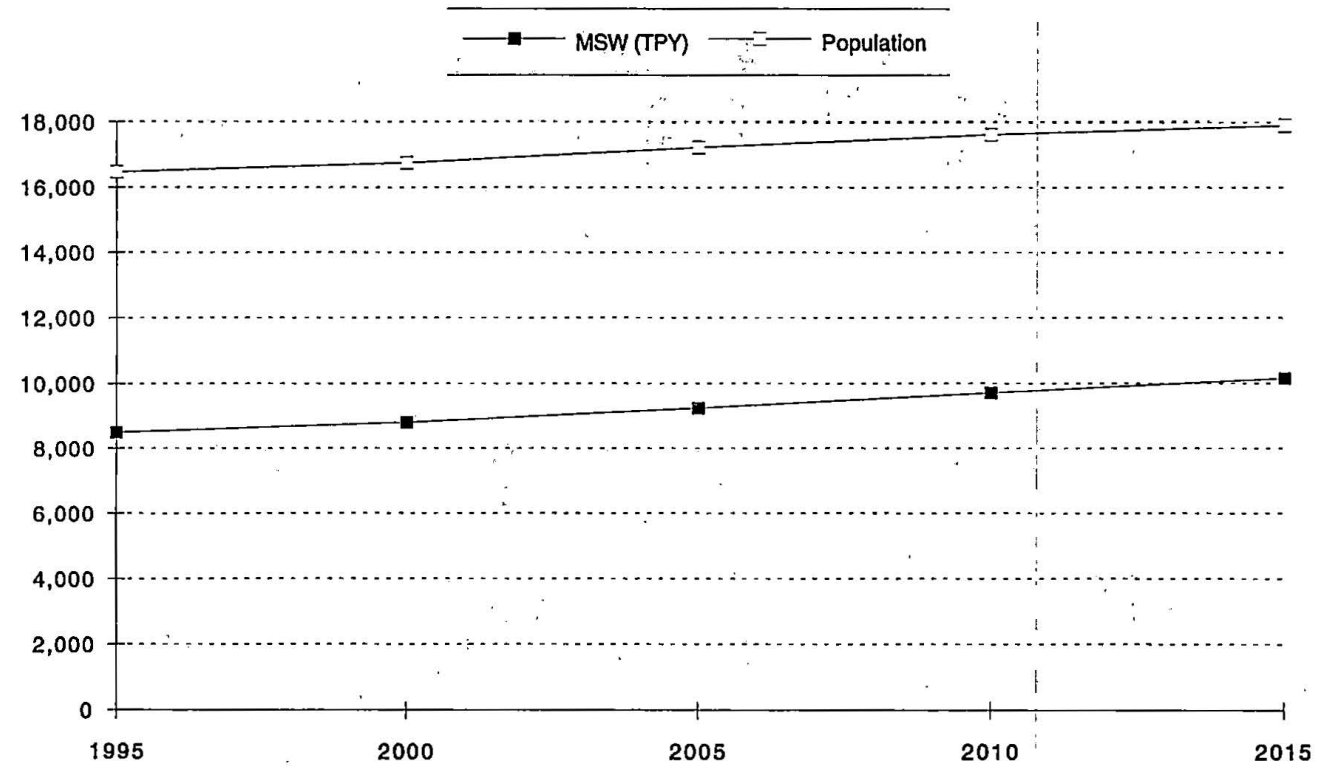


Figure 2-2
PROJECTED MSW GENERATION IN JEFFERSON COUNTY



OTHER WASTE STREAMS

Construction and Demolition Waste

Construction and demolition (C&D) wastes are generated from the construction, renovation, and demolition of buildings and other structures, roads and bridges, and site conversions. Construction and demolition wastes are generally grouped into three main categories:

1. Asphalt, concrete, and masonry rubble
2. Wood material
3. Other materials such as wallboard, metals, plastics, glass, and carpet scraps.

Quantity proportions for each of these categories are generally estimated to be 50 percent of the first category and 25 percent of the other two categories.

The size of the C&D waste stream is significant, with estimates ranging from 15 to 25 percent of the total waste stream. Quantities of C&D wastes depend on the specifics of the community such as its geographical location, age and size, and rate of economic growth.

Based on the construction employment of 16.6 per 1,000 persons in Douglas County and 8.6 employees per 1,000 persons in Jefferson County, an estimated 18,828 tons of C&D waste are generated each year in Douglas County and 1,811 tons in Jefferson County.

Large-scale recovery of C&D wastes in Douglas and Jefferson Counties is believed to be limited to road materials such as asphalt and concrete rubble. Typically during road construction, materials are passed through mobile crushing units and reused as roadbase material. If one assumes that about 25 percent of all asphalt and concrete rubble is recovered for road base material in the region, an estimated 2,580 tons per year of these materials are diverted from landfills.

Based on a total generation of 20,639 tons per year, and an estimated recovery of 2,580 tons per year, about 18,059 tons per year (or about 50 tons per day) are being disposed of in landfills.

Nonhazardous Industrial Process Waste

Manufacturing industries typically generate a wide variety of solid process wastes depending on the type of products manufactured. Currently there are about 110 manufacturing establishments in the two-county region. Manufacturing establishments are those establishments categorized within Department of Commerce Standard Industrial Classifications (SIC) 20 through

39. Total employment for these establishments is about 5,500 persons in Douglas County and 100 in Jefferson County. A large fraction of these companies are located in the City of Lawrence.

Since most of the industries are located in Lawrence, where most MSW is handled by City trucks, disposal data were available for a significant portion of this waste stream. The major facilities in the two-county area were contacted by phone to obtain estimates for recovery, which is added to disposal to obtain generation. Manufacturing facilities with more than 20 employees were targeted by the phone survey. According to County Business Patterns there are 28 establishments in Douglas County and two in Jefferson County with more than 20 employees in SIC classifications 20 through 39. Twenty establishments were contacted (representing 67 percent of the establishments with more than 20 employees). It was estimated from employment data (given as ranges in County Business Patterns) that 87 percent of the manufacturing employees were represented by the survey.

Two methodologies were used to estimate non-hazardous process waste for the 13 percent not represented by the phone survey. Actual recovery and disposal amounts received by the responding establishments on a tons per employee per year basis were applied to similar establishments not contacted. For example, the actual data averaged from two commercial printing establishments (SIC 27) with more than 20 employees listed in Douglas County were applied to the third commercial printing establishment. For the three textile products (SIC 23) establishments, discards/employee/year based on national data was applied to the local employment. Recovery from these establishments was not estimated.

It is estimated that annually about 46,000 tons of process waste are generated in Douglas and Jefferson Counties. Recovery in the two counties is estimated at 31,320 tons for a 68 percent recovery rate.

Municipal Wastewater Treatment Sludge

Wastewater treatment sludge in the region originates from four treatment facilities. The City of Lawrence facility landfills about 158 tons of sludge (30 percent solids) per year and 11 tons per year of grits and screenings. In addition, about 50,000 tons (1,650 dry tons) are landspread each year. Excluding the water, the solids total amounts to about 1,708 tons per year (1,650 being applied to the land and 58 tons landfilled).

Baldwin City's wastewater treatment plant produces over 2,800 tons per year (65 dry tons) of sludge.

In Jefferson County, two package treatment plants in subdivisions around Lake Perry produce about 50 tons per year.

Combustion Residue

There are no incinerators for solid waste in Douglas or Jefferson County. The only significant generator of combustion ash in the region is the KPL electric generation facility, located north of Lawrence. An estimated 100,900 tons of coal ash are produced each year at the KPL facility. This figure includes 6,700 tons of limestone. About 14,100 tons per year of ash are used for road construction, and the remaining 86,800 tons are disposed on-site.

Household Hazardous Waste in MSW

Household hazardous waste (HHW) represents a very small part (less than 1/2 percent) of the residential waste stream. There is a special interest in HHW due to its potential toxicity; therefore generation estimates of HHW have been made.

The collection of HHW in the study area is limited to Douglas County. The City of Lawrence and Douglas County operate a drop-off site for Douglas County residents. In 1994, 8.3 tons of hazardous materials were collected at the facility. Of the hazardous materials collected at the facility, 4.7 tons of latex and oil base paints, 0.3 tons of fuels, and 0.63 tons of other hazardous wastes were recycled. This recovery represents 68 percent of the household hazardous material collected at the facility.

Old Vehicles

In 1994, a total of 50,435 cars and 19,828 trucks were registered in the two-county region. Cars and trucks that become obsolete or are wrecked beyond repair are taken out of service. Most steel and other metals from vehicle shredding facilities are recovered for recycling before landfilling the remainder. The automobile shredder residue (ASR), often called "fluff", is usually disposed of in MSW landfills.

Estimates of old vehicle waste generation from the two counties were made based on motor vehicle data, including the number retired from use. Based on these data and an average of 1.7 tons per vehicle, 7,254 tons were generated, 5,150 tons were recovered, and 2,104 tons were disposed. This calculation assumes that about 90 percent of vehicles are shredded, and about 79 percent of the shredded material (iron, steel and other metals, rubber) recovered.

Street Sweepings

Street refuse includes material swept from urban streets, alley-cleaning, and wastes resulting from periodic cleaning of storm sewer catch basins. Street sweepings consist primarily of sand and dust and are often disposed of in C&D landfills. Two cities in the region (Lawrence and Baldwin City) sweep their streets on a regular basis. Other cities may sweep on an as-needed basis. The Kansas Turnpike Commission sweeps the turnpike on an as-needed basis, depending on the sand and salt required.

Lawrence has almost 250 miles of city streets. Streets are swept daily by city sanitation crews. Some streets are swept more frequently than others. Downtown streets are swept about once a month. The City plans to sweep all streets at least two times a year. Lawrence street sweepings are estimated at 500 to 600 tons per year.

About 4 to 5 miles of Baldwin City streets are swept once or twice a year on a contract basis. Sweeping is usually done in the late summer, following the annual maple leaf festival. An estimated 5 to 10 tons per year are collected.

About 17 miles of the Kansas Turnpike are located in Douglas County. Typically, 10 cubic yards per mile are swept from the highway 4 times per year. At 1,000 pounds per cubic yard, that equates to 340 tons per year.

Trees and Brush

Trees and brush result from trimming trees and bushes and cutting brush and trees, mostly from public property or along power lines. These wastes are in addition to yard trimmings, which are included in MSW. Trees and brush are usually chipped and used as mulch, cut up as firewood, or used as erosion control in drainage areas.

Discussions with local utility officials and their contractors and Lawrence Parks and Recreation staff were the basis for estimating this category of solid waste. KPL estimates that approximately 624 tons of trees and brush were used as mulch by their crews. This includes tree trimmings from Lawrence and Eudora in Douglas County and Perry in Jefferson County.

The Lawrence Parks and Recreation Department collects an estimated 1,500 tons per year of trees and brush, which is chipped and used as mulch. In 1994, 219 tons were disposed in the Hamm landfill.

SUMMARY

Table 2-6 summarizes the solid waste generated, recovered for recycling or composting, and disposed for the two-county region. An estimated 260,000 tons per year of solid waste are generated each year. Excluding the coal combustion residue, which is a special waste managed on site, MSW is the largest component of the waste stream. Approximately 23.5 percent of MSW in the two counties is being recovered for recycling or composting. Industrial process waste, the next largest waste category, is currently being recovered at a 68 percent rate. For all solid waste generated in the two counties, the recovery rate is 28.4 percent, leaving 188,594 tons for disposal.

Table 2-6
SUMMARY OF ESTIMATED SOLID WASTE GENERATION, RECOVERY, AND DISPOSAL DOUGLAS AND JEFFERSON COUNTIES (1995)

	Generation		Recovery		Recovery	Disposal	
	Tons	Percent of total	Tons	Percent of total	as Percent of Generation	Tons	Percent of total
Municipal Solid Waste	83,424	31.7	19,626	26.2	23.5	63,798	33.8
Construction & Demolition Debris	20,641	7.8	2,580 (1)	3.4	12.5	18,061	9.6
Nonhazardous Industrial Process Waste	46,245	17.5	31,320	41.8	67.7	14,925	7.9
Municipal Wastewater Treatment Sludge (dry wt)	1,775 (2)	0.7			0.0	1,775	0.9
Combustion Residue	100,891 (3)	38.3	14,119 (4)	18.8	14.0	86,772	46.0
Trees and Brush from Clearing Work	2,343	0.9	2,124 (5)	2.8	90.7	219	0.1
Street Sweepings	940	0.4	0	0.0	0.0	940	0.5
Old Vehicles	7,254	2.8	5,150	6.9	71.0	2,104	1.1
Total	263,513	100.0	74,919	100.0	28.4	188,594	100.0

(1) Asphalt and concrete reuse as base material.
(2) Wet weight of sludge estimated at 53,000 tons.
(3) Includes 6,763 tons of limestone.
(4) Coal ash used for road construction.
(5) Mulch used by Lawrence Parks and Recreation and Kansas University.

Source: Franklin Associates, Ltd.

Chapter 2

REFERENCES

2-1 Franklin Associates, Ltd. *Characterization of MunicipalSolid Waste in the United States. 1994 Update.* U. S. Environmental Protection Agency. 1994.

2-2 *Circulation 94.* American Newspaper Markets, Inc. Northfield, Illinois.

2-3 *Editor & Publisher 1994 International Yearbook.* The Editor & Publisher Co. Inc. New York, New York.

2-4 United States Department of Commerce, Bureau of the Census. *1992 County Business Patterns (Kansas)* Report No. CBP-92-18.

Chapter 3

CURRENT WASTE MANAGEMENT PRACTICES

INTRODUCTION

Solid waste management in Douglas and Jefferson Counties, as it currently exists, is described in this chapter. The chapter is divided into discussions on collection and transportation of waste generated in the Counties, and the solid waste management facilities used in the processing and disposal of these wastes. Greater emphasis is given to detailing the management of MSW—particularly household MSW—than other solid wastes generated. MSW is generated in greater quantities than most of the other waste streams and accounts for most of the costs of managing solid wastes in the two Counties.

The information presented in this chapter is largely from the following sources:

- City of Lawrence records
- Douglas County records
- Jefferson County records
- Cities/towns in Douglas and Jefferson Counties
- Commercial and institutional establishments recovering selected recyclables
- Industrial establishments recovering process wastes
- Firms collecting recyclables.

COLLECTION AND TRANSPORTATION

Residential MSW

Approximately 36,000 occupied housing units exist in Douglas and Jefferson Counties (Chapter 1). About 78 percent of the households of Douglas County and 99 percent of households in Jefferson County are in buildings with 1 to 4 units per structure. These households have solid waste collection service provided weekly.

Individual household collection of non-bulky waste to be disposed (i.e., refuse/trash) is, typically, accomplished with rear-loading packer trucks of 20 to 30 cubic yards capacity. Two- or three-person crews with these trucks are common, driver included. Three-person crews are used by the City of Lawrence. The driver occasionally assists in loading household trash, which is usually stored in 30-gallon bags or containers of similar size. Most waste is collected at the curb (i.e., alongside the street). All of the collected trash is disposed in landfills—some outside of the study area.

Households in Lawrence also have access to separate collection of recyclables through individual contract with private collection companies. The recyclable materials are marketed by the collection companies. City crews collect leaves and grass clippings separately from trash. Virtually all leaves and grass clippings that are bagged by the generator are recovered in the separate collection program. Since there is no added charge for this collection there is no reason for the generator to mix the yard debris with refuse. The leaves and grass clippings collected by the city are taken to the city owned compost site.

A summary of waste management practices for households in the study area with individual collection service is found in Table 3-1. Finding from Table 3-1 include the following:

- Three of the four cities in Douglas County contract for household trash collection. Lawrence is the only city using city crews and equipment.

- Five of the cities in Jefferson County contract for household trash collection. Individuals must arrange for trash collection in the other three cities in Jefferson County. All trash collection service in Jefferson County is provided by private crews and equipment.

- Households in both counties have trash collection once per week.

- Lawrence is the only city in the two-county area with curbside collection of recyclable materials. Individuals may, if desired, contract with one of two private companies for recyclables collection. One company collects from subscribers one time a week and the other collects every other week.

- Lawrence city crews collect leaves and grass trimmings separately from trash. The cost of this service is included in the fee paid by all households for trash collection.

- Bulky waste is picked up at no additional charge in 10 cities. In two cities, individuals pay an extra charge when the service is needed.

- While most of the trash from the two counties is disposed in the Hamm Landfill, trash is also taken to the Rolling Meadows Landfill in Topeka and the Johnson County Landfill in Shawnee.

- Payment for waste collection services is added to utility bills or, in those cities where individuals are responsibility for contracting, by direct billing.

Households in multi-family housing of more than four households per building store waste in common containers prior to collection. Containers of two to eight cubic yards capacity are typical in these multi-family buildings. The containers are emptied into front- or rear-loading packer trucks that automatically lift and unload the containers. Arrangements for collection of waste in multi-family houshing is usually the responsibility of the building management. In Lawrence, city crews collect MSW from the multi-family housing.

Separate collection of recyclables in multi-family buildings does not usually occur. The exception is that recyclables are recovered in some of the dormitories, sororities, and fraternities on university campuses in Douglas County. Recyclable materials collection at these facilities is contracted on an individual basis with private recycling companies.

Drop-off centers are available for recovery of recyclable materials. The City of Lawrence maintains 5 collection containers for newspaper recovery. Lawrence High School and the University of Kansas also provide drop-offs for newspapers. Wal-mart and Dillon Stores provide collection points for additional recyclables. Other retail outlets accept certain recyclable materials (usually as an exchange for new products purchased or material the business can utilize) from customers.

Non-Residential MSW

Non-residential MSW in the two counties is generated by retail establishments, offices, and institutional establishments. Commercially generated MSW is generally stored in two to eight cubic yards dumpster containers or in larger roll-off containers. The city of Lawrence collects most of the non-residential MSW in the city, including much of that from the University of Kansas. The University collects a few of the dumpsters on campus because their location is inaccessible by city refuse trucks. Deffenbaugh Industries collects the MSW from Haskell University. Non-residential MSW is collected by private haulers in the other cities in Douglas County and the cities in Jefferson County.

Commercial establishments generating substantial quantities of old corrugated boxes often store the material, loose or baled, and have it collected separately for recovery. This is common at grocery stores, large retail stores, and shopping malls.

The other recyclable materials recovered from commercial establishments are usually collected on a volunteer basis by employees and taken to local recyclers or given to community organizations. Office paper and aluminum cans are the most commonly recovered materials. The University of Kansas Unions recover OCC, glass, styrofoam and aluminum cans. Several offices on campus recycle computer paper as well as newspaper and aluminum cans.

Some retailers will accept for recovery special residential waste when an equivalent new product is purchased. Examples of this recovery include: automobile batteries, tires, and motor oil. Even though the waste came from the residential sector, storage and collection is shifted to the commercial sector. Management of these wastes then becomes the responsibility of the non-residential generator.

Table 3-1

WASTE MANAGEMENT PRACTICES FOR HOUSEHOLDS WITH INDIVIDUAL COLLECTION SERVICE

	Contract Responsibility		Collection Equipment/Crew	Curbside Collection Bulky Waste	Collection Service Availability	
	Recyclables	Trash			Recyclables	Yard Trimmings
Douglas County						
Baldwin City	N	C	P	P1	N	I
Eudora	N	C	P	P1	N	I
Lawrence	P	C	C	C1	P	S
Lecompton	N	C	P	P1	N	I
Jefferson County						
McLouth	N	C	P	P1	N	I
Meriden	N	P	P	P2	N	I
Nortonville	N	P	P	P1	N	I
Oskaloosa	N	C	P	P1	N	I
Ozawkie	N	C	P	P1	N	I
Perry	N	C	P	P2	N	I
Valley Falls	N	C	P	C1	N	I
Winchester	N	P	P	P1	N	I

	Trash Collection			Disposal Site	Recyclables Drop-off Center	Method of Payment	
	Frequency	Storage	Site			Recyclables	Trash
Douglas County							
Baldwin City	1/wk	bag/can	curbside	3	C	city utility	city utility
Eudora	1/wk	bag/can	curbside	3	N	N	city utility
Lawrence	1/wk	bag/can	curbside	3	C,P	direct bill	city utility
Lecompton	1/wk	bag/can	curbside	3	N	N	city utility
Jefferson County							
McLouth	1/wk	bag/can	curbside	4	N	N	city utility
Meriden	1/wk	bag/can	curbside	3,5	N	N	direct bill
Nortonville	1/wk	bag/can	curbside	3	N	N	direct bill
Oskaloosa	1/wk	bag/can	curbside	3	N	N	city utility
Ozawkie	1/wk	bag/can	curbside	3	N	N	city utility
Perry	1/wk	bag/can	curbside	3	N	N	city utility
Valley Falls	1/wk	bag/can	curbside	4	N	N	city utility
Winchester	1/wk	bag/can	curbside	3	N	N	direct bill

C = City
N = None
P = Private

1 = Charge included in trash fee
2 = Extra charge

D = Drop-off site
I = Included with trash
S = Separate pickup

3 = Hamm
4 = Johnson County
5 = Rolling Meadows

Source: Douglas County Public Works

Other Solid Waste

Other solid wastes managed in Douglas and Jefferson Counties include construction and demolition debris, industrial non-hazardous process waste, municipal wastewater treatment sludge, combustion residue, trees and brush from parks and trimming around power lines, street sweepings, and old vehicles.

Construction and Demolition Debris. The City of Lawrence collects C&D in roll-off containers, both permanently and temporarily sited, and transports it to the Hamm landfill. Construction companies will often self-haul or hire private waste collection firms. Less expensive C&D landfills are often used for disposal of the waste collected by private firms.

Recovery of construction and demolition debris in the two counties is reported to be limited to road materials such as asphalt and concrete rubble. Mobile crushing units allow road crews to reuse old road material as base material for the new road.

Industrial Non-hazardous Process Waste. Most industries which generate a process waste with a market value recover close to 100 percent of that waste. Steel, aluminum, paper, corrugated fibers, and other organics are some of the process wastes recovered in Douglas and Jefferson Counties. The quantity of industrial process waste that is disposed is stored in both roll-off and smaller containers prior to collection. Disposal is primarily in landfills although a small amount is land applied.

Municipal Wastewater Treatment Sludge. The wastewater treatment plant in Lawrence landspreads the majority of wastewater treatment sludge on farm land. Currently a small amount of dewatered sludge is landfilled in the Hamm landfill. In the future the treatment plant plans to increase their capacity to dewater the sludge to create more flexibility in disposal options.

Baldwin City is the only other city in Douglas County with a wastewater treatment facility. Landspreading the sludge on farm land is the current disposal method used by that facility. Jefferson County has two treatment plants. Private haulers transport the sludge for disposal to Topeka. The rest of the cities in the two counties utilize lagoons for wastewater treatment. The solids which settle in lagoons are usually left in place and not removed.

Combustion Residue. Coal burning facilities producing electricity create two types of ash. The facility in Lawrence combines the bottom ash with the fly ash and disposes of this combined waste in a permitted on-site landfill. Approximately 50 percent of the bottom ash is not landfilled but recovered for use in on-site road construction. A limestone sludge is also produced at the facility and disposed in the same on-site landfill as the ash.

Trees and Brush. Most of this waste stream is from trimmings around power lines in both counties and from work done by Lawrence parks and recreation. Chipping is usually done at the site of the trimming. All of the wood chips generated are recovered. The wood chips generated by the trimmings around power lines are given away to homeowners and also used at the Douglas County fairgrounds. The Parks and Recreation Department uses the recovered chips as mulch on their own landscaping projects.

Street Sweepings. Special collection vehicles with sweepers are used by the City of Lawrence to collect street refuse. Much of this activity occurs after the use of sand and salt on roads during winter storms. The material collected is generally quite heavy and goes to the Hamm landfill.

The other cities in Douglas and Jefferson Counties generate very little from street cleaning. Cleaning is contracted to outside firms on an as needed basis. This is usually no more than two times per year or after special community events such as the Maple Leaf Festival in Baldwin City. The Kansas Turnpike Commission also sweeps the turnpike, as needed, depending on the use of sand and salt.

Old Vehicles. Every year, vehicles become obsolete, delicensed, and removed from use. Old vehicles are taken to salvage companies by individual owners, tow-truck companies and automobile dealerships. Seventy-five percent of an old vehicle is recyclable. The materials recycled include steel, aluminum, copper, brass, fluids, tires, and batteries.

Solid Waste Collection Firms

Numerous solid waste collection firms operate in Douglas and Jefferson Counties. The City of Lawrence is the only residential MSW hauler in that city. Deffenbaugh is under contract with Haskell University for collection of that University's waste. Private haulers are permitted to haul non-MSW waste for disposal within the city of Lawrence.

The other cities in Douglas County contract with private haulers to collect and transport residential and non-residential solid waste. Douglas County has no permitting process for rural collectors. Jefferson County requires waste haulers to obtain an annual permit before collecting and transporting waste within the incorporated and unincorporated areas of the county. Table 3-2 lists the solid waste haulers operating in the cities of Douglas County and in Jefferson County.

Recyclable Materials Collection Firms

Several recyclable materials collection firms operate in the two county area. These collectors operate from individual contracts with recyclables generators and are not required to apply for a permit in either county.

Depending on the material and quantity collected, the collection firm may pay for the recyclables, haul the recyclables away at no fee, or charge the generator for removing the recyclables. Companies collecting recyclable materials in the study area are listed in Table 3-3.

Table 3-2

SOLID WASTE HAULERS

Baldwin City	Ottawa Sanitation
Eudora	Weldon Enterprises
Lawrence	City of Lawrence
	Deffenbaugh
	Midway USA Service, Inc.
Lecompton	Lecompton Rural Refuse Service
Jefferson County	Aards Trash Service
	Brey Trash Hauling
	Countryside Recycling and Refuse
	Deffenbaugh Industries
	Ditch Hauling, Inc.
	Lecompton Rural Refuse Service
	McMillan Sanitation
	Midway USA Service, Inc.
	Topeka Waste Systems
	Willie's Trash Service

Sources: Douglas County Public Works,
Jefferson County Trash Hauling Permit Applications 1994.

Table 3-3

RECYCLABLE MATERIALS COLLECTORS

Company	Service	Materials Collected
Batliner	Institutional, Commercial, Industrial	office paper, corrugated containers
Central Fiber	Commercial, Institutional	newspaper
Conservation Resources	Residential, Institutional, Commercial	glass, corrugated containers, paper, steel cans, aluminum cans, plastic
Covenant Recycling	Commercial	paper fibers
Eco Services Recycling	Residential, Commercial	glass, newspaper, office paper, steel cans, aluminum cans
Jefferson Smurfit	Institutional, Commercial, Industrial	glass, corrugated containers, office paper, aluminum cans, plastic
Dickerson Recycling	Institutional, Commercial, Industrial	office paper
Republic	Institutional, Commercial, Industrial	corrugated containers, office paper, newspaper
Resource Control	Institutional, Commercial, Industrial	corrugated containers
Weyerhauser	Commercial	corrugated containers

Source: Franklin Associates, Ltd.

SOLID WASTE MANAGEMENT FACILITIES

Recycling and Composting Facilities for MSW

Drop-off recycling centers are locations where recyclables may be donated for recovery. Drop-off centers are available for residents not involved in a curbside collection program, and for deposit of certain materials not accepted in curbside programs.

Most of the drop-off recycling centers are located in Lawrence. Dillon stores accept recyclables inside the three stores located in Lawrence. Wal-mart accepts recyclables at a free standing recycling center and at the automotive department inside the store. The city of Lawrence provides unmanned drop-off sites for newspaper collection. One active drop-off center was identified in Jefferson County; Pat's Thriftway in Oskaloosa which accepts corrugated containers.

Many of the drop-off centers are material specific. Retailers accept materials which are sold or used by their business; for example, mail stores accept polystyrene peanuts, automotive battery retailers accept old batteries at the point of sale. The drop-off recycling centers in Douglas and Jefferson Counties are listed in Table 3-4.

Buy-back recycling centers are private businesses which accept recyclable materials from individuals and organizations. Buy-back centers pay for materials based on market conditions. They are often not as conveniently located to most households as drop-off centers. The buy-back centers identified in the two county area are listed in Table 3-4.

Recyclables processing centers are facilities that prepare recyclable materials for sale to end-user markets. The processing may include sorting, shredding, crushing, baling, etc. Recyclable materials collectors often do some processing, such as sorting, before the material is sent for further processing at a recyclables processing center.

Buy-back recycling centers are often processing centers, as well. Some buy-back centers identified in the two county area are also recyclables processing centers. The Dillon stores are exceptions; aluminum cans purchased by the stores are back-hauled to a processing center in Hutchinson, KS.

A large percentage of the recyclable materials collected in the two counties are taken outside of the region for processing. The following collection firms have their own recyclables processing centers outside of the region: Batliner, Jefferson Smurfit, Leavenworth Recycling, Packaging Corporation of America, Resource Control, and Weyerhauser. Central Fibers is an end-user of recovered newspapers.

Table 3-4

DROP-OFF AND BUY-BACK RECYCLING CENTERS LOCATED IN DOUGLAS AND JEFFERSON COUNTIES

Drop-off Centers	Material Accepted
Douglas County	
City of Lawrence	Newspapers
City of Lawrence	Leaves, grass, holiday trees
Dillon Stores	Plastic milk and soda bottles, plastic & paper sacks, polystyrene
Kansas University	Newspapers, aluminum cans
Lawrence High School	Newspapers
Mail Box	Polystyrene peanuts
Pack and Ship Express	Polystyrene peanuts
Wal-mart	Newspapers, mixed paper, corrugated containers, office paper, magazines, plastic containers, polystyrene, aluminum cans, steel cans, glass food containers
Tuff (Eudora)	Inactive
Ottawa Sanitation	Newspapers, plastic containers, steel cans, aluminum cans
Jefferson County	
Pat's Thriftway	Corrugated containers
Glacial Hills Oskaloosa	Inactive
Glacial Hills Valley Falls	Inactive
Ozawkie Recycling	Inactive
Buy-back Centers	**Material Accepted**
Douglas County	
Dillon Stores	Aluminum cans
Kaw Motors and Salvage	All metals
Lonnie's Recycling	All metals
Jefferson County	
Robbins Salvage	All metals

Source: Franklin Associates, Ltd.

Composting in the two counties is limited to leaves and grass clippings. The City of Lawrence has a compost site on East 8th Street. The materials composted are collected either through the curbside program or at the Saturday drop-off located at Centennial Park. The University of Kansas composts leaves and grass clippings on University ground. The landscaping department bags approximately 1 mowing day out of 5, leaving the majority of the grass clippings on the ground.

The yard trimmings collected by the City are composted at the city owned site by open windrow technology. The City's finished compost is used as a soil conditioner for City landscape projects and the University's is used on University grounds.

Households Hazardous Waste Facilities

The collection of household hazardous waste (HHW) in the study area is limited to Douglas County. The HHW facility located at 711 East 23rd Street is open to Douglas County residents only. Currently the facility is open one Saturday a month. The materials accepted are listed in Table 3-5. In 1994, 8.3 tons of hazardous materials were collected at the facility.

Table 3-5

Household Hazardous Wastes Accepted By The Lawrence Facility

Automobile Products	motor oil, fuel, transmission fluid, antifreeze, batteries, brake fluid, etc.
Household Products	ammonia based cleaners, bleach, disinfectants, drain cleaners, general purpose cleaners, oven cleaners, pool chemicals, photo chemicals, etc.
Home Maintenance/ Improvement Products	oil or water based paints, paint stripper, stains, finishes or preservatives, thinners and turpentine, etc.
Pesticides	ant and roach killers, arsenicals, botanicals, carbonates, chlorinated hydrocarbons, herbicides, organo-phosphates, rat and mouse poisons

Source: City of Lawrence
"Environmentally, Lawrence Moves Forward!"

Landfills

Landfilling is the principal means of solid waste disposal in Douglas and Jefferson Counties. One sanitary landfill licensed to receive all non-hazardous solid waste and four demolition landfills are currently in operation in the two counties; the demolition landfills are all in Douglas County. Two landfills outside of the planning region were identified as receiving solid waste from Douglas and Jefferson Counties. Table 3-6 lists the area landfills receiving waste from Douglas or Jefferson Counties.

Sanitary Landfills accept MSW, construction & demolition waste, agricultural waste, non-hazardous industrial waste, and wastewater treatment plant sludge. The three sanitary landfills in Table 3-6 are estimated, at the current disposal rates, to have capacity well above what will be necessary to meet the needs of Douglas and Jefferson Counties over the next 20 years. The Hamm Landfill takes in approximately 750 tons per day average over 6 days per week. The estimated future capacity of the Hamm Landfill at this daily rate is 250 years. However, some additional tonnage is expected from the City of Olathe later in 1995 and other quantities are being sought. Rolling Meadows accepts approximately 1,000 ton per day and has a special use permit with an expected life of 90 years. The Johnson County Landfill accepts >3,000 tons per day and is currently permitted for 15 years.

Construction and demolition landfills accept C&D waste only. The C&D landfills in Douglas County may accept concrete and masonry waste but are not allowed to dispose of wood wastes and certain other wastes from buildings.

On-site industrial monofills are landfills that are permitted by the State to accept only one type of waste. One mono-fill was identified in Douglas County; no mono-fills were identified in Jefferson County.

Table 3-6

AREA LANDFILLS

Sanitary Landfills	Location
Hamm Landfill	Jefferson County, KS
Johnson County Landfill	Shawnee, KS
Rolling Meadows Landfill	Topeka, KS

Construction and Demolition Landfills	Location
Bernard Landfill	Douglas County, KS
Aldrich Landfill	Douglas County, KS
Snodgrass Landfill	Douglas County, KS
Dunbar Landfill	Douglas County, KS

On-site Industrial Mono-fills	
KPL Power Plant	Douglas County, KS

Chapter 4

COSTS OF EXISTING WASTE MANAGEMENT

INTRODUCTION

Current solid waste management costs estimated for off-site disposed solid wastes generated in Douglas and Jefferson counties are presented below. Costs are presented for residential and non-residential municipal solid wastes (MSW), construction/demolition debris, non-hazardous industrial process wastes and municipal wastewater treatment sludge. Costs for other solid wastes identified in the study were not developed. Some of these wastes, such as street sweepings and trees and brush from clearing work, are generated in comparatively small quantities and have little effect on total waste management costs. Combustion residue from the KPL power plant near Lawrence is disposed in large quantities but is landfilled at the site where generated.

Costs for separate collection and composting of leaves and grass in Lawrence were estimated, as well. These costs are a significant part of total residential MSW management costs in Lawrence. No estimates were made of the costs of operating the drop-off recycling programs.

The solid waste management costs shown in this chapter were largely determined from information provided by the following sources:

- City and county officials in Douglas and Jefferson Counties
- Records from the Lawrence Sanitation Department
- Solid waste management studies conducted for others

The cost estimates are presented below for each waste stream on a per ton disposed or recovered basis; annual costs are also addressed. Household costs are shown for those households with separate (individual) collection service.

MUNICIPAL SOLID WASTE

MSW is generated primarily from residential, commercial and institutional sources. A small amount of MSW is from industrial sources, which generate some packaging waste, lunchroom wastes, etc. The discussion on MSW management costs is divided into residential and non-residential sources since the methods of waste collection are different for each.

Residential MSW

Most residential MSW is generated from households that have individual (separate) collection service. Collection of MSW from these households typically involves a monthly charge to each household to cover the cost of collection, transportation and disposal. Households that receive separate collection of certain wastes for recycling/composting are charged for that service, as well.

Monthly charges to households in Douglas and Jefferson Counties receiving individual waste collection—primarily single-family households—are shown in Table 4-1. Except for Lawrence, Meriden, and Perry, the charges shown in Table 4-1 are for trash/refuse and bulky waste collected for disposal. Lawrence households receive both trash and bulky waste collection and separate collection of leaves and grass for composting for the $9.23 per month charge. Meriden and Perry households receive only trash/refuse collection for the charges shown; they pay extra for collection of disposed bulky wastes.

The monthly charges shown in Table 4-1 range from $5.45 to $10.40 per household. However, households in most of the cities in the two counties pay around $8.00 to $9.00 per month for collection service. Some households in the unincorporated areas also have waste collection service and pay similar costs. Weighted average household charges in Douglas County cities (excluding Lawrence) and Jefferson County cities are just under $8.00 per month in each county. This translates to $78 per ton of household MSW disposed in Douglas County cities and $88 per ton in Jefferson County cities based on estimates of MSW disposed.

Household costs for collection of trash and bulky waste and separate collection of leaves and grass clippings in Lawrence were estimated as higher than the current household charge. Total monthly costs for these services were calculated at about $10.40 per household ($91 per ton) based upon City budget projections for 1995 and data on occupied households. Estimated quantities of leaves and grass plus cost data from the City and another study (4-1) were used to estimate monthly yard trimmings program costs at about $2.50 per household ($76 per ton). Deducting this figure from the total household cost estimate leaves $7.90 per household per month for trash and bulky waste collection. The trash and bulky waste collection cost equates to $97 per ton for estimated quantities collected. This is higher than corresponding costs in the other cities because of smaller quantities collected per household. If the leaves and grass in Lawrence were collected (as trash) for disposal as in the other cities, trash and bulky waste management costs would be expected at about $80 per ton; corresponding household costs would be just over $9.00 per month.

Less waste is generated in households located in apartment complexes and other multi-family housing where individual household waste collection does not exist. Disposed MSW from these households is usually collected from large containers used by several or all households in a multi-family complex. Multi-family households are usually smaller and generate little yard trimmings. MSW from these households is frequently considered commercial waste due to the way it is collected. However, MSW from multi-family housing may represent 10 to 15 percent of total residential MSW. Because it is often collected in small dumpster containers, trash from multi-family housing is reported to be nearly as expensive per ton to collect as that from individually collected households (4-2, 4-3).

Some households in Lawrence pay for separate curbside collection of recyclables. Two private haulers offer this service and charge from $3.30 to $4.95 per household per month. In addition, numerous locations exist in Lawrence where household recyclables can be taken. Costs for these drop-off operations were not determined.

Table 4-1
HOUSEHOLD SOLID WASTE COLLECTION CHARGES
(1995)

DOUGLAS COUNTY CITIES	CHARGE ($/household/month)
Baldwin City	$8.05
Eudora	$7.50
Lawrence	$9.23
Lecompton	$8.15
JEFFERSON COUNTY CITIES	**CHARGE ($/household/month)**
McLouth	$6.25
Meriden	$9.00 - $10.40
Nortonville	$9.00
Oskaloosa	$8.00
Ozawkie	$8.00
Perry	$8.00
Valley Falls	$5.45
Winchester	$9.00

Source: Franklin Associates, Ltd.

Non-residential MSW

Most non-residential MSW is from wholesale and retail establishments as well as offices and institutional establishments. Costs for collection of MSW to be disposed from these sources vary widely depending upon the quantities collected. Establishments with a single small container emptied once per week may be charged well over $100 per ton. Conversely, the charge for collecting, hauling and disposing of waste from a 40 cubic yards roll-off container may be between $30 and $40 per ton.

Data from the City of Lawrence were used to estimate costs for management of disposed non-residential MSW from the two counties. An average cost of $98 per ton was determined from City budget projections after deducting estimated costs for other waste streams also included in the budget. While this estimate is higher than often found in larger metropolitan areas, it is believed to reflect smaller business establishments more typical of the community size.

Collection and Transportation Versus Disposal

Costs for management of disposed MSW may be divided between collection, transportation, and disposal. Disposed MSW from Douglas and Jefferson Counties goes to landfills. Most is taken to the Hamm Landfill in Jefferson County where the tipping fee is $19.65 per ton including the state fee of $1.50 per ton.

Subtracting the landfilling costs for the disposed MSW from total management costs provides estimates of the costs of collecting and transporting these wastes. Thus, collection and transportation costs for disposed residential MSW from Lawrence is estimated at 80 percent of total management costs. Corresponding estimates for other Douglas County cities and Jefferson County cities are 75 percent and 78 percent respectively. For disposed non-residential MSW, collection and transportation is also about 80 percent of management costs.

Summary of MSW Costs

A summary of estimated MSW management costs for landfilled/disposed MSW from Douglas and Jefferson Counties is shown in Table 4-2. Costs are shown in dollars per ton for both residential and non-residential MSW. Since many households in the unincorporated areas of both counties do not have trash collection service, it is difficult to estimate total annual costs for management of disposed MSW. However, if all households had collection service, total annual costs for management of disposed MSW would be over $5 million in Douglas County and

approximately $0.7 million in Jefferson County. Approximately $0.6 million annually is estimated for management of leaves and grass collected and composted by the City of Lawrence.

Table 4-2

ESTIMATED MANAGEMENT COSTS FOR DISPOSED MSW FROM DOUGLAS AND JEFFERSON COUNTIES (1)(2)

	DOUGLAS COUNTY		JEFFERSON COUNTY
	Lawrence ($/ton)	Other Cities ($/ton)	Cities ($/ton)
Residential MSW	97	78	88
Non-residential MSW	98	98	98

(1) Weighted average cost per ton estimates
(2) Cost estimates for non-residential MSW are based on data for Lawrence

Source: Franklin Associates, Ltd.

OTHER SOLID WASTES

Off-site disposal of construction and demolition (C&D) debris, municipal wastewater treatment sludge and non-hazardous industrial process waste also involves significant costs. The estimated costs of managing these waste streams from Douglas and Jefferson Counties is shown in Table 4-3.

The per ton cost shown for each waste stream was based largely upon cost data from the City of Lawrence. Charges reported by the City for collection of C&D debris and industrial process wastes were the initial basis of cost estimates for these waste streams. Wide variances in landfill charges for C&D debris was factored into the estimate for this waste. Contract costs for off-site landspreading of sludge from the Lawrence wastewater treatment plant constitute the main cost for disposal of this waste stream. Sludge from the Baldwin wastewater treatment plant is landspread also.

Both the costs per ton and total costs shown for management of these other solid wastes are substantially below those for MSW. As with MSW, wide variances in site specific costs may occur depending upon quantities

collected and other factors. The costs reported in Table 4-3 represent weighted average estimates and do not represent the cost of a site specific waste.

Table 4-3

ESTIMATED MANAGEMENT COSTS
FOR OFF-SITE DISPOSED OTHER SOLID WASTES
FROM DOUGLAS AND JEFFERSON COUNTIES

	Estimated Quantities Disposed Off-site (annual tons)	Average Cost Per Ton (1) (dollars)	Total Annual Costs (million dollars)
Construction and Demolition Debris	18,100	31	0.56
Non-hazardous Industrial Process Wastes	14,900	49	0.73
Municipal Wastewater Treatment Sludge	53,000 (2)	8	0.42
Totals	86,000	20	1.71

(1) Weighted average costs per ton estimates
(2) Reflects wet weight of sludge, which is mostly from the Lawrence and Baldwin wastewater treatment plants and is largely disposed through land application. Dry weight is approximately 1,775 tons per year.

Source: Franklin Associates, Ltd.

Chapter 4

REFERENCES

(4-1) Franklin Associates, Ltd. *The Role Of Recycling In Integrated Solid Waste Management To The Year 2000.* Prepared for Keep America Beautiful, Inc. September, 1994.

(4-2) Communication with Browning-Ferris Industries representative. Southwest Region, Houston, Texas. October, 1991.

(4-3) Communication with Laidlaw Waste Systems, Inc. representative. Oklahoma City, Oklahoma, October, 1991.

Chapter 5

LEGISLATIVE/REGULATORY REVIEW

INTRODUCTION

Federal, state, and local legislative and regulatory actions impact current and future SWM in Douglas and Jefferson Counties. The Objective of this chapter is to review these actions so that they may be accounted for in the planning process. The review included the following:

Federal

- The Resource Conservation and Recovery Act
- The Clean Water Act
- The Clean Air Act
- Intermodal Surface Transportation Efficiency Act

State

- House Bill No. 2801
- Kansas Recycling Act SB 310
- Kansas Hazardous Waste Management Regulations

County/Municipal

- Local Ordinances and Codes.

FEDERAL

The Resource Conservation and Recovery Act (RCRA) was enacted by Congress in 1976 and modified in 1984. The objectives of this act as stated in Section 1003 are to promote the protection of health and the environment and to conserve valuable material and energy resources. RCRA is divided into 9 subtitles. Relevant to this study are Subtitle C Section 3014—Restrictions on recycled oil and Subtitle D—State or Regional Solid Waste Plans Sec. 4001 through Sec. 4010.

Section 3014 of RCRA requires EPA to establish standards applicable to recycled used oil. Section 3014 was added to RCRA by the Used Oil Recycling Act of 1980. The Hazardous and Solid Waste Amendments of 1984 altered the language of RCRA Section 3014 to direct the promulgation of regulations as may be necessary to protect human health and the environment from hazards associated with recycled oil. In response to these directives the EPA promulgated a final listing decision for used oils that are recycled and simultaneously promulgated standards for management of used oil under RCRA Section 3014. Publication of the final rule is in the Federal Register September 10, 1992.

EPA determined that recycled used oil does not have to be listed as a hazardous waste since the used oil management standards promulgated are adequate to protect human health and the environment. These standards apply to used oil generators, transporters, processors and re-refiners, burners, and marketers (effective March 8, 1993).

The management standards contain basic, good housekeeping requirements for the management of used oil. These standards apply to do-it-yourself (DIY) generated used oils only when these used oils are collected and aggregated. The oils may be collected and aggregated at individual privately-owned or company-owned service stations with DIY oil collection programs, auto centers or other state or local government-approved, community-based used oil collection centers (5-1).

The objectives of Subtitle D (Sec. 4001) are: (1) to assist in developing and encouraging methods for the disposal of solid waste which are environmentally sound and which maximize the utilization of valuable resources including energy and materials that are recoverable from solid waste, and (2) to encourage resource conservation. Sections 4002—4010 address the following:

- Federal guidelines for plans
- Requirements for approval of plans
- Criteria for sanitary landfills
- Upgrading of open dumps
- Procedure for development and implementation of State plans
- Approval of State plan; Federal assistance
- Federal assistance
- Rural communities assistance
- Adequacy of certain guidelines and criteria.

In response to Sec. 4004—Criteria for sanitary landfills, EPA completed a study on the adequacy of the existing criteria to protect human health and the environment from subtitle D facilities. On October 9, 1991, the EPA promulgated revisions to the Criteria for Classification of Solid Waste Disposal Facilities and Practices set forth in 40 CFR part 257. The rule also added a new part 258, which revised minimum federal criteria for municipal solid waste landfills including:

- Location restrictions
- Facility design and operating criteria
- Ground-water monitoring requirements and corrective action requirements
- Closure and post-closure care requirements
- Financial assurance requirements.

The effective date of the final rule is October 9, 1993, except subpart G of part 258 which had an original effective date of April 9, 1994. The effective date has been pushed back by EPA to April 9, 1996 (5-2). Subpart G—Financial assurance criteria addresses financial assurance for closure, for post-closure care, and for corrective action. These criteria do not apply to MSW landfill units that stopped receiving waste before October 9, 1991. MSW landfill units that received waste after October 9, 1991, but stop receiving waste before October 9, 1993, are exempt from all the requirements of part 258, except the final cover requirements. The criteria apply to new MSW landfill units, existing MSW landfill units, and lateral expansions receiving waste on or after October 9, 1993.

Clearly, the new landfill management regulations will impact Douglas and Jefferson Counties. The major impact will be from the closure of non-Subtitle D landfills in Kansas. An increase in the amount of MSW being disposed in the Hamm Landfill in Jefferson County will increase truck traffic through the two counties. Solid waste management costs may also increase due to the legislative requirements.

The Clean Water Act (CWA) Section 318, 402, and 405 contain provisions for the National Pollutant Discharge Elimination System (NPDES) permitting program. The system is designed to improve water quality by requiring compliance with minimum discharge standards. The regulations require permits for landfills and land application sites that receive or have received any industrial wastes including those that are subject to regulation under subtitle D of RCRA. Specifically the permit is for the storm water runoff collection system (i.e.; any channel, pipe, ditch, tunnel etc.) which discharges into a managed water area. Permits are also required for facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards (Standard Industrial Classification 5015 & 5093) which discharge pollutants into a managed water area (5-3). Also any landfill that discharges leachate generated and treated onsite must obtain an NPDES permit based on the definition of a point source, Section 122.2.

The Clean Air Act (CAA) governs air pollution prevention and control. Of importance to this review is the New Source Performance Standards (NSPS) published in the Federal Register February 11, 1991. The standards regulate emissions from new municipal solid waste incinerators. The regulations will affect new MSW incinerators with the capacity to combust ≥250 tons per day. At this time there are no MSW incinerators with ≥250 ton per day capacity in Kansas.

In response to Sections 111(b) and 111(d) of the CAA, the EPA published proposed standards and guidelines for air emissions from new and existing MSW landfills in the Federal Register May 30, 1991. The final regulations, if passed, will require landfills to achieve and maintain

emissions at an acceptable level. MSW landfills emitting greater than 150 megagrams per year (approximately 167 tons per year) of nonmethane organic compounds would be required to design and install gas collection and combustion systems.

MSW landfills with a maximum design capacity of 100,000 megagrams (111,000 tons) or more will be required to calculate an annual nonmethane organic compounds emission rate. Landfill gases consist of methane and carbon dioxide, with trace amounts of more that 100 different nonmethane organic compounds. The primary reasons for regulating the nonmethane organic compounds are their impact on ozone formation, the fact that some are known carcinogens (e.g. benzene), and their potential explosion hazards. Final emission limits would be established through state plans, which require EPA approval.

MSW landfills with design capacities less than 100,000 megagrams will only be required to file an initial design capacity report, and to report any changes in capacity (5-4).

The emission level of 150 megagrams per year of nonmethane organic compounds and the monitoring requirement based on a design capacity of ≥100,000 megagrams are currently being evaluated in response to public comment. Final ruling on these standards and guidelines has not been published (5-5).

The Intermodal Surface Transportation Efficiency Act PL#102-240, 1991, Section 1038 addresses the use of recycled paving material. Beginning January 1, 1995, each State must certify that they have met the minimum utilization requirement for asphalt pavement containing recycled rubber. The minimum utilization requirement as a percentage of the total tons of asphalt laid in the State and financed in whole or in part by Federal assistance shall be:

- 5 percent in 1994,
- 10 percent in 1995,
- 15 percent in 1996,
- 20 percent in 1997 and each year thereafter.

Substitution of recycled rubber with other recycled materials, up to 5 percent, will be allowed, after studies specified by the law have determined which materials are appropriate substitutes (5-6). Amendments to the last two Department of Transportation appropriation bills have kept Section 1038 from taking effect. The amendments will delay implementation until 1997 (5-7).

CURRENT FEDERAL LEGISLATION

Waste flow control has been a legislative priority in 1995. May 1994, the U.S. Supreme Court struck down local governments' authority to maintain control over the flow of waste leaving the community for cheaper disposal sites. According to the decision, only Congress has the authority to regulate interstate commerce in solid waste.

The Senate passed S.534 authorizing "grandfathered" flow control laws to continue until existing debt is repaid, contracts end, or the useful life of the facility is over. A similar bill is in subcommittee in the House of Representatives (5-8).

Waste flow control affects Douglas/Jefferson Counties in two areas. The two counties will have no control over the movement of materials in or out of the region when private haulers or facilities are utilized. As long as all regulations are adhered to, the region has no control over the amount or origin of solid waste accepted at the Hamm Landfill.

If private haulers are used for collection of solid waste, the final disposition of that waste is determined by the hauler. The same can be assumed for recyclables collected in the region. Unless Congress permits local flow control, private haulers can not be forced to use a regional materials recovery facility. Requiring the use of a regional facility as a condition of contract award is currently being challenged under interstate commerce laws (5-9).

STATE

Kansas Tipping Fee/Grants Bill (HB 2036) was signed into law April 22, 1995. The provisions of the bill include:

- reduction in the tipping fee collected on solid waste disposed in the State to $1.00 per ton effective July 1, 1995
- establishment of 5 new solid waste grant programs and the local financial match for all grants
- authorization of grants to private entities in competitive grants
- requires KDH&E to report solid waste fee fund activity in January 1998
- caps KDH&E solid waste fee-funded employees at 44
- modifies the household hazardous waste statutes to allow conditional small quantity generators (CESQG)
- modified the definition of construction and demolition waste.

KDH&E presented the following information to local officials May 16, 1995. The *integrated solid waste management base grant program* is a one year transition grant program available to regions actively involved in SWM planning. The program assists regions in completing the transition from the

planning process and dealing with new landfill regulations and SWM plan implementation.

The *competitive plan implementation grant program* will award funds for efficient and cost effective projects that help develop an integrated solid waste management system which incorporates recycling, source reduction, waste minimization and public education. Public and private entities are eligible for the grant program. An updated SWM plan must be approved by KDH&E before competitive plan implementation grant applications can be submitted.

HB 2036 provided for increased funding for the *household hazardous waste grant program.* The local match was also reduced to 40% for fiscal year 1996. This program will assist local governments in the safe disposal of household hazardous waste, public education, and the development of local collection programs. Improvements to an existing household hazardous waste facility/program are eligible for funding. Existing household hazardous waste operating expenses are ineligible.

The *agricultural pesticide collection grant program* will begin in fiscal year 1996. This program will assist local governments in the development of temporary agricultural pesticide collection and disposal programs. This is a temporary program funded by the solid waste tipping fee fund.

Assistance to local governments through the *conditionally exempt small quantity generator (CESQG) grant program* will help develop and implement a CESQG waste program effective fiscal year 1996. The CESQG grant program will be managed through KDH&E permitted HHW facilities.

Kansas House Bill No. 2801 amended Kansas Statutes Annotated Chapter 65—Public Health July 1, 1992. K.S.A. 63-3505 requires all planning regions to complete a workable solid waste management plan and describes content requirements for these plans. K.S.A. 63-3505 states that the goal of solid waste management (SWM) should be to prevent pollution, conserve resources, and properly dispose of any remaining waste in an economically and socially appropriate manner.

The SWM plan will provide a path for the each county or group of counties cooperating in a regional plan towards improved waste management practices. A 10 year minimum planning period is to be presented. A solid waste management committee, selected from the planning region, will develop and manage the SWM plan.

Committee Membership. Subject to the requirements of the act stated below, the membership of the committee, the terms of committee members, the organization of the committee and selection of its officers shall be

determined by the planning region. The membership of the committee shall not exceed 30 members and shall include:

- Representatives of incorporated cities located in the planning region, equal to 5 members representing any cities of the first class, 3 members representing any cities of the second class and 1 member representing any cities of the third class
- One representative of unincorporated areas of the region
- Representatives of the general public, citizen organization, private industry, any private solid waste management industry operating in the region and any private recycling or scrap material processing industry operating in the region
- The recycling coordinator of the county or counties
- Any other persons deemed appropriate by the county or counties including, but not limited to, county commissioners, county engineers, county health officers and county planners
- members must be appointed by the county commissioners
- city members must be nominated by the mayor of the city represented.

Committee Functions. The principal function of the SWM committee is to prepare the SWM plan. The SWM committee is to develop, through the plan, an adequate and workable system of SWM for the entire planning area.

The SWM committee should identify the principal agencies or local officials which will be responsible for the coordination of the planning effort. They should suggest broad policies that should govern the implementation of the solid waste management plan. Other functions of the committee are to define and document the extent and nature of the problems to be resolved in the plan and to develop one or more methods for financing the operation of the SWM systems chosen to address these problems.

The SWM committee shall also review the plan at least annually and submit to the secretary of KDH&E any recommendations for revision of the plan At least every five years the SWM committee shall hold a public hearing on the plan and the future goals of solid waste management.

SWM Plan Criteria. The completed SWM plan should satisfy the following basic conditions:

- The agency and/or local official responsible for implementing existing and planned SWM systems should be defined
- The SWM plan must serve the residents of all townships and cities within the planning region
- The SWM plan must be compatible with the existing political structure of the planning area; not conflicting with other plans such as road and streets, health, and sewerage
- The SWM plan must take into consideration the ability of the implementing entities to finance the system
- The SWM plan should achieve the desired level of benefits to the citizens at a reasonable cost
- The SWM plan should be flexible to respond to changes in the wastes to be managed, to changes in management objectives, and to changes in technology over the lifetime of the plan
- The SWM plan must meet all federal, state, and local laws, rules, and regulations.

The SWM plan shall also consider the development of specific management programs for certain wastes, including lead acid batteries, household hazardous wastes, small quantities of hazardous waste, white goods containing chlorofluorocarbons, pesticides and pesticide containers, motor oil and yard trimmings.

The SWM plan shall utilize available resources both public and private. Additional financial, technical, and human resources needed to implement the plan should be addressed.

K.S.A. 2801 does not establish reduction/recycling goals for the region but allows the solid waste committee through the SWM plan to establish a schedule for the reduction of waste volumes taking into consideration the following:

- Source reduction
- Reuse, recycling, composting
- Land disposal.

Source: Kansas Solid Waste Management Planning Guidelines. February 1993. KDH&E staff.

Kansas Recycling Act (SB 310) addresses waste tire management and state procurement policy toward newsprint and high grade bleached printing and writing paper with a specified recycled paper content. Provisions of this act state that as of July 1, 1990:

- Waste tire storage sites must be permitted unless accumulation is for tire retreading
- Disposal of waste tires must be at a permitted site
- Disposal of whole waste tires in a landfill is prohibited
- With approval, whole tires may be used as a leachate collection system
- With approval, waste tires cut into sufficiently small parts can be used as daily cover material for a landfill
- An excise tax on retail sales of new tires at the rate of $.50 per tire sold which is credited to the waste tire management fund.

The legislation was amended in 1991 to establish 2 waste tire grant programs; abatement and base. Abatement grants are to be used to abate waste tire accumulations. Base grants are to be used to enforce laws relating to collection and disposal of tires, encourage recycling of tires, or develop and implement management plans for tires.

Kansas Hazardous Waste Management Regulations (Title 28, Article 31) address standards for generators of hazardous waste. Generators are classified based on the quantity of hazardous waste produced. The three classifications are; EPA generator, Kansas generator, and small quantity generator. Small quantity generator means any person who generates less than 25 kilograms of hazardous waste per month and who does not accumulate quantities greater than 1,000 kilograms at any time. Households are considered small quantity generators and do not fall under hazardous waste regulations. When a community provides a collection system for household hazardous wastes from small quantity generators, the community becomes either a Kansas generator or EPA generator depending on quantities collected and quantities accumulated before disposal. For example one vehicle battery weighs less than 25 kilograms but a collection of three batteries is regulated under hazardous waste management standards.

COUNTY/MUNICIPAL

County and City regulations providing for solid waste management and associated nuisances control were reviewed. The types of documents which exist (either on a County or Municipal level) to regulate solid waste include:

- resolutions
- agreements
- ordinances

- codes
- permit applications.

The documents were reviewed and determined to be conducive to cooperative actions where mutually beneficial. Deficiencies of city codes in the management of solid waste were identified.

Douglas County has three resolutions pertaining to solid waste management in the county. Resolution #72-24 August 23, 1972 provided for the adoption of the Douglas County Solid Waste Management Plan. The main areas of emphasis of the 1972 SWM plan were solid waste collection and disposal. Composting and recycling were examined but not considered feasible.

Resolution # 76-28 July 21, 1976 regulates solid waste management in the county. Minimum standards were set for the storage, collection, transportation, processing, utilization and final disposal of solid waste. Private solid waste haulers must be permitted and file a semiannual report listing names and addresses of all customers serviced. County residents in the rural areas are permitted to utilize rubbish on private property as a control method for soil erosion if such use does not create a public health hazard.

Home Rule Resolution #HR-86-9-10 September 26, 1986 addressed the problem of littering of roadsides in the unincorporated areas of the County. The resolution declared it unlawful for any person to operate a vehicle containing solid waste unless the solid waste is fully covered to prevent spilling, leaking, blowing or other loss of the solid waste.

Jefferson County Resolution August 24, 1973 provided for the adoption of the Jefferson County Solid Waste Management Plan. The main areas of emphasis of the SWM plan were similar to the Douglas County SWM plan; solid waste collection and disposal with composting and recycling not considered feasible.

Resolution June 25, 1976 provides minimum standards for the collection, transporting, processing, and disposal of solid wastes in the County. The resolution addresses illegal dumping and burning. An exclusion is provided to residents who deposit solid waste resulting from their own residential or agricultural activities onto the surface of land owned or leased by them.

An interlocal cooperative agreement between Douglas and Jefferson County Commissions for the development of coordinated solid waste planning was signed May 23, 1994. The stated goal of the agreement is to design an acceptable regional solid waste plan that will ultimately contain elements such as solid waste management, composting, recycling and other elements deemed locally necessary.

A previous intercounty agreement over the construction and maintenance of the access road to the Hamm landfill dated September 7, 1983 was entered into between Douglas and Jefferson Counties. It was agreed that a surcharge collected by Hamm Quarry, Inc. from the City of Lawrence and sent to Douglas County would be remitted to Jefferson County to be used to repair, maintain, improve or reconstruct the access road.

Municipalities in Douglas and Jefferson Counties were asked to provide a copy of the city codes or ordinances pertaining to the storage, collection, transportation, processing and disposal of solid waste. Also codes or ordinances addressing solid waste nuisances, especially open burning and illegal dumping were requested.

Some municipalities control solid waste collection and transportation through contracts or permits with private haulers. Nuisances are often covered in chapters different from solid waste (i.e., open burning may be addressed in the fire protection code).

Table 5-1 summarizes the information received from the 12 municipalities listed in column 1. The SWM chapters are listed in column 2. When nuisances are covered in chapters different from solid waste the applicable chapter is listed in column 3. Column 4 lists the specific section dealing with solid waste management or nuisances. The local documents reviewed are on file with the Douglas County engineer.

Two cities, Nortonville and Ozawkie, were identified as lacking city codes addressing solid waste management. The transportation of solid waste is not specifically address in the city codes for Baldwin City, McLouth, and Valley Falls. The hauler contract for Valley Falls specifies that the hauler transport solid waste in accordance with applicable federal, state, and local laws. Baldwin City and Nortonville have outdated codes pertaining to local landfills. Meridan city codes do not require a permit for solid waste haulers.

All of the other cities have adequate provisions in either their solid waste management regulations or other regulations (as listed in Table 5-1) to deal with solid waste nuisances and other solid waste management issues.

Table 5-1
MUNICIPAL CODES

1 City	2 SWM City Code	3 Other Applicable City Code	4 Section Reference	Date of Latest Revision	Contact Person Phone No.
Baldwin City	Chapter 15	Chapter 7 Chapter 8	Article 4, 5 Article 2 Article 2	Dec. 1994	Brian Wilcox City Admin. 594-6427
Eudora	Chapter 15		Article 3	1977	Joanne Becker 542-2153
Lawrence	Chapter 9	Chapter 9 Chapter 8	Article 4, 5 Article 2, 6 Article 2	1995	Bob Yoos Solid Waste Supt. 832-3032
Lecompton	Chapter 15		Article 4	1992	Laurie Milligan City Clerk 887-6407
McLouth	Chapter 15	Chapter 7	Article 3 Article 2	1984	Stella Luse City Clerk 796-6411
Meriden	Chapter 6	Chapter 6	Article 2 Article 3	Oct. 1993	Bill Dauber 484-3450
Nortonville		Chapter 3	Articles 1, 2, 3,5	Aug. 1982	Theresa Schrick 886-2060
Oskaloosa	Chapter 15	Chapter 7 Chapter 8	Article 5 Article 2 Articles 2, 2a	April, 1992	Pam Jackson 863-2651
Ozawkie		Chapter 4	Article 2	April, 1986	Caroline Holliday City Clerk 876-2550 876-2701
Perry	Chapter 15	Chapter 7 Chapter 8	Article 4 Article 2 Article 2, 2a	1990	Caroline Neal City Clerk 587-5613
Valley Falls	Chapter 8	Chapter 7 Chapter 8	Article 6 Article 3 Articles 2, 4	March, 1987	Brett Frakes 945-6612
Winchester	Chapter 15		Article 5	Dec. 1992	Pam Erhart 774-2922

Other Applicable City Code/Ordinances includes Health & Sanitation, Health & Welfare, Nuisance, Environmental & Health, Fire Protection Offense Code.
Source: Franklin Associates, Ltd.

Chapter 5

REFERENCES

5-1 *Federal Register*. September 10, 1992. Vol. 57, No. 176.

5-2 The Bureau of National Affairs, Inc. *Environment Reporter*. Current Developments. Vol. 25 Number 25 page 1220.

5-3 BNA 1992. The Bureau of National Affairs, Inc. May 29, 1992. EPA NPDES Permit Regulations.

5-4 *Federal Register*. May 30, 1991. Vol. 56, No. 104.

5-5 Telephone conversation with Dennis Doll. U.S. Environmental Protection Agency. July 1995.

5-6 Scrap Tire Management Council. Scrap *Tire Connection*. Summer 1992.

5-7 Recycling Research Institute. *Scrap Tire News*. June 1995.

5-8 National Association of Counties Fact Sheet. *1995 Legislative Priorities Waste Flow Control*. June 1995.

5-9 Discussion during the Environment, Energy and Land Use Steering Committee meeting July 22, 1995. National Association of Counties Annual Conference. Atlanta, Georgia.

CHAPTER 6

SOLID WASTE MANAGEMENT NEEDS AND GOALS

INTRODUCTION

An important step in the planning process is choosing the plan objectives/goals. The selected goals are a function of identified SWM needs or problems, legislative requirements and community desires with respect to services. Factors used to arrive at goals for Douglas and Jefferson Counties included the following:

- review of existing SWM practices
- review of federal and state legislation and regulations
- review of local ordinances
- discussions with the SWM Planning Committee
- discussions with county and city officials
- public meetings (one in each county)

Some goals—for example, the goal setting a specific recycling level—were also influenced by technical and economic considerations.

The SWM goals selected for the two-county Region are discussed below along with the reasons they were chosen. These goals were the basis for the SWM scenarios selected for technical and economic/cost comparisons in the two counties. The descriptions of these scenarios and the results of the technical and economic evaluations of each are presented in succeeding chapters.

LONG-TERM DISPOSAL CAPACITY

Regardless of the levels of source reduction and recycling achieved in the two counties, long-term disposal capacity—specifically, long-term landfill capacity—will be needed. The availability of the Hamm Landfill in Jefferson County and other large landfills in adjacent counties both east and west of Douglas County appears to provide this assurance. The Hamm Landfill, Rolling Meadows Landfill (in Shawnee County) and the Johnson County Landfill all report many years of remaining capacity at current waste disposal rates. All are privately owned landfills and accept waste from counties beyond where they are located.

REASONABLE COSTS FOR SOLID WASTE MANAGEMENT

Much of the two-county Region is rural in nature and would not be amenable to substantial increases in SWM costs. In addition, the success of

the drop-off recycling programs in Lawrence makes it more difficult to add a substitute curbside recycling program if the cost would be significantly higher.

INCREASED WASTE COLLECTION SERVICE IN RURAL AREAS

Only about 25% of unincorporated households in Jefferson County have waste collection service. Although data was not available to determine a corresponding figure for Douglas County, many unincorporated households there also do not have collection service. This increases open dumping —particularly of large bulky items.

Households outside Lawrence do not have local outlets for collection of household hazardous wastes (HHW). Households in Douglas County may use the HHW facility in Lawrence during scheduled collections.

Drop-off centers for household recyclables are not available in Jefferson County. Neither are households in the County using curbside recycling services.

INCREASED DIVERSION OF SOLID WASTE FROM DISPOSAL

Kansas House Bill 2801, in a revision of K.S.A. 3406, states that every County Solid Waste Management Plan shall: *Establish a schedule for the reduction of waste volumes taking into consideration the following: (A) Source reduction; (B) reuse, recycling, composting; and (C) land disposal.* It is clear from this directive that a goal and schedule for diverting solid waste from disposal must be included in a SWM plan.

The estimated effects of additional recycling programs considered for the two-county Region are shown in Chapter 8. A drop-off recycling program in Jefferson County and a Lawrence program to collect non-residential paper are projected to increase total MSW recovery for recycling (including composting) in the Region from 23.5 to about 25 percent. Substituting curbside recycling for drop-off recycling in all the cities should increase MSW recovery to approximately 28 percent. Thus, an initial goal of 25 percent diversion of MSW from disposal by year 2000 is considered reasonable for the Region. A higher goal may be considered later if curbside recycling is implemented.

Chapter 7

SOLID WASTE MANAGEMENT SCENARIOS REVIEWED

INTRODUCTION

SWM scenarios were formulated to consider for future use in the Douglas/Jefferson Counties Region. Two new scenarios were developed for comparison with existing SWM in the two counties. The new scenarios include alternatives designed to meet the goals described in the previous chapter. They focus on management of MSW and address all elements of SWM including waste storage, collection and transport, processing and final disposition.

The first scenario is continuation of the existing system. The new scenarios each add alternatives beyond those in the existing system. Scenario 2 includes increased collection of household wastes and recyclables in areas outside Lawrence and added collection of non-residential recyclables in Lawrence. Scenario 3 substitutes curbside recycling for drop-off recycling in all the cities in the two counties.

Each of the scenarios is described below.

SCENARIO 1—EXISTING SYSTEM

Current waste management practices in Douglas and Jefferson Counties are described in Chapters 2 and 3. MSW management under this system served as the base case from which to compare costs and effectiveness of alternative waste management scenarios for future use in the Counties.

SCENARIO 2—INCREASED RURAL WASTE & RECYCLABLES COLLECTION; INCREASED NON-RESIDENTIAL RECYCLABLES COLLECTION IN LAWRENCE

This scenario would provide drop-off locations for household refuse and bulky wastes, household hazardous wastes (HHW), and household recyclables from areas outside Lawrence. Increased recovery of non-residential recyclables from Lawrence would be the other change from the existing system of SWM in the two-county region.

In each County, four or five locations would be established where residents outside the incorporated cities could take trash and bulky items (including appliances, tires and furniture). These drop-off sites would be fenced and would be staffed by an attendant to eliminate littering and improper dumping at the sites. Collected trash and certain bulky items would be hauled to a landfill. Large "white goods" appliances would be taken to

scrap dealers/processors for recycling. Tires would be taken to a processor to prepare them for recovery or disposal. To ensure that only non-city households use the waste drop-off sites, all cities in the Counties would need to provide (by contract or otherwise) for regular collection of household refuse and bulky items within their jurisdictions.

Periodic HHW collections would be arranged in Oskaloosa and Valley Falls in Jefferson County and Baldwin and Eudora in Douglas County. All County households would be encouraged to bring HHW to one of the two specified HHW drop-off locations on their respective days of collection or to the HHW facility in Lawrence. Collected HHW from the four outlying cities would be taken to the HHW facility in Lawrence prior to final disposition.

A mobile drop-off center for household recyclables would also be provided in Oskaloosa and Valley Falls. The recyclables drop-off center would only be available at specified times—perhaps on alternate Saturdays in the two cities. All County residents would be encouraged to take their recyclables to this or other recycling centers. An attendant would need to be available to monitor and direct incoming materials. Collected recyclables would be taken to a recyclables processing facility.

Existing recyclables drop-off centers in Baldwin and Lawrence would be used by Douglas County households.

In addition to the above, efforts would be undertaken to increase recovery of recyclable waste paper from non-residential sources in Lawrence. Drop-off locations would be established along with a recyclables processing center to handle collected corrugated and/or office paper.

SCENARIO 3—CURBSIDE RECYCLING INSTEAD OF DROP-OFF RECYCLING

This scenario would be the same as Scenario 2 except curbside recycling would be substituted for drop-off recycling. All the cities in the two counties would offer curbside collection of source-separated household recyclables. No city or county-provided drop-off locations for household recyclables would be available. Privately owned and operated recyclables buyback centers, drop-off centers and scrap dealers would continue to exist in the two Counties as dictated by market demand.

The respective drop-off operations for HHW and household refuse and bulky wastes generated outside the cities, as proposed in Scenario 2, would also be included in this Scenario. Increased recovery of waste paper from businesses and other non-residential sources in Lawrence would be included, as well.

As noted from the above descriptions of Scenarios 2 and 3, combinations of new waste management alternatives are included in each. However, any of the alternatives in either scenario may be selected for use independent of the other alternatives. Thus, some of the comparative cost data presented in Chapter 9 examines the effect of each alternative in Scenarios 2 and 3.

Chapter 8

TECHNICAL COMPARISON OF SCENARIOS

INTRODUCTION

The results from a technical comparison of the three scenarios evaluated for potential use in Douglas and Jefferson Counties are presented in this chapter. The technical criteria used in the comparison are:

- system compatibility,
- environmental effects,
- system reliability,
- land use requirements,
- resource conservation,
- facility siting,
- regulatory requirements,
- implementability, and
- effectiveness in meeting goals.

SYSTEM COMPATIBILITY

System compatibility refers to how well the various components of the waste management system work with each other and how well the system fulfills state and local requirements. For example, a system is incompatible if more than one component of the system requires the same portion of the waste stream for successful operation. An example of an incompatible system would be one that included a waste-to-energy facility and a recycling program both designed to receive the same wastes.

The system alternatives (within each scenario) analyzed for Douglas and Jefferson Counties were designed to be compatible with the waste stream and the needs of the Counties. Both of the new scenarios would include a higher recycling rate than the current system. All three scenarios would dispose of waste not recycled/composted by landfilling, which is the lowest-cost disposal option for the two Counties.

ENVIRONMENTAL EFFECTS

A complete environmental impact analysis for each of the scenarios was beyond the scope of the study. However, certain conclusions were drawn. Table 8-1 summarizes the comparisons of environmental effects as well as the remaining technical considerations. Scenarios 2 and 3 would divert more MSW from landfilling than the existing system (Scenario 1) which should result in less adverse environmental effects. This assumes that markets are available for the collected recyclables, thereby reducing the environmental

costs associated with the production of new products from virgin materials. Scenarios 2 and 3 also remove some household hazardous wastes from MSW and should reduce open dumping through the establishment of drop-off centers for waste from rural households.

SYSTEM RELIABILITY

The existing system is the most reliable scenario because of its simplicity. The added collections of wastes and recyclables under Scenarios 2 and 3 reduce the reliability of these scenarios compared to Scenario 1. However, the added services with these scenarios are based on proven technology and should not lead to serious reliability problems.

LAND USE

The greater quantities recovered for recycling under the new scenarios would decrease land use for disposal. Scenario 3, because of the addition of curbside recycling, would have the highest recovery rate and would divert the most waste from landfilling.

RESOURCE CONSERVATION

The new scenarios are judged to result in the greatest conservation of natural resources, since the recycled materials would reduce the amount of virgin resources required to manufacture new products. However, this savings would be somewhat offset by the added collection and transportation—and increased fuel use—associated with the new programs in these scenarios. Scenario 3 would result in the highest recycling level and should be the best of the three scenarios in conserving natural resources.

FACILITY SITING

No new siting needs within the planning time period are anticipated with continuation of the existing system. Neither the drop-off recycling program (in Scenario 2) or HHW program (in Scenarios 2 and 3) are expected to add siting needs. Both programs would rely on public/private parking areas during drop-off collections. Collected recyclables from the drop-off program would be hauled to an existing processor. HHW would go to the Lawrence HHW facility.

The rural waste drop-off centers included in Scenarios 2 and 3 could each require a site of one acre or more. In Scenario 3, the curbside recycling program would be expected to include a materials recovery facility (MRF) to process the collected household recyclables; a site in or near Lawrence for this facility is envisioned. Thus, siting requirements would be greatest with Scenario 3.

Table 8-1
TECHNICAL COMPARISON OF MSW MANAGEMENT SCENARIOS
FOR DOUGLAS/JEFFERSON COUNTIES

	Scenario 1 Existing System	Scenario 2 Existing w/Drop-Offs for Recyclables, Rural Waste, HHW	Scenario 3 Existing w/Curbside Recycling Plus Drop-Offs for Rural Waste, HHW
Environmental effects	Status quo	Improved	Improved
System reliability	Best	Good	Good
Land use	Status quo	Better	Best
Conservation of natural resources	Status quo	Better	Best
Facility siting requirements	Least	More (1)	Most (2)
Regulatory requirements	Least complex	More complex	Most complex
Implementability	Status quo	More difficult	Most difficult
Effectiveness in meeting goals:			
Disposal capacity assurance	Good	Good	Good
Waste management costs	Lowest	Higher	Highest
Improved rural waste collection	Status quo	Best	Best
Diversion of waste from disposal	Least	More	Most

(1) Four sites in each county of about one acre each projected for rural waste drop-offs.
(2) Four rural waste drop-off sites in each county plus materials recovery facility (MRF) site in Lawrence.

Source: Franklin Associates, Ltd.

REGULATORY REQUIREMENTS

Regulatory compliance increases in complexity with increasing use of waste management alternatives and facilities. New facilities and operations will require permits and adherence to regulatory standards. Since both of the new scenarios include new operations and facilities, both would be more complex than continuing only with the existing system. Scenario 3 would be the most complex because of curbside recycling and the need for a MRF.

IMPLEMENTABILITY

The ease or difficulty of implementing a SWM system/program must consider the potential political, social, and legal problems. Such problems often occur when establishing new SWM facilities. They may also be

significant when attempting to develop a regional approach that requires inter-governmental cooperation and, perhaps, the need for a regional authority. The HHW program (in Scenarios 2 and 3) and the curbside recycling program (in Scenario 3) would both require the use of a regional facility. The HHW program would rely on the existing Lawrence HHW facility for necessary storage (prior to disposition) of materials collected outside Lawrence. The curbside recycling program, as envisioned, would also be dependent upon establishing a MRF that would be available to all the cities in the two Counties.

Another factor in determining implementability is the comparative need for capital expenditures. Given two otherwise equal SWM systems with different capital costs, the system with the lowest capital cost will be the most acceptable.

Thus, both of the new scenarios would be expected to present implementation difficulties since both would require inter-governmental cooperation and initial capital expenditures. However, both requirements are greater with Scenario 3.

EFFECTIVENESS IN MEETING GOALS

With one exception, both of the new scenarios would be expected to better meet the two-County Region's SWM goals than the existing system. Continuing with the existing system is estimated as the least expensive approach for the Region. However, the new scenarios would provide improved rural waste collection service and would divert more recyclables and HHW from disposal.

A comparison of MSW recovery for recycling (including yard trimmings composting) under the existing system scenario and the new scenarios is shown in Table 8-2. Both of the new scenarios are shown to include more recovery than the existing system (Scenario 1). However, no increase in recovery would occur in Douglas County outside Lawrence with Scenario 2.

Scenario 3, with curbside recycling, would divert more recyclables than Scenario 2 but would likely be the most expensive scenario, as noted in Chapter 9. The gain in recovery shown with curbside recycling is not as much as might normally be expected because of the high level of participation in the existing drop-off recycling programs in Lawrence. In total, recovery for the two-county Region with Scenario 3 is shown at just over 28 percent versus about 25 percent with Scenario 2 and 23.5 percent currently. Lawrence would have the highest percentage recovery levels under all three scenarios. Use of Scenario 2 plus education programs to promote source reduction and

recycling measures should allow the Region to achieve a 25 percent diversion of MSW from disposal by 2000.

Table 8-2
ESTIMATED MSW RECOVERY WITH
CURRENT SYSTEM AND SCENARIOS 2 & 3
(1995)

	Scenario 1 Current system		Scenario 2 With Drop-Off Recycling(1)		Scenario 3 With Curbside Recycling(2)	
	(%)	(tons)	(%)	(tons)	(%)	(tons)
Jefferson County	3.0	258	4.6	394	7.6	642
Douglas County (Outside Lawrence)	5.5	516	5.5	516	8.0	744
City of Lawrence	28.7	18,852	30.3	19,852	33.8	22,152
Totals	23.5	19,626	24.9	20,762	28.2	23,539

(1) Includes mobile drop-off centers for household recyclables in Jefferson County and increased recovery of non-residential waste paper by City of Lawrence. Existing drop-off centers in Lawrence and Baldwin would remain as well.
(2) Replaces drop-off recycling with curbside recycling in all cities; also includes increased recovery of non-residential waste paper by City of Lawrence.

Source: Franklin Associates, Ltd.

Chapter 9

ECONOMIC/COST COMPARISONS OF SCENARIOS

INTRODUCTION

Cost analyses were developed to compare the proposed SWM alternatives in Scenarios 2 and 3 with existing practices (Scenario 1). Cost estimates were made for Jefferson County, the City of Lawrence, and Douglas County outside Lawrence. In addition, costs were developed for both city and rural households in the two counties. All elements of a SWM system were included in the cost estimates including collection and transportation, processing (including the processing of recyclables and composting of yard trimmings), and landfilling. Revenues from the sale of recyclables were included in the analyses as well. The costs are presented in dollars per ton and dollars per household for purposes of comparison.

The base year of the cost analyses is 1995, which is useful for purposes of comparison but not realistic in terms of implementation. A 20-year time frame from 1995 through 2014 was used for development of life cycle costs on selected parts of the scenario analyses.

While the costs presented here are judged to be representative estimates of those that would be experienced in the two counties, it should be understood that not all areas will be typical. For example, households located further from the proposed materials recovery facility (MRF), included with the curbside recycling alternative in Scenario 3, might pay more for curbside recycling than households that are closer.

Some assumptions about the proposed Scenarios 2 and 3 that were important in developing the cost estimates are the following:

Scenario 2 Assumptions

Mobile drop-off center for household recyclables:

- Contracted service for operation in Oskaloosa & Valley Falls on alternate Saturdays.
- 10% household participation in Jefferson County.
- Avoided refuse collection and disposal costs realized.
- Costs allocated to all Jefferson County households.

Household hazardous waste drop-off collections:

- Twice yearly collections in Oskaloosa, Valley Falls, Baldwin, Eudora.
- Less than 5% household participation in each County.
- Volunteers available for collection events.

- Costs allocated to all Jefferson and Douglas County households outside Lawrence.

Rural drop-off centers for refuse and bulky items:

- Four permanent convenience centers in each County.
- Each center staffed and open at least two days/week.
- County owned and operated centers with contracted waste hauling.
- Used by 60% of unincorporated households—i.e., 80% of the 75% of unincorporated households estimated to be without individual collection service.
- Costs allocated to all unincorporated (rural) households.

Increased recovery of non-residential waste paper in Lawrence:

- City collection of old corrugated containers (OCC).
- No cost impact on households.

Scenario 3 Assumptions

Curbside recycling in cities outside Lawrence:

- Contracted once per week collection of recyclables from single-family households.
- 75% household participation in both Counties.
- Unincorporated/rural households excluded.
- Processing of commingled recyclables at MRF in Lawrence.
- Avoided refuse collection and disposal costs realized.
- Current prices for recyclables (historically high).

Curbside recycling in Lawrence:

- City collection once per week of recyclables from single-family households.
- 85% household participation.
- Processing of commingled recyclables at MRF in Lawrence.
- Avoided refuse collection and disposal costs realized.
- Current prices for recyclables (historically high).
- May be accompanied by volume-based fees on refuse and yard wastes.

Household recyclables collected under the proposed drop-off program in Scenario 2 and the curbside programs in Scenario 3 were assumed to include: old newspapers; magazines; mixed paper; glass, steel and aluminum beverage and food containers; PET soft drink bottles; and HDPE bottles (natural and colored).

Information from several sources was useful in developing the cost estimates. These sources are referenced at the end of the chapter. Tables

containing more detailed capital and operating costs and life cycle costs necessary to the cost comparisons are found in Appendix D.

COST COMPARISONS

Scenario 1—Existing System

Existing system cost estimates for management of MSW from single-family city households in the two counties are found in Table 9-1. The cost estimates are for all generated single-family household MSW including that going to recyclables drop-off centers and separately collected yard waste composted in Lawrence. Thus, the cost per ton estimates do not correspond to those shown in Chapter 4 for only the disposed (i.e., landfilled) MSW from households.

Costs for unincorporated households are not shown since the majority of these do not have collection service. For rural households that do have waste collection, costs may be similar to somewhat higher than for city households. Higher costs will often occur where collection results in greater haul distances.

The costs shown in Table 9-1 are for households in Jefferson County, Douglas County outside Lawrence and the City of Lawrence, respectively. Monthly household costs in the Jefferson and Douglas County cities (outside Lawrence) are about the same at $7.75 and $7.78 per month for typical/average single-family households. The cost for Lawrence single-family households is higher at $10.25 per month per household. However, Lawrence households generate more MSW per household and the approximately $82 per ton cost is less than that to manage household MSW from the cities in Jefferson County.

Table 9-1

ESTIMATED HOUSEHOLD SWM COSTS WITH SCENARIO 1 EXISTING SYSTEM (1995)

	Single-Family City Households		
	(tons/hshld/year)	($/ton)	$/hshld/month)
Jefferson County	1.069	87.01	7.75
Douglas County outside Lawrence	1.242	75.05	7.78
City of Lawrence	1.506	81.69	10.25

Source: Franklin Associates, Ltd.

Scenario 2—Increased Rural Waste & Recyclables Collection; Increased Non-Residential Recyclables Collection in Lawrence

Cost estimates for management of single-family MSW under Scenario 2 are shown in Table 9-2. Current system (Scenario 1) household costs are shown along with added costs for the Scenario 2 alternatives. Both city and rural (unincorporated) households are included but current system costs are not shown for rural households since most do not have waste collection service. Lawrence households would not be affected by the Scenario 2 alternatives.

The Scenario 2 alternatives would result in relatively small cost increases for city households in the two counties. City households in Jefferson County would pay for the addition of both drop-off recycling and HHW collection whereas cities in Douglas County would add only HHW collection costs. Total Scenario 2 costs were estimated at just over $8 per household per month for cities in both counties, which is about $.25 to $.30 more than current system costs.

In addition to drop-off recycling (in Jefferson County) and HHW collection in both counties, the rural/unincorporated households would pay for rural waste drop-off services under Scenario 2. These would add substantially to rural household costs. Total Scenario 2 costs for the rural households are shown at over $5 per household per month with the rural waste drop-off convenience centers included. The costs per household would be still higher if allocated only to households without collection service instead of all the rural households.

Scenario 3—Curbside Recycling Instead of Drop-Off Recycling

The cost estimates for Scenario 3 assume that curbside recycling will be added in all the cities in the two counties. No city or county drop-off programs are included in this scenario. However, the other features of Scenario 2 are included in Scenario 3.

The cost estimates for managing MSW from single-family households under Scenario 3 are presented in Tables 9-3 and 9-4. Of major interest are the added costs shown for curbside recycling, which range from $.16 per household per month in Jefferson County cities (Table 9-3) to $.90 per household per month in Lawrence (Table 9-4). These are lower than would have been estimated for curbside recycling prior to substantial increases in prices paid for recyclables between early 1994 and early 1995. If prices for recyclables should drop to levels experienced in early 1994, curbside recycling would be more expensive. In Lawrence, for example, curbside recycling would be estimated to add over $3 per household per month instead of $.90.

Table 9-2
HOUSEHOLD SWM COSTS
WITH SCENARIO 2 ALTERNATIVES
(1995)

	Jefferson County Single-Family Households	
	City Households ($/hshld/mo)	Rural Households(1) ($/hshld/mo)
Current System	7.75	-
Drop-Off Recycling	0.06	0.16
HHW Program	0.23	0.23
Rural Waste Drop-Offs	-	4.85
Total Scenario 2 Cost	8.04	5.24
($/Ton)	90.25	115.59

	Douglas County Single-Family Households: Outside Lawrence	
	City Households ($/hshld/mo)	Rural Households(1) ($/hshld/mo)
Current System	7.78	-
HHW Program	0.25	0.25
Rural Waste Drop-Offs	-	5.06
Total Scenario 2 Cost	8.03	5.31
($/Ton)	77.58	110.05

(1) Costs apply to all rural households. However, approximately 25% are estimated to have collection service for which costs are not shown.

Source: Franklin Associates, Ltd.

Table 9-3
HOUSEHOLD SWM COSTS IN JEFFERSON AND DOUGLAS COUNTIES
OUTSIDE LAWRENCE WITH SCENARIO 3 ALTERNATIVES
(1995)

	Jefferson County Single-Family Households	
	City Households ($/hshld/mo)	Rural Households(1) ($/hshld/mo)
Current System	7.75	-
Curbside Recycling	0.16	-
HHW Program	0.23	0.23
Rural Waste Drop-Offs	-	4.85
Total Scenario 3 Cost	8.14	5.08
($/Ton)	91.38	119.30

	Douglas County Single-Family Households Outside Lawrence	
	City Households ($/hshld/mo)	Rural Households(1) ($/hshld/mo)
Current System	7.78	-
Curbside Recycling	0.39	-
HHW Program	0.25	0.25
Rural Waste Drop-Offs	-	5.06
Total Scenario 3 Cost	8.42	5.31
($/Ton)	81.35	110.05

(1) Costs apply to all rural households. However, approximately 25% are estimated to have collection service for which costs are not shown.

Source: Franklin Associates, Ltd.

The differences in Lawrence household SWM costs with early 1994 versus 1995 prices for household recyclables are estimated in Table 9-4. Costs under another hypothesis—i.e., no revenues from recovered recyclables—are also shown. It is of interest to note that costs are shown to be higher for both the current system, when using lower recyclables revenues, as well as for Scenario 3 which includes curbside recycling. This is due to reduced revenues from recyclables collected in the City's drop-off recycling program.

It is clear from Table 9-4 that the cost impact of curbside recycling varies a great deal depending upon the prices received for the recyclables collected.

With no revenues for recyclables, curbside recycling in Lawrence would be expected to add over $4 per household per month to SWM costs; at early 1995 recyclables prices, SWM costs would be expected to increase $0.90 per household per month. On a city-wide basis, these added household costs would translate, respectively, to between $997,000 and $210,000 annually.

Table 9-4
HOUSEHOLD SWM COSTS IN LAWRENCE
WITH SCENARIO 3 ALTERNATIVES & VARYING RECYCLABLES REVENUES (1)
(1995)

	City of Lawrence Single-Family Households ($/hshld/mo)		
	1995 Revenue	1994 Revenue	No Revenue
Current system	10.25	10.42	10.48
Curbside Recycling	0.90	3.10	4.27
Total Scenario 3 Cost	11.15	13.52	14.75
($/Ton)	88.85	107.72	117.54

(1) Detailed cost estimates in Appendix Tables D-12 and D-12A.

Source: Franklin Associates, Ltd.

Scenario 3 costs shown in Table 9-3 for single-family city households in Jefferson County and Douglas County outside Lawrence are not much higher than estimated with Scenario 2. This reflects the small cost increases estimated with curbside recycling based on recent market prices for recyclables. When compared to current system (Scenario 1) costs, Scenario 3 (based on the higher recyclables prices experienced in 1995) was estimated to increase household monthly costs by $.39 in Jefferson County cities, and $.64 in Douglas County cities outside Lawrence.

Costs for rural households would be the same as in Scenario 2 except for elimination of the drop-off recycling program in Jefferson County.

CAPITAL COSTS

Table 9-5 contains estimated initial county and city capital costs to implement the new SWM alternatives proposed with Scenarios 2 and 3. For

Scenario 2, no capital expenditures were estimated for the drop-off recycling program since the service would likely be contracted through use of a recycling truck and driver from a private company. A small truck and enclosed liquid-tight trailer were assumed for the HHW program with the costs shared by each county. The capital costs shown for the rural waste drop-off program are for developing and equipping four sites (convenience centers) in each county where both refuse and bulky items could be collected.

Capital expenditures shown for the Scenario 3 alternatives include the county expenditures shown for Scenario 2 plus the expected City of Lawrence capital costs with curbside recycling. The curbside recycling costs include about $1.5 million for a MRF that would process both Lawrence and other curbside collected recyclables in the two counties. The remainder of the $2.17 million shown would go toward recyclables collection vehicles and containers for use by households served by the program. The containers would be used by households to store separated recyclables prior to collection.

Table 9-5

EXPECTED COUNTY & CITY CAPITAL COSTS WITH SCENARIO 2 & 3 ALTERNATIVES

	Scenario 2 Alternatives		
	Jefferson County (Dollars)	Douglas County (Dollars)	City of Lawrence (Dollars)
Drop-Off Recycling	0	0	-
HHW Program	18,200	18,200	-
Rural Waste Drop-Offs	168,000	168,000	-
Total Scenario 2 Cost	186,200	186,200	-

	Scenario 3 Alternatives		
	Jefferson County (Dollars)	Douglas County (Dollars)	City of Lawrence (Dollars)
Curbside Recycling	0	0	2,170,000
HHW Program	18,200	18,200	-
Rural Waste Drop-Offs	168,000	168,000	-
Total Scenario 3 Cost	186,200	186,200	2,170,000

Source: Franklin Associates, Ltd.

LIFE CYCLE COSTS

Costs were projected over each year of the 20-year period from 1995 to 2014 for a few of the systems examined. Estimated present value costs—designed to equate future year costs to first year costs—were also developed for each year. The present value costs reflect the time value of money and were developed by discounting annual costs after 1995 at a 6 percent annual rate. Present value costs are judged more useful than total costs in comparing alternatives over a period of time. Where debt service costs are a large part of annual costs on a project, a present value analysis may show this project to be less expensive on a life cycle basis than a project with lower first year costs. This reflects the fact that debt service costs remain the same each year over a period of time whereas other costs are subject to inflationary increases during that time. Inflation was assumed at 3 percent for use in the life cycle cost projections reported here.

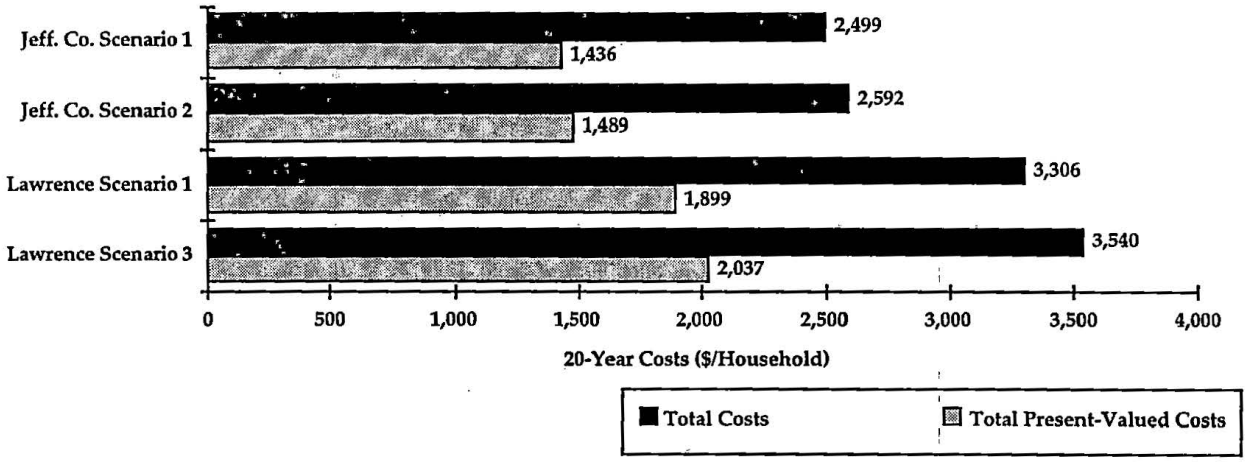
None of the systems examined for use in Douglas or Jefferson Counties were expected to have a different cost ranking on a life cycle basis than on a first year basis. However, life cycle costs were developed for Jefferson County Scenarios 1 and 2 (city households only) and Lawrence Scenarios 1 and 3. A summary of the results are shown in Figure 9-1. Estimated total household costs and total present-valued household costs over the 20-year analysis period are shown. (Detailed cost tables covering each year of the analysis period are found in Appendix D.)

For a Jefferson County household, total costs over the 20-year period are shown at about $2,500 with the existing system (Scenario 1) and just under $2,600 when adding drop-off recycling and periodic HHW collection (Scenario 2); corresponding present-valued costs are shown at $1,436 and $1,489 respectively. The percentage increase in costs with Scenario 2 versus Scenario 1 is essentially the same whether considering life cycle costs or first year costs. Since this would be true for households in Douglas County cities outside Lawrence, as well, life cycle analyses for these systems were not developed.

Life cycle costs developed for Lawrence Scenario 3 included more debt service costs because of the substantial capital costs for a MRF, recyclables collection vehicles and household recyclables containers. Total costs over the 20-year period for a Lawrence household are shown at $3,540 for Scenario 3 versus $3,306 for the existing system (Scenario 1); corresponding present-valued costs totaled $2,037 and $1,899 respectively. The percentage increase in costs with Scenario 3 is less on a life cycle basis than on a first year basis. However, the difference is small and would probably have little bearing on a decision to proceed/not proceed with curbside recycling.

Figure 9-1

SUMMARY OF ESTIMATED HOUSEHOLD SWM LIFE CYCLE COSTS
JEFFERSON COUNTY SCENARIOS 1 & 2, LAWRENCE SCENARIOS 1 & 3 1/ 2/



1/ For households with individual curbside collection of household MSW
2/ Projected for analysis period from 1995 through 2014

Source: Franklin Associates, Ltd.

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Chapter 10

REVIEW OF IMPLEMENTATION ISSUES

INTRODUCTION

When establishing new waste management systems, choices must be made in several areas necessary for system implementation. Decisions may be needed on the following:

- Implementing entity(s)
- Ownership
- Procurement and operation
- Financing
- Public risk
- Method of payment for services
- Implementation scheduling
- Public education and promotion.

Choices in these areas are often interrelated and must be considered in terms of compatibility as well as other factors. A discussion of options for implementing waste management systems is presented below along with factors related to choosing between them.

IMPLEMENTING ENTITY SELECTION

When new SWM services/options are to be provided, some entity must act as the implementing agent. Where several cities or counties are to be part of a regional SWM system, the choice of implementing entity is more difficult. It is conceivable that a single city or county in the region could take the lead and act as the implementing agent and provider of services. This would require contractual agreements from the other local governments in the region to use these services. Long-term assurances would be needed from participating cities/counties to support new waste management programs and facilities.

Another alternative is the establishment of a SWM agency. Creating an implementing agency in a solid waste management region would require the signing of an interlocal agreement between the governments participating. The duties, powers, funding, management and staffing of the agency would need to be established. The agency would need to have sufficient authority to provide for implementation of the recommended solid waste management programs. The necessary powers of the agency might include the following:

- to operate, or cause to be operated, solid waste management services and facilities
- to enter into contracts
- to levy fees for payment of services
- to borrow money and issue evidence of indebtedness for the purpose of financing services and facilities
- to regulate the flow of MSW to services and facilities.

OWNERSHIP ARRANGEMENTS

Ownership of SWM facilities can be either public or private. Public ownership is normally through a municipal government unit, authority, or agency. Private ownership may be through a private corporation, partnership, or sole proprietorship.

The choice between public or private ownership affects financing choices as well as options for procurement and operation. Features of solid waste management projects under public versus private ownership are shown in Table 10-1.

In years past, private ownership of capital intensive solid waste management facilities was often selected to avoid public agency involvement and risk in an unfamiliar area. In addition, private ownership tax benefits were much larger prior to the Tax Reform Act of 1986. As a result, private ownership was often judged to result in a lower cost project.

Currently, public ownership of highly capitalized waste management facilities is frequently recommended as the most practical and cost-effective approach. Publicly owned projects can require less time to finance and implement and may involve little, if any, increased public risk. Comparisons of risk allocation between the public and private sectors in a solid waste project suggest that ownership is largely irrelevant. Tax-exempt debt financing of solid waste projects is often easier to obtain with public ownership and is another reason why public ownership is used more often than in the past.

Options for procuring and operating as well as financing solid waste projects with public versus private ownership are described below.

PROCUREMENT AND OPERATING ARRANGEMENTS

The three basic forms of procurement used for solid waste management projects are:

- Architectural/Engineering (A/E)
- Turnkey
- Full service.

Table 10-1
FEATURES OF PUBLIC VERSUS PRIVATE OWNERSHIP OF SOLID WASTE MANAGEMENT FACILITIES

	Public Ownership	Private Ownership
Procurement options	Architectural/Engineering Turnkey Full service	Full service
Operation	Public (typically) with A/E Public/private with turnkey Private with full service	Private
Financing options	General obligation bonds (GO) Government purpose bonds (GPB) Private activity bonds (PAB) Taxable municipal bonds Traditional loans Federal/state grants Public funds	Private activity bonds Taxable bonds Private equity Traditional loans
Public risk	Similar*	Similar*
Implementation time	Less than with private ownership	Greater than with public ownership

* Applies primarily to facilities/systems financed with large bond issues.
Source: Franklin Associates, Ltd.

The A/E procurement method is the approach that governments use to build most public facilities. A consulting engineer is retained to prepare the facility design and a contractor is hired through a bidding process to build the facility. The facility is publicly owned and in most cases, publicly operated, as well.

With a turnkey procurement, a single contractor is responsible for both designing and building the facility. The completed facility usually involves public ownership, but may be either publicly or privately operated. The

turnkey contractor, by virtue of being familiar with the facility design and construction, is often hired to operate the facility.

In full service procurement, one private entity accepts project responsibility for design, construction, and operation. This type of procurement is usually considered mandatory for private ownership of a capital intensive waste management facility, but it may be used with public ownership as well.

Most SWM facility or system procurements follow one of the three options described above or close variations thereof. Either of these options can be used with public ownership while full service is usually the only acceptable procurement for private ownership.

Procurement and operation of SWM facilities can impact financing only insofar as they affect the choice of public or private ownership. For example, public operation is incompatible with private ownership. Conversely, private operation and public ownership are compatible through either turnkey or full service procurements. An A/E procurement requires public ownership and, in general, public operation.

FINANCING METHODS

Financing the capital expenditures can be a major issue in implementing new SWM facilities or systems. Several alternatives for financing proposed SWM facilities or systems may be available. Some of the more prominent financing options used in financing solid waste projects are listed in Table 10-1. The discussions below describe these options and provide information on their potential applicability. Not all of the financing options described are available for every financing need. Also , it is common for combinations of options to be used in financing a solid waste management project.

Private Equity

A privately owned facility may be financed in part or in total with the owner's cash. The owner may be the vendor who builds and operates the facility, or a third party. A third party owner will provide equity in anticipation of a competitive return on his/her investment. A private owner may be allowed the tax benefit of an accelerated depreciation schedule on the initial value of the facility and will retain the residual value of the facility after any debt is retired.

Privately owned SWM facilities are frequently financed with a combination of owner equity and tax-exempt project revenue bonds. The

equity is often used for that portion of a facility that doesn't qualify for tax-exempt debt and is often 10 to 20 percent of the facility cost.

In some cases, SWM facilities are financed entirely by owner equity. This is often the choice for less capital intensive operations such as small recyclables processing facilities. Complete owner financing avoids the time and expense of obtaining debt financing.

Traditional Loans

Solid waste management facilities may be financed with traditional loans from lending institutions. Short-term loans covering construction of a project are generally available from commercial banks, finance companies, and thrifts. Long-term financing needed after a project becomes operational may require other lenders such as insurance companies and pension funds.

Traditional loans can be used to finance solid waste projects where tax-exempt financing is not readily available. Owner equity is usually required to supplement traditional loans as part of the loan collateral. Traditional loan financing is more commonly used with private ownership projects.

Tax-exempt Bonds

Tax-exempt bonds can be issued by a governmental agency and represent an alternative to taxable debt on some SWM projects. Since the interest paid on funds raised from these bonds is exempt from federal taxes, the interest rate will be lower than that on taxable bonds. General obligation (GO) bonds and project revenue bonds are the two basic types of tax-exempt bonds issued to finance solid waste projects.

General Obligation Bonds. With public ownership and voter approval, GO bonds may be used by a local government to finance the capital costs of a solid waste project. The full faith and credit and taxing power of the local government is pledged as security on the bonds. As a result, GO bonds are considered the most secure form of debt which, coupled with their tax-exempt status, results in the lowest interest rate on a project. Still, GO bonds are not typically used for solid waste projects because of the availability of other financing mechanisms and the need to preserve a community's GO debt capacity for other projects.

Municipal Service Agreement Bonds. These bonds resemble GO bonds in that they are secured by a pledge of the general fund revenues of the local government. However, municipal service agreement bonds do not have the local government's unlimited taxing power behind them. In addition, they are more likely to be tied to the success or failure of the project being financed. Municipal service agreement bonds are, therefore, not as secure as actual GO

bonds but will vary depending upon the contractual agreements. Interest rates may be higher than under a GO pledge because of the lower security of the bonds.

Project Revenue Bonds. Revenue bonds are also tax-exempt, but not as secure as GO bonds or municipal service agreement bonds and, therefore, carry higher interest rates. Revenue bonds are largely secured by the revenues from the project they are used to finance. Other guarantees, including a project mortgage, may be pledged, as well, but the credit and taxing power of a local government is not included.

Since the Tax Reform Act of 1986, two types of project revenue bonds are available: government purpose bonds (GPBs) and private activity bonds (PABs). The use of GPBs in SWM projects requires public ownership and strict limits on private sector involvement. However, GPBs can sometimes be beneficial in financing publicly owned and operated projects. They usually carry a lower interest rate than PABs because PAB interest is included in calculations of alternative minimum tax for individuals and corporations.

PABs are also subject to some restrictions, but can be used with either public or private ownership as well as long-term private operation of a solid waste project. PABs are the only source of tax-exempt financing for privately owned projects. However, privately owned projects willing to use PABs must compete for a portion of the state's annual allotment. The annual state ceiling on private use of PABs is equal to $50 multiplied by the state's population or $150 million—whichever is greater.

Publicly owned projects are exempted from the state allocation cap on PAB use. This results in more public ownership of solid waste projects as a means of obtaining tax-exempt financing. PABs cannot be used for certain solid waste project costs such as the energy generating equipment in a waste-to-energy facility. This factor and the demand for equity to increase debt security usually results in PABs being used in conjunction with other funds to finance solid waste projects.

Taxable Bonds

Taxable bonds can be used for all or partial financing of a SWM project. Taxable municipal bonds (TMBs) may be used to finance costs not qualifying for PAB financing in both publicly and privately owned projects. TMBs are sometimes substituted for PABs in privately owned projects when sufficient tax-exempt bond allocation for private use is not available. Although this results in paying higher interest rates, TMBs allow a private owner more favorable depreciation periods (for tax purposes) on solid waste equipment. This has the effect of, at least, partially offsetting the higher interest costs.

Public Funds

Public funds may sometimes be available to finance capital expenditures on a project. They are typically used for projects that are less capital intensive or portions of projects that don't qualify for PABs. Materials recovery facilities (MRFs) and yard trimmings composting operations are examples of solid waste facilities that might be financed in total with public funds. Both are lower capital cost than waste-to-energy facilities. In addition, the uncertainty of prices for recovered recyclables makes debt financing of recycling operations more difficult.

Federal/State Grants and Loans

Federal or state money to fund solid waste projects have periodically become available for projects that can show a demonstration or research function. A local funding match at some level may be required.

Currently in Kansas, state funding is available for specified SWM projects. In addition to funding for SWM planning, the following grant programs are available for fiscal year 1996:

- *Competitive Plan Implementation Grant Program* provides competitive grant funding for the development and operation of recycling, source reduction, waste minimization and SWM public education programs. Counties, designated cities, municipalities, regional SWM entities and private entities are eligible.

- *Household Hazardous Waste Grant Program* provides funding to assist counties, cities, and regional SWM entities to provide for the safe disposal of household hazardous waste (HHW), public education and the development of local HHW programs.

- *Temporary Agricultural Pesticide Collection Grant Program* provides funding to counties, cities or regional SWM entities to develop and implement temporary agricultural pesticide collection programs.

- *Conditionally Exempt Small Quantity Generator Grant Program* provides funding to assist counties, cities or regional SWM entities to develop and implement exempt small quantity HHW generator collection programs.

- *Waste Tire Management Grant Program* provides funding to assist counties, regional SWM and private entities to develop and implement waste tire management programs.

PUBLIC RISK

A community will always be in a position of risk when implementing a SWM system. The level of risk varies depending upon the system chosen. The risks associated with SWM include:

- Financial
- Legal
- Environmental
- Composition and quantity of the solid waste stream
- Technical performance of equipment and facilities
- Changes in federal and state legislation.

Risks can be minimized through financing and contractual agreements. Risk sharing through contractual agreements with other public or private agencies/entities is usually decided upon early in the implementation process. As noted previously, public or private ownership often has little bearing on the allocation of risk. However, financing publicly owned projects with GO bonds results in the greatest degree of public risk.

PAYMENT METHODS

Paying for SWM services can be accomplished either through taxes or user fees. The options within each of these basic payment methods are described below.

Taxes

Traditionally, communities have often paid for household SWM services with general tax funds. As competition for tax revenue increases and solid waste services become more complex and expensive, other sources of paying for this service are being sought. However, tax revenues are still a major mechanism for funding solid waste services and several types of taxes are used.

Property Tax. Property taxes have been a primary source of revenue to cover household solid waste collection and disposal. This payment method is simple to administer and the homeowner is not bothered with a separate billing. A disadvantage of this method is that solid waste services must compete with other municipal services for available dollars. Further, there is little incentive for reducing solid waste disposed since the household does not perceive any cost regardless of what is set out for collection.

Utility Tax. Utilities are commonly subject to a municipal tax. This tax can usually be imposed by ordinance instead of by referendum. Individual billing problems are eliminated since a solid waste service charge can be added to an existing utility bill.

Sales Tax. The use of new sales taxes may require voter approval. As with the use of property taxes, a household may not recognize any cost for SWM with this form of payment since no bill for the service is received.

Special Tax Levy. Some states allow communities or counties to levy special taxes for certain services. The amount of a special tax levy is usually limited, though, and the solid waste system may have to compete with other projects for special tax levy funds.

User Fees

User fees are another means of paying for the cost of solid waste management services. The fees can be established on the basis of actual costs to collect, transport, process, and dispose of solid waste. Household user fees can be assessed at a flat (uniform) rate per household or at a variable rate reflecting the service used.

Uniform Rate Fees. Under this system, each household is charged the same for solid waste service. For example, the user fee for curbside collection of household refuse would be the same for each household in a service area regardless of the variability in household quantities collected. The cost of other services, such as curbside collection of recyclables, would also be shared equally by all households in the service area. The simplicity of this system is an advantage for billing purposes and it is the least costly to administer. However, it is often criticized as inequitable because some households dispose of far more solid waste than others.

Variable Rate Fees. This fee system may be used to correlate costs and service by charging households according to quantities of waste collected. For example, the charge for refuse collection at a household could be calculated by one of the following ways:

1. A charge for each container or bag of refuse collected, or
2. A minimum charge covering collection of a given number of containers or bags plus an extra charge for each additional container or bag.

In addition to this volume-based fee system, some areas have used weight-based charges. The volume-based system is more common, but requires a means of collecting fees based on the number of bags or containers

each household sets out for collection. Specially marked containers or bags or the use of stickers or tags will be needed with a volume-based fee system.

Some communities are using volume- or weight-based fees on refuse collected for disposal to encourage participation in separate recyclables collection, which is offered at no charge. Households can reduce their costs by participating in the recycling program.

While variable rate user fees encourage waste reduction and recycling, they are more difficult to administer. A community may also experience an increase in illegal dumping of refuse in rural areas and commercial dumpsters.

Subscription System. A system of charging for a service that is not mandatory is the subscription system. For example, households in rural areas may have the option of contracting directly with a private hauler for waste collection service or finding an alternative means of waste disposal. In addition, some communities allow curbside recycling service on a subscription basis. Households willing to participate in the recycling program are offered the service at a specified charge while households not interested in the service are not charged.

SCHEDULE FOR IMPLEMENTATION

After a solid waste management plan has been accepted, implementation of any new services/operations set forth in the plan may involve the following steps:

- Predevelopment
  - negotiations
  - program design
  - site selection, if necessary
- Project development
  - financing
  - contracting
  - engineering
  - permitting
- Construction
- Operation.

If new processing facilities are required by the SWM plan, the time necessary to implement the program will be greater than if existing facilities are used. Several years may be needed to establish and begin full-time operation of a new facility; the more complex the facility, the greater the time period usually required.

PUBLIC EDUCATION AND PROMOTION

Public education will be needed to effectively implement new SWM programs. Information may be needed on new recycling/composting programs, source reduction opportunities, or perhaps changes in household waste collection.

Several techniques may be used to educate the public about SWM. Educational material can be targeted toward a specific audience such as elementary students or developed to be used by all levels of the community. Presentation techniques include video tapes, slide presentations, newspapers, television and radio announcements, and publications. Announcements may be public service announcements, paid advertisements, feature stories, or news briefs.

Publications include newsletters, newspaper inserts, fact sheets, and informational and promotional brochures. Distribution of technical reports or environmental documents to community groups will provide detailed information to those most interested and increase public access to key documents.

Chapter 10

REFERENCES

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Chapter 11

SELECTED SOLID WASTE MANAGEMENT SYSTEM FOR DOUGLAS & JEFFERSON COUNTIES

INTRODUCTION

Kansas House Bill 2801 sets forth the following requirements for every county/regional solid waste management (SWM) plan in Kansas:

"(1) Delineate areas within the jurisdiction of the political subdivision or subdivisions where waste management systems are in existence and areas where the solid waste management systems are planned to be available within a 10-year period.

(2) Reasonably conform to the rules and regulations, standards and procedures adopted by the secretary for implementation of this act.

(3) Provide for the orderly extension of solid waste management systems in a manner consistent with the needs and plans of the whole area, and in a manner which will not contribute to pollution of the waters or air of the state, nor constitute a public nuisance and shall otherwise provide for the safe and sanitary disposal of solid waste.

(4) Take into consideration existing comprehensive plans, population trend projections, engineering and economics so as to delineate with practicable precision those portions of the area which may reasonably be expected to be served by a solid waste management system within the next 10 years.

(5) Take into consideration existing acts and regulations affecting the development, use and protection of air, water or land resources.

(6) Establish a time schedule and revenue schedule for the development, construction and operation of the planned solid waste management systems, together with the estimated cost thereof.

(7) Describe the elements of the plan which will require public education and include a plan for delivering such education.

(8) Include such other reasonable information as the secretary requires.

(9) Establish a schedule for the reduction of waste volumes taking in consideration the following: (A) Source

reduction; (B) reuse, recycling, composting; and (C) land disposal.

(10) Take into consideration the development of specific management programs for certain wastes, including but not limited to lead acid batteries, household hazardous wastes, small quantities of hazardous waste, white goods containing chlorofluorocarbons, pesticides and pesticide containers, motor oil and yard waste."

The information contained hereafter and in the preceding chapters of this report are designed to meet these requirements.

SWM SYSTEM COVERAGE IN COUNTIES

All of the households and businesses in the eight cities in Jefferson County and the four cities in Douglas County have access to solid waste collection service either through city provided service or through direct contracts with private firms. Some households in the unincorporated areas of the two counties also have collection service. Available records indicate that about 25 percent of the households in the unincorporated areas of Jefferson County have collection service; the corresponding number in Douglas County is unknown but may be somewhat higher.

More extensive collection service in the rural areas of the counties is complicated by load limits on roads, bridges and culverts below those needed for typical collection trucks. In addition, the costs of collection are higher in areas of low population density unless the homes are along roads that would be traveled by the collection truck anyway. To lessen the rural waste collection problem, the two counties will provide drop-off locations for selected waste streams. Drop-off programs for bulky items, recyclables and HHW from rural areas will be made available as described in this chapter.

SELECTED SWM SYSTEM

Current Solid Waste Management

Current SWM in Douglas and Jefferson Counties is described in Chapter 3. No significant deficiencies in existing SWM practices in these counties were found although some improvements are planned as described later. A summary of the current practices described in Chapter 3 follows:

- Collection of solid waste in both counties is by private firms except in Lawrence where city crews collect most residential and non-residential MSW. The University collects some of the waste on campus that is inaccessible to City trucks.

- Outside Lawrence, all but three cities contract for household waste collection service. Households must contract for collection service in Meriden, Nortonville and Winchester in Jefferson County.

- Households in both counties have trash collection once per week.

- Leaves and grass clippings are collected separately in Lawrence for composting at the City's compost site. A small percent of Lawrence households contract with one of two private companies for curbside collection of recyclables.

- Bulky waste is collected at no additional charge in 10 of the 12 cities in the two counties. An added charge is incurred for bulky waste collection in Meriden and Perry in Jefferson County.

- One MSW landfill exists in the two-county Region—the Hamm Landfill in Jefferson County. Most of the MSW from the two counties is taken to this landfill but some goes to the Rolling Meadows Landfill in Topeka and the Johnson County Landfill in Shawnee.

- A household hazardous waste facility (HHW) in Lawrence is jointly owned by the City and Douglas County and is open to residents throughout the County one Saturday per month April through October.

- Numerous drop-off locations for household recyclables are available in Lawrence and one drop-off center is available in Baldwin City.

- Construction and demolition (C&D) debris is mostly landfilled either at the Hamm Landfill or at four C&D landfills in Douglas County that are allowed to accept only concrete and masonry waste.

- Approximately two-thirds of the non-hazardous industrial process waste generated in the two counties is recovered for recycling. The remainder is mostly landfilled.

- Municipal wastewater treatment sludge generated in Lawrence is mostly landspread although a small quantity goes to the Hamm Landfill. Sludge from Baldwin City is also landspread and that from the two treatment plants in Jefferson County is hauled to

Topeka for further treatment. Lagoons are used by the other cities in the two counties.

- Combustion residue—mostly ash and a smaller amount of limestone sludge—from the KPL power plant north of Lawrence is managed on-site. Some of the bottom ash is used for on-site road construction. Remaining ash (largely fly ash) and the limestone sludge are disposed in an on-site landfill.

- Street sweepings waste from Lawrence and the other cities in the two counties as well as the Kansas Turnpike Commission is mostly landfilled.

- Trees and brush—generated mostly from trimmings around power lines in the counties and from Lawrence parks—are chipped and used as mulch.

Facilities for the disposition of the various solid wastes generated in the two counties should be available during the 10-year planning period. The Hamm Landfill is expected to dispose of MSW as well as other solid wastes from the counties well beyond this time period. Both the Johnson County Landfill and the Rolling Meadows Landfill (north of Topeka) should also be available. The HHW facility in Lawrence will act as a receptor for hazardous materials from households in Douglas County and will periodically send loads to hazardous waste disposal facilities located elsewhere. Lead acid batteries may be returned to retail outlets in the counties from where they are sent to recycling facilities. Motor oil may be taken to a number of retail outlets, as well, from where the oil is generally sent to fuel processors such as Industrial Service Corporation located in the Kansas City area. The HHW facility in Lawrence will accept motor oil, also.

White goods may be taken, initially, by processing firms that can remove freon, electric motors and capacitors. Large appliances collected by the City of Lawrence are taken by a processing contractor from Eudora who either refurbishes them for reuse or prepares them for recycling. Thus, most of the white goods from the Region are ultimately taken to companies with shredders that strip the enamel paint so that the metal can be recycled. However, a few large appliances are reported at the Hamm Landfill, which will accept them only if the freon and capacitors have been removed.

Unused pesticides and their containers from households may be taken to the HHW facility in Lawrence. While unused pesticides from agricultural or other sources in the counties have not been identified as a problem, the HHW facility in Lawrence may eventually be expanded to take these and other hazardous materials from identified conditionally exempt small quantity generators.

Used tires are taken by retailers in trade for new tires. From the retailers, the tires may be delivered to processors such as those in Leavenworth and Wyandotte Counties. Tires at the processors are either processed for fuel in a cement kiln, used in new products or mono-filled after being cut into pieces or shredded. Tires are sometimes received at the Hamm Landfill where they are stockpiled and eventually collected by a processor.

Agricultural wastes are generated in both counties but, in general, are left on farm land and incorporated into the soil. Some waste grain is reported as accepted at the Hamm Landfill.

Medical wastes in the Region are largely from the hospital, nursing homes and medical clinics in Lawrence. No hospitals exist in the Region outside Lawrence. The hospital in Lawrence incinerates much of its own waste plus some from the other nearby facilities generating medical wastes. However, some medical waste in the area is handled by a private contractor who must secure proper disposal.

The current SWM practices noted above will mostly continue; however, some changes will occur. Planned changes to SWM in the two counties are described below.

Planned Changes/Additions to Solid Waste Management

The Douglas/Jefferson Counties Solid Waste Planning Committee identified increased SWM service to rural areas of the two counties as a major need/goal. Another goal to reduce solid wastes disposed, as required by H.B. 2801, was set at 25 percent of MSW by 2000. These goals had to be considered in view of a concurrent need to keep SWM costs at reasonable levels. The following changes (including additions) to SWM in the two counties will be undertaken in an effort to best meet the identified goals of the Region:

1. Expanded HHW collection services. A permanent HHW storage facility will be established in Oskaloosa at an existing County facility. It will be open to Jefferson County residents on a daily basis. In addition, drop-off collections in outlying areas of both counties will be conducted on a periodic basis. Twice yearly collection in Valley Falls, Baldwin and Eudora would be expected, at minimum. Also the city of Lawrence will review the possibility of extending the hours of operation at the existing HHW permanant facility.

2. A mobile drop-off center for household recyclables. A recyclables collection vehicle will be stationed in Oskaloosa and Valley Falls or other cities in Jefferson County (as deemed suitable) on

alternate Saturdays and will accept recyclable paper and containers from all Jefferson County households.

3. Recovery of non-residential waste paper by the City of Lawrence. This will focus on recovery of old corrugated containers (OCC) from small generators, initially, and may expand to other paper grades later.

4. Rural waste drop-off centers for bulky items. One or two sites in each county will be prepared and designated as a drop-off location for proper handling of bulky wastes from rural households (i.e., households outside the cities). Old furniture, carpets, major appliances, tires and vehicle batteries from rural households would be accepted at the centers at no charge. Certain recoverable items would be processed where practical.

5. City-provided waste collection service (including bulky waste pickup) for all single-family city households. This service would be accomplished through city contracts with private haulers or by city crews.

6. Variable rate fees or subscription fees on leaves and grass clippings collected by the City of Lawrence.

7. Waste reduction by the University of Kansas. An environmental specialist has been hired to expand waste reduction efforts at the campus.

The expanded HHW collection services, mobile drop-off center for household recyclables and drop-off centers for bulky wastes will provide improved SWM services to the rural households. Open dumping and other improper disposal in the rural areas should be reduced. In addition, city households in Jefferson County will have more recycling opportunities and city households in both counties will have more access to separate HHW collection. On-site staff will be required to monitor and supervise all drop-off collections. This will be necessary to assure that only acceptable materials are received and that they are properly handled.

Only three cities in the Region do not provide waste collection services for single-family households. Households arrange, individually, for collection in these cities and pay higher monthly fees than households in the other small cities in the two counties. City-provided household waste collection, including periodic collection of bulky items, should improve SWM in two ways: lower household costs and better management of bulky waste. Individual households arranging for collection services usually pay more than those in cities where the services are provided by the city or homes

associations. This is due, in part, to economies achieved when a number of adjoining households' wastes are collected by the same crew. It can also reflect greater bargaining power when bidding a large block of household waste collections to a private collector. Including bulky items in the collection service will reduce open dumping and prevent city households from attempting to use the rural waste drop-off centers, which are intended for rural households only.

Either variable rate fees or subscription fees on separately collected leaves and grass clippings in Lawrence will be a more equitable system of paying for management of yard waste. Yard waste is the waste component that often varies the most between households in quantities generated. Whereas some households may set out far more yard trimmings for collection during much of the year than other wastes, other households may set out little or no yard trimmings. A flat rate fee system results in all households paying the same regardless of quantities collected. A variable rate fee system is designed to charge the customer based on the quantity collected. A subscription system would charge the same fee to all households setting out leaves or grass clippings but no charge for households not using this service. Thus, under either a variable rate system or subscription system, households not setting out leaves or grass would not pay for this service and, further, would not be subsidizing the cost of collection from households that do. Many households that set out leaves and grass for collection under a flat rate fee system will choose to manage them at home under a variable rate or subscription based system. Total collection of yard waste will therefore decrease when subscription or quantity-based charges are applied. Storm debris will be handled as a separate waste stream and will not be included in the variable rate fee system.

A variable rate fee system—also called a unit-based system—can be based on either volume or weight. A volume-based fee system could, for example, be structured as a pay per bag system. Specified plastic or paper bags would be purchased from the City or from designated retail establishments such as hardware or grocery stores. A fee covering the cost of the bag (including distribution) and the collection and composting service would be charged. Households setting out leaves or grass clippings in the bags would be advised of weight limits—perhaps 30 to 40 pounds maximum in each bag. They would also be advised not to include leaves/grass clippings with trash collected separately for landfilling.

A weight-based fee system would be designed to charge based on the weight of leaves and grass collected. The collection vehicles would need to be equipped with scales and probably a computerized bar code system to match yard waste containers to households. This system could be difficult to implement because of the need for coded containers and added truck

equipment. Households with large quantities of leaves and grass clippings might need several containers.

Potential Future Changes/Additions to Solid Waste Management

Other changes or additions to current SWM practices in the Douglas/Jefferson Counties Region may be considered later. These include:

- City-provided curbside recycling service for single-family households in the cities.
- Collection of leaves and grass clippings (in Lawrence) in biodegradable paper bags.
- Collection of hazardous waste from small quantity generators that are currently exempt from hazardous waste regulations.
- Expansion of recovery efforts by the University of Kansas with Dickerson Recycling as well as cooperative programs between the University and other recycling entities.

City-provided curbside collection of household recyclables is expected to be more expensive in the cities in Douglas and Jefferson Counties than in large metropolitan areas. This reflects higher processing costs when handling smaller quantities of recyclables and, in some instances, more hauling costs. However, market prices for household recyclables have increased dramatically since early 1994 thereby making curbside recycling more attractive—even in smaller communities. Still, the long-term economic viability of curbside recycling in the Region will likely depend on markets remaining at or near these high levels. A decision on proceeding with curbside recycling in Lawrence and perhaps other cities in the two counties will depend upon price stability in markets for recyclables and public demand.

Use of paper bags for separately collected leaves and grass clippings in Lawrence would eliminate the time-consuming de-bagging process and improve compost quality. However, the ability to shred the bags and their contents will be needed. Implementation of this approach must await a City budget that will allow purchase of a suitable shredder.

Collection of hazardous waste from conditionally exempt small quantity generators of hazardous waste is expected to be reviewed pending approval of a grant request. Acceptance of conditionally exempt small quantity generator hazardous waste at the HHW facility in Lawrence will depend upon the availability of funding and amending necessary permits.

Chapter 12

IMPLEMENTATION OF SELECTED SYSTEM

INTRODUCTION

Options for implementing new waste management systems are discussed in Chapter 10. For new SWM services to be implemented, decisions must be made on responsibilities and methods to provide the services. These are discussed below for the planned SWM system changes described in the previous chapter.

DELINEATION OF RESPONSIBILITIES

The expanded HHW, mobile drop-off recycling, and rural waste drop-off programs all affect rural households. As such, the County governments will need to be responsible for implementing these programs. Jefferson County will own and operate a HHW storage facility in Oskaloosa. In addition, Jefferson and Douglas Counties may jointly provide (through an interlocal agreement) for the periodic HHW collections planned in Valley Falls, Baldwin and Eudora. A suitable liquid-tight trailer will be necessary and could be shared by the two counties; the trailer may be purchased or, alternatively, might be leased from other nearby county/regional programs. Collected materials in Valley Falls will be stored in the facility at Oskaloosa and materials from the Baldwin and Eudora collections will be taken to the HHW facility in Lawrence. Contractors will be hired to remove materials that must be disposed.

Jefferson County is expected to contract for mobile drop-off recycling in Oskaloosa and Valley Falls or other cities as practical. A recyclables collection vehicle with multiple compartments for household recyclables will be needed along with an on-site attendant, which could be the vehicle driver.

Each county will arrange for at least one drop-off site for bulky waste items from the rural households. Existing county- or township-owned sites may be used if space is available. The sites will be staffed when wastes are received. Removal of collected items will be contracted to private haulers/processors. Collected white goods will go to a processor for refurbishing or preparation for recycling. Tires will be taken to processors to prepare them for recovery or disposal and vehicle batteries will be sent to recyclers. Large items to be disposed will be hauled to a licensed MSW landfill.

Kansas University will be responsible for the expansion of waste recovery and reduction efforts on campus property. The office paper recovery program will be improved. Other recyclables from office buildings will be

recovered as practical. The Environmental Specialist will arrange for recovery of materials generated by the students living on campus.

The City of Lawrence will arrange for a facility to process recyclable waste paper from business and institutional establishments that do not have separate private collection of paper. The City will collect old corrugated containers (and perhaps office paper) to be handled at the facility. The facility will bale the collected paper for sale to brokers or end-user markets. The facility building will be owned by the City. However, the processing equipment may be owned by either the City or a private company depending upon operating and marketing arrangements.

As noted previously, the plan calls for all cities in the two counties to provide collection service to single-family households either with city crews or through contracting with a private collector. In addition, the City of Lawrence is expected to provide either variable rate or subscription fees on separately collected leaves and grass clippings in the City.

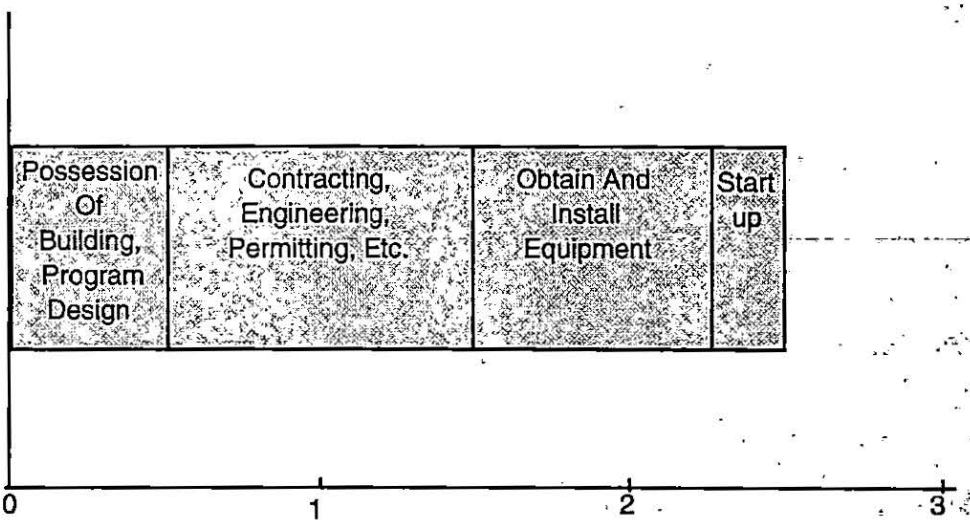
SCHEDULE FOR IMPLEMENTATION

The schedule for implementation of the planned SWM programs will be largely dependent upon the timing of city and county efforts. Perhaps the most time-consuming task will be establishment of the non-residential waste paper recovery program by the City of Lawrence. Figure 12-1 shows the projected steps and associated time requirements that may be necessary to implement this program. From Fall, 1995, it is estimated that the time required to prepare the processing facility for full-time operation could be between two and three years.

Once efforts begin, the other planned programs are expected to take less time to implement due to comparatively little need for new equipment and construction. In total, implementing the planned SWM system in the Douglas/Jefferson Counties Region and achieving the 25 percent goal for diversion of Region-generated MSW from disposal should be accomplished by 2000.

Figure 12-1

Estimated Time For Implementing City Of Lawrence Non-residential Waste Paper Recovery Program With Processing Facility



Source: Franklin Associates, Ltd.

COSTS OF ADDED PROGRAMS

Estimated costs for the proposed County SWM programs are shown in Table 12-1. Both county-wide annual costs and costs per household are shown. Household costs shown for the rural bulky waste drop-off centers are much less than for the rural waste drop-offs evaluated (in Scenarios 2 and 3) to take household trash as well (Tables 9-2 and 9-3). Still, the bulky waste drop-offs are projected to be the highest cost SWM program to be implemented by the counties.

The proposed HHW drop-off program in Jefferson County is also changed from that for which estimated costs are shown in Chapter 9. However, substitution of an existing County facility to receive HHW in Oskaloosa, along with periodic collections in Valley Falls as planned before, may not change total costs substantially if added labor is not needed. Thus, HHW costs shown in Table 12-1 for Jefferson County reflect the earlier cost estimates.

The drop-off recycling costs shown in Table 12-1 for Jefferson County do not reflect potential savings/avoided costs for less trash collection and disposal from city households. While city households may realize this savings in their

collection fees, the County will still have the cost shown for the drop-off recycling program.

The two counties may choose to fund their planned programs through tax revenues or fees on all households to which the added services will be available. (The bulky waste drop-offs will be available to rural households only, the other programs to both city and rural households.) If practical, no fees on materials brought to the drop-off facilities should be charged since this would discourage participation.

The other planned changes in SWM in the two counties, including the proposed non-residential waste paper recovery program in Lawrence, are not expected to result in net cost increases. In fact, both city-provided waste collection service for single-family households and separate charges for collection of leaves and grass clippings in Lawrence may result in net cost reductions or offset inflationary increases. Costs for the Lawrence non-residential paper recovery program are expected to be offset by revenues from sale of the recovered paper. Expansion of waste reduction and recycling at Kansas University will be at the expense of the University and not the City of Lawrence or Douglas County unless a partnering of efforts is deemed desirable by involved parties.

Capital expenditures to implement the planned programs should be minimal except for the Lawrence facility to process waste paper recovered from non-residential sources. Capital costs at the facility will be primarily for equipment (including baling equipment) and costs for purchase and necessary modifications to the existing building.

Some modifications at the proposed Jefferson County storage facility for HHW in Oskaloosa will be needed but may be at least partially funded through a state grant. A liquid-tight trailer will be needed for periodic collections in Valley Falls, Baldwin and Eudora. The trailer may/may not need to be purchased depending upon whether one could be borrowed or rented.

Some initial costs may also be necessary to prepare the rural bulky waste drop-off sites. If room is available at existing county/township facilities, these costs should be minimal. Arrangements for storing and handling the collected items will be needed.

Table 12-1
ESTIMATED COSTS FOR
PLANNED COUNTY SWM PROGRAMS
(1995 dollars)

	Jefferson County		
	City Households ($/hshld/mo)	Rural Households ($/hshld/mo)	Total County Costs ($/year)
HHW Drop-off Collections	$0.23	$0.23	$16,300
Drop-Off Recycling	$0.16	$0.16	$11,400
		$0.43 - $0.55	$18,400 - $24,000
Total Costs	$0.39	$0.82 - $0.94	$46,100 - $51,700

	Douglas County Outside Lawrence		
	City Households ($/hshld/mo)	Rural Households ($/hshld/mo)	Total County Costs ($/year)
HHW Drop-off Collections	$0.25	$0.25	$17,900
		$0.44 - $0.57	$19,800 - $25,400
Total Costs	$0.25	$0.69 - $0.82	$37,700 - $43,300

(1) Lower cost assumes no site costs and no added labor at the site; higher cost assumes added labor at 8 hours/week.

Source: Franklin Associates, Ltd.

PUBLIC EDUCATION

Public education programs explaining the proposed SWM changes in Douglas and Jefferson Counties will be needed if the changes are to be effective. Public education will need to address the following elements of the plan:

- The expanded HHW, mobile drop-off recycling, and rural bulky waste drop-off programs
- City-provided waste collection service for single-family households
- Variable rate/subscription charges on leaves and grass clippings collected in Lawrence
- Source reduction alternatives including the management of leaves and grass trimmings at home.

Several factors will need to be covered in educating households subject to the HHW, drop-off recycling, and bulky waste drop-off programs. These

include: the location, frequency and timing of the drop-off collections; the materials to be included in the collections; and the method(s) by which the collections will be paid for (i.e., fees, taxes, etc.).

In cities changing to city-provided waste collection service, affected households should be notified of reasons for the change and the elements of service to be provided. Information on service charges, collection schedules, and the collection entity (either the city or private hauler) will be needed. Specifics relative to collection of trash/refuse versus bulky items will also be needed.

Lawrence households will need to know the purpose for and the basic method to be used in charging separately for collection of leaves and grass clippings. If variable rate fees are to be used, the volume/weight units to which the fees apply must be indicated. With a volume-based system, weight limits per bag/container will be needed and must be publicized as well. In conjunction with the separate charge for collection of leaves and grass in Lawrence, it will be particularly important to provide information on backyard composting of yard wastes and allowing grass clippings to remain on the lawn.

At minimum, implementing a new SWM program will require sending a newsletter to each affected household explaining the program, its purpose and how to participate. It will also be useful to provide advance notice of the program through media coverage and public service announcements. If needed, a public meeting or "hotline" telephone service should be arranged to further explain the program and allow the public to ask questions.

The two counties will each be responsible for providing public education about the new programs they are implementing: expanded HHW collections and rural waste drop-off programs in both counties plus drop-off recycling in Jefferson County. The City of Lawrence will provide education on the variable rate/subscription charges on collection of leaves and grass clippings. In addition, the City will provide information on home management of yard wastes and will share this information with other cities in the two counties. The cities changing to city-provided collection of refuse and/or bulky waste from single-family households will be responsible for providing the specifics of the changes to the households affected.

In summary, the new SWM programs affecting households in the two counties will be publicized and explained through county and city newsletters, flyers and other materials as needed. Options that households can use to reduce waste generation will also be promoted in these materials. It is expected that the counties and cities will utilize publications and information available from the U.S. EPA, state agencies and other communities that could be useful in preparing the educational materials on the new programs.

APPENDIX A

DETAILED COMPOSITION OF DOUGLAS COUNTY AND JEFFERSON COUNTY MUNICIPAL SOLID WASTE BY SOURCE

Table A-1

MUNICIPAL SOLID WASTE GENERATION
1995

	Total Douglas County					
	Residential		Non-residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Durable Goods						
Major Appliances	116	0.29	1,143	3.32	1,259	1.68
Small Appliances	173	0.43	23	0.07	196	0.26
Furniture and Furnishings	1,919	4.74	671	1.95	2,591	3.46
Carpets and Rugs	580	1.43	203	0.59	783	1.05
Rubber Tires	58	0.14	1,206	3.50	1,264	1.69
Batteries, Lead-Acid	29	0.07	590	1.71	618	0.82
Miscellaneous Durables	3,741	9.24	1,308	3.80	5,049	6.74
Total Durable Goods	**6,617**	**16.34**	**5,143**	**14.94**	**11,760**	**15.69**
Nondurable Goods						
Newspapers	3,146	7.77	555	1.61	3,701	4.94
Books	275	0.68	96	0.28	371	0.49
Magazines	645	1.59	348	1.01	993	1.33
Office Papers	977	2.41	3,277	9.52	4,253	5.68
Third Class (Direct) Mail	628	1.55	339	0.99	967	1.29
Directories	75	0.19	60	0.17	135	0.18
Commercial Printing	975	2.41	527	1.53	1,503	2.01
Disposable Diapers	725	1.79	81	0.23	806	1.08
Textiles, footwear, misc.	1,667	4.11	1,937	5.63	3,604	4.81
Tissue & Other Misc. Paper	1,615	3.99	1,559	4.53	3,174	4.24
Total Nondurable Goods	**10,728**	**26.48**	**8,778**	**25.49**	**19,506**	**26.03**
Containers & Packaging						
Glass Packaging						
Beer & Soft Drink Bottles	1,289	3.18	449	1.30	1,738	2.32
Wine & Liquor Bottles	287	0.71	100	0.29	387	0.52
Food & Other Bottles & Jars	1,386	3.42	374	1.09	1,760	2.35
Total Glass Packaging	**2,962**	**7.31**	**923**	**2.68**	**3,885**	**5.18**
Steel Packaging						
Beer & Soft Drink Cans	41	0.10	14	0.04	55	0.07
Food & Other Cans	764	1.89	206	0.60	971	1.30
Other Steel Packaging	3	0.01	67	0.20	71	0.09
Total Steel Packaging	**808**	**2.00**	**288**	**0.84**	**1,096**	**1.46**
Aluminum Packaging						
Beer & Soft Drink Cans	562	1.39	196	0.57	758	1.01
Food & Other Cans	7	0.02	8	0.02	15	0.02
Foil & Closures	100	0.25	20	0.06	120	0.16
Total Aluminum Packaging	**669**	**1.65**	**224**	**0.65**	**893**	**1.19**

Table A-1 (cont'd)

MUNICIPAL SOLID WASTE GENERATION
1995

	Total Douglas County					
	Residential		Non-residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Paper & Paperboard Packaging						
Corrugated Boxes	929	2.29	9,157	26.59	10,086	13.46
Milk Cartons	27	0.07	31	0.09	57	0.08
Folding Cartons	997	2.46	799	2.32	1,795	2.40
Bags & Sacks	651	1.61	130	0.38	780	1.04
Other Packaging	319	0.79	211	0.61	530	0.71
Total Paper & Board Pkging	**2,922**	**7.21**	**10,327**	**29.99**	**13,249**	**17.68**
Plastics Packaging						
Soft Drink Bottles	225	0.55	78	0.23	303	0.40
Milk and Water Bottles	131	0.32	18	0.05	148	0.20
Other Containers	602	1.49	210	0.61	812	1.08
Bags & Sacks	331	0.82	66	0.19	397	0.53
Other Packaging	1,096	2.71	383	1.11	1,479	1.97
Total Plastics Packaging	**2,383**	**5.88**	**755**	**2.19**	**3,139**	**4.19**
Wood Packaging	0	0.00	3,547	10.30	3,547	4.73
Other Miscellaneous Packaging	52	0.13	28	0.08	80	0.11
Total Containers & Packaging	**9,796**	**24.18**	**16,092**	**46.74**	**25,889**	**34.55**
Total Product Wastes	**27,141**	**67.00**	**30,014**	**87.17**	**57,155**	**76.27**
Other Wastes						
Food Wastes	2,277	5.62	2,647	7.69	4,924	6.57
Yard Wastes	10,575	26.11	1,175	3.41	11,750	15.68
Miscellaneous Inorganic Wastes	513	1.27	596	1.73	1,109	1.48
Total Other Wastes	**13,365**	**33.00**	**4,418**	**12.83**	**17,783**	**23.73**
TOTAL GENERATION	**40,506**	**100.00**	**34,433**	**100.00**	**74,938**	**100.00**
	54.05%		45.95%			

Table A-2

MUNICIPAL SOLID WASTE GENERATION
Jefferson County
1995

	Residential		Non-residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Durable Goods						
Major Appliances	22	0.39	110	4.04	133	1.56
Small Appliances	33	0.58	1	0.04	34	0.40
Furniture and Furnishings	368	6.40	51	1.85	419	4.94
Carpets and Rugs	111	1.93	15	0.56	127	1.49
Rubber Tires	11	0.19	117	4.28	128	1.51
Batteries, Lead-Acid	5	0.10	57	2.09	63	0.74
Miscellaneous Durables	718	12.47	99	3.61	816	9.62
Total Durable Goods	**1,269**	**22.06**	**450**	**16.48**	**1,719**	**20.26**
Nondurable Goods						
Newspapers	367	6.38	65	2.37	432	5.09
Books	53	0.92	7	0.27	60	0.71
Magazines	111	1.93	60	2.19	171	2.02
Office Papers	95	1.66	286	10.47	381	4.49
Third Class (Direct) Mail	143	2.48	42	1.55	185	2.18
Directories	11	0.20	8	0.28	19	0.23
Commercial Printing	204	3.54	60	2.21	264	3.11
Disposable Diapers	140	2.43	16	0.57	155	1.83
Textiles, footwear, misc.	320	5.56	176	6.44	496	5.84
Tissue & Other Misc. Paper	310	5.38	139	5.10	449	5.29
Total Nondurable Goods	**1,753**	**30.47**	**859**	**31.45**	**2,612**	**30.78**
Containers & Packaging						
Glass Packaging						
Beer & Soft Drink Bottles	243	4.22	61	2.23	304	3.58
Wine & Liquor Bottles	55	0.96	14	0.50	69	0.81
Food & Other Bottles & Jars	266	4.62	26	0.94	292	3.44
Total Glass Packaging	**564**	**9.80**	**100**	**3.67**	**664**	**7.83**
Steel Packaging						
Beer & Soft Drink Cans	4	0.07	1	0.04	5	0.06
Food & Other Cans	147	2.56	14	0.52	161	1.90
Other Steel Packaging	1	0.01	7	0.24	7	0.08
Total Steel Packaging	**152**	**2.63**	**22**	**0.80**	**173**	**2.04**
Aluminum Packaging						
Beer & Soft Drink Cans	93	1.61	23	0.85	116	1.37
Food & Other Cans	1	0.02	1	0.03	2	0.02
Foil & Closures	19	0.33	1	0.04	20	0.24
Total Aluminum Packaging	**113**	**1.97**	**25**	**0.92**	**139**	**1.63**

Table A-2 (cont'd)

MUNICIPAL SOLID WASTE GENERATION
Jefferson County
1995

	Residential		Non-residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Paper & Paperboard Packaging						
Corrugated Boxes	46	0.80	416	15.23	462	5.44
Milk Cartons	5	0.09	5	0.19	10	0.12
Folding Cartons	191	3.32	70	2.57	261	3.08
Bags & Sacks	125	2.17	8	0.28	132	1.56
Other Packaging	61	1.06	18	0.66	79	0.93
Total Paper & Board Pkging	**428**	**7.45**	**517**	**18.92**	**945**	**11.14**
Plastics Packaging						
Soft Drink Bottles	63	1.09	16	0.57	78	0.92
Milk and Water Bottles	25	0.44	1	0.05	26	0.31
Other Containers	115	2.01	16	0.58	131	1.55
Bags & Sacks	63	1.10	4	0.14	67	0.79
Other Packaging	210	3.65	29	1.06	239	2.82
Total Plastics Packaging	**477**	**8.28**	**66**	**2.40**	**542**	**6.39**
Wood Packaging	0	0.00	345	12.64	345	4.07
Other Miscellaneous Packaging	10	0.17	2	0.09	12	0.15
Total Containers & Packaging	**1,744**	**30.31**	**1,077**	**39.45**	**2,821**	**33.25**
Total Product Wastes	**4,767**	**82.83**	**2,386**	**87.38**	**7,153**	**84.29**
Other Wastes						
Food Wastes	437	7.59	240	8.80	677	7.98
Yard Wastes	453	7.87	50	1.84	503	5.93
Miscellaneous Inorganic Wastes	98	1.71	54	1.98	153	1.80
Total Other Wastes	**988**	**17.17**	**345**	**12.62**	**1,333**	**15.71**
TOTAL GENERATION	**5,755**	**100.00**	**2,731**	**100.00**	**8,485**	**100.00**
Percent	68%		32%		100%	

Source: Franklin Associates, Ltd.

Table A-3

MUNICIPAL SOLID WASTE GENERATION
1995

	City of Lawrence					
	Residential		Non-Residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Durable Goods						
Major Appliances	92	0.27	1,025	3.26	1,117	1.70
Small Appliances	137	0.40	22	0.07	160	0.24
Furniture and Furnishings	1,527	4.48	617	1.96	2,144	3.27
Carpets and Rugs	462	1.35	187	0.59	648	0.99
Rubber Tires	46	0.14	1,081	3.43	1,128	1.72
Batteries, Lead-Acid	23	0.07	529	1.68	551	0.84
Miscellaneous Durables	2,976	8.73	1,203	3.82	4,179	6.37
Total Durable Goods	**5,264**	**15.44**	**4,664**	**14.81**	**9,927**	**15.14**
Nondurable Goods						
Newspapers	2,550	7.48	450	1.43	2,999	4.57
Books	218	0.64	88	0.28	307	0.47
Magazines	523	1.53	282	0.89	805	1.23
Office Papers	875	2.57	2,972	9.44	3,847	5.87
Third Class (Direct) Mail	509	1.49	294	0.93	803	1.23
Directories	60	0.17	50	0.16	109	0.17
Commercial Printing	791	2.32	463	1.47	1,253	1.91
Disposable Diapers	588	1.72	65	0.21	653	1.00
Textiles, footwear, misc.	1,326	3.89	1,750	5.56	3,076	4.69
Tissue & Other Misc. Paper	1,285	3.77	1,410	4.48	2,695	4.11
Total Nondurable Goods	**8,724**	**25.59**	**7,824**	**24.85**	**16,548**	**25.23**
Containers & Packaging						
Glass Packaging						
Beer & Soft Drink Bottles	1,025	3.01	383	1.22	1,408	2.15
Wine & Liquor Bottles	228	0.67	85	0.27	314	0.48
Food & Other Bottles & Jars	1,102	3.23	347	1.10	1,449	2.21
Total Glass Packaging	**2,356**	**6.91**	**815**	**2.59**	**3,171**	**4.84**
Steel Packaging						
Beer & Soft Drink Cans	32	0.09	12	0.04	44	0.07
Food & Other Cans	608	1.78	191	0.61	799	1.22
Other Steel Packaging	3	0.01	60	0.19	63	0.10
Total Steel Packaging	**643**	**1.89**	**264**	**0.84**	**907**	**1.38**
Aluminum Packaging						
Beer & Soft Drink Cans	447	1.31	167	0.53	614	0.94
Food & Other Cans	6	0.02	7	0.02	13	0.02
Foil & Closures	80	0.23	19	0.06	98	0.15
Total Aluminum Packaging	**533**	**1.56**	**193**	**0.61**	**726**	**1.11**

Table A-3 (Cont'd)

MUNICIPAL SOLID WASTE GENERATION
1995

	City of Lawrence					
	Residential		Non-Residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Paper & Paperboard Packaging						
Corrugated Boxes	739	2.17	8,714	27.68	9,453	14.41
Milk Cartons	21	0.06	25	0.08	47	0.07
Folding Cartons	793	2.33	724	2.30	1,517	2.31
Bags & Sacks	518	1.52	121	0.39	639	0.97
Other Packaging	254	0.74	192	0.61	446	0.68
Total Paper & Board Pkging	**2,324**	**6.82**	**9,777**	**31.05**	**12,101**	**18.45**
Plastics Packaging						
Soft Drink Bottles	179	0.52	67	0.21	245	0.37
Milk and Water Bottles	104	0.30	16	0.05	120	0.18
Other Containers	479	1.40	193	0.61	672	1.02
Bags & Sacks	263	0.77	62	0.20	325	0.50
Other Packaging	872	2.56	352	1.12	1,224	1.87
Total Plastics Packaging	**1,896**	**5.56**	**690**	**2.19**	**2,586**	**3.94**
Wood Packaging	0	0.00	3,179	10.10	3,179	4.85
Other Miscellaneous Packaging	41	0.12	26	0.08	67	0.10
Total Containers & Packaging	**7,793**	**22.86**	**14,943**	**47.47**	**22,736**	**34.67**
Total Product Wastes	**21,780**	**63.88**	**27,431**	**87.13**	**49,211**	**75.04**
Other Wastes						
Food Wastes	1,812	5.31	2,391	7.59	4,203	6.41
Yard Wastes	10,094	29.61	1,122	3.56	11,216	17.10
Miscellaneous Inorganic Wastes	408	1.20	539	1.71	947	1.44
Total Other Wastes	**12,314**	**36.12**	**4,051**	**12.87**	**16,365**	**24.96**
TOTAL GENERATION	**34,094**	**100.00**	**31,482**	**100.00**	**65,576**	**100.00**

Source: Franklin Associates, Ltd.

Table A-4

MUNICIPAL SOLID WASTE GENERATION
1995

	Douglas County Outside Lawrence					
	Residential		Non-residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Durable Goods						
Major Appliances	24	0.37	118	3.99	141	1.51
Small Appliances	35	0.55	1	0.03	36	0.39
Furniture and Furnishings	392	6.12	54	1.83	446	4.77
Carpets and Rugs	119	1.85	16	0.55	135	1.44
Rubber Tires	12	0.19	125	4.23	137	1.46
Batteries, Lead-Acid	6	0.09	61	2.07	67	0.71
Miscellaneous Durables	765	11.93	105	3.57	870	9.30
Total Durable Goods	**1,353**	**21.10**	**480**	**16.26**	**1,833**	**19.58**
Nondurable Goods						
Newspapers	596	9.30	105	3.57	702	7.49
Books	56	0.88	8	0.26	64	0.68
Magazines	122	1.91	66	2.23	188	2.01
Office Papers	102	1.58	305	10.33	406	4.34
Third Class (Direct) Mail	119	1.86	45	1.52	164	1.75
Directories	15	0.24	10	0.35	26	0.27
Commercial Printing	185	2.88	64	2.18	249	2.66
Disposable Diapers	137	2.14	15	0.52	153	1.63
Textiles, footwear, misc.	341	5.32	187	6.35	528	5.64
Tissue & Other Misc. Paper	330	5.15	149	5.04	479	5.11
Total Nondurable Goods	**2,004**	**31.26**	**954**	**32.34**	**2,958**	**31.60**
Containers & Packaging						
Glass Packaging	0					
Beer & Soft Drink Bottles	264	4.11	66	2.23	329	3.52
Wine & Liquor Bottles	59	0.92	15	0.50	73	0.78
Food & Other Bottles & Jars	283	4.42	28	0.93	311	3.32
Total Glass Packaging	**606**	**9.45**	**108**	**3.66**	**714**	**7.62**
Steel Packaging						
Beer & Soft Drink Cans	8	0.13	2	0.07	10	0.11
Food & Other Cans	156	2.44	15	0.52	172	1.83
Other Steel Packaging	1	0.01	7	0.24	8	0.08
Total Steel Packaging	**165**	**2.58**	**24**	**0.82**	**190**	**2.02**
Aluminum Packaging						
Beer & Soft Drink Cans	115	1.79	29	0.97	144	1.54
Food & Other Cans	1	0.02	1	0.03	2	0.02
Foil & Closures	20	0.32	1	0.04	22	0.23
Total Aluminum Packaging	**137**	**2.13**	**31**	**1.04**	**168**	**1.79**

Table A-4 (cont'd)

MUNICIPAL SOLID WASTE GENERATION
1995

	Douglas County Outside Lawrence					
	Residential		Non-residential		Total	
	tons/year	Percent	tons/year	Percent	tons/year	Percent
Paper & Paperboard Packaging						
Corrugated Boxes	190	2.96	443	15.02	633	6.76
Milk Cartons	5	0.08	5	0.18	11	0.12
Folding Cartons	204	3.18	75	2.53	279	2.98
Bags & Sacks	133	2.08	8	0.28	141	1.51
Other Packaging	65	1.02	19	0.65	85	0.90
Total Paper & Board Pkging	**597**	**9.32**	**551**	**18.67**	**1,148**	**12.27**
Plastics Packaging						
Soft Drink Bottles	46	0.72	11	0.39	57	0.61
Milk and Water Bottles	27	0.42	1	0.05	28	0.30
Other Containers	123	1.92	17	0.57	140	1.49
Bags & Sacks	68	1.05	4	0.14	72	0.77
Other Packaging	224	3.49	31	1.04	255	2.72
Total Plastics Packaging	**487**	**7.60**	**65**	**2.19**	**552**	**5.90**
Wood Packaging	0	0.00	368	12.47	368	3.93
Other Miscellaneous Packaging	11	0.17	3	0.08	13	0.14
Total Containers & Packaging	**2,003**	**31.24**	**1,149**	**38.95**	**3,152**	**33.67**
Total Product Wastes	**5,360**	**83.61**	**2,583**	**87.55**	**7,944**	**84.85**
Other Wastes						
Food Wastes	466	7.26	256	8.68	722	7.71
Yard Wastes	481	7.50	53	1.81	534	5.70
Miscellaneous Inorganic Wastes	105	1.64	58	1.96	163	1.74
Total Other Wastes	**1,051**	**16.39**	**367**	**12.45**	**1,418**	**15.15**
TOTAL GENERATION	**6,411**	**100.00**	**2,950**	**100.00**	**9,362**	**100.00**

Source: Franklin Associates, Ltd.

APPENDIX B

DETAILED COMPOSITION OF RECOVERED DOUGLAS COUNTY AND JEFFERSON COUNTY MUNICIPAL SOLID WASTE BY SOURCE

Table B-1
MUNICIPAL SOLID WASTE RECOVERY
1995 (tons)

	Total Recovery		Douglas County Recovery		Jefferson County Recovery
			Lawrence	Outside Lawrence	
Durable Goods					
Major Appliances	1,264		1,117	76	71
Small Appliances					
Furniture and Furnishings					
Carpets and Rugs					
Rubber Tires					
Batteries, Lead-Acid	627		502	64	60
Miscellaneous Durables					
Total Durable Goods	1,890		1,619	140	132
Nondurable Goods					
Newspapers	1,865		1,672	152	40
Books					
Magazines	275		244	25	6
Office Papers	406		406	0	0
Third Class (Direct) Mail	95	(1)	84	8	2
Directories	16		13	2	1
Commercial Printing					
Disposable Diapers					
Textiles, Footwear, misc.					
Tissue & Other Misc. Paper					
Total Nondurable Goods	2,657		2,419	188	49
Containers & Packaging					
Glass Packaging					
Beer & Soft Drink Bottles					
Wine & Liquor Bottles					
Food & Other Bottles & Jars					
Total Glass Packaging	741		691	40	10
Steel Packaging					
Beer & Soft Drink Cans					
Food & Other Cans					
Other Steel Packaging					
Total Steel Packaging	122		114	6	2
Aluminum Packaging					
Beer & Soft Drink Cans					
Food & Other Cans					
Foil & Closures					
Total Aluminum Packaging	334		301	26	7

Table B-1 (cont'd)
MUNICIPAL SOLID WASTE RECOVERY
1995 (tons)

	Total Recovery		Douglas County Recovery: Lawrence	Douglas County Recovery: Outside Lawrence	Jefferson County Recovery
Paper & Paperboard Packaging					
Corrugated Boxes	4,992		4,858	85	48
Milk Cartons					
Folding Cartons	163	(1)	145	13	4
Bags & Sacks	105	(1)	94	8	3
Other Packaging					
Total Paper & Board Pkging	5,259		5,097	107	55
Plastics Packaging					
Soft Drink Bottles	49		43	5	1
Milk and Water Bottles	42		38	3	1
Other Containers HDPE colored	12		11	1	0
Bags & Sacks	5		5	0	0
Polystyrene (Other Pkg)	2		2	0	0
Total Plastics Packaging	110		99	9	2
Wood packaging					
Other Miscellaneous Packaging					
Total Containers & Packaging	6,566		6,301	188	77
Total Product Wastes	11,113		10,340	516	258
Other Wastes					
Food Wastes					
Yard Wastes	8,512		8,512		
Miscellaneous Inorganic Wastes					
Total Other Wastes	8,512		8,512	0	0
Total MSW Recovery	**19,625**		**18,852**	**516**	**258**

(1) Mixed paper assumed to be 23% 3rd class mail, 45% folding cartons, and 29% bags & sacks.
Source: Franklin Associates, Ltd., based on information from recycling programs 1995.

APPENDIX C

PROJECTIONS OF MUNICIPAL SOLID WASTE GENERATION FOR DOUGLAS AND JEFFERSON COUNTIES

Table C-1

PROJECTED MUNICIPAL SOLID WASTE GENERATION
Tons/year

	Douglas County				
	1995	2000	2005	2010	2015
Durable Goods					
Major Appliances	1,259	1,382	1,473	1,523	1,557
Small Appliances	196	221	242	257	269
Furniture and Furnishings	2,591	2,901	3,153	3,322	3,463
Carpets and Rugs	783	870	938	981	1,015
Rubber Tires	1,264	1,419	1,546	1,633	1,707
Batteries, Lead-Acid	618	691	751	790	823
Miscellaneous Durables	5,049	5,621	6,072	6,361	6,590
Total Durable Goods	**11,760**	**13,106**	**14,175**	**14,867**	**15,423**
Nondurable Goods					
Newspapers	3,701	4,077	4,359	4,519	4,633
Books	371	428	479	521	560
Magazines	993	1,152	1,297	1,415	1,528
Office Papers	4,253	4,916	5,515	5,999	6,454
Third Class (Direct) Mail	967	1,104	1,224	1,314	1,397
Directories	135	154	171	184	196
Commercial Printing	1,503	1,720	1,910	2,057	2,191
Disposable Diapers	806	856	882	881	871
Textiles, footwear, misc.	3,604	4,038	4,391	4,630	4,828
Tissue & Other Misc. Paper	3,174	3,536	3,824	4,009	4,157
Total Nondurable Goods	**19,506**	**21,981**	**24,051**	**25,529**	**26,815**
Containers & Packaging					
Glass Packaging					
Beer & Soft Drink Bottles	1,738	1,776	1,761	1,694	1,611
Wine & Liquor Bottles	387	410	422	422	416
Food & Other Bottles & Jars	1,760	1,816	1,819	1,767	1,698
Total Glass Packaging	**3,885**	**4,003**	**4,003**	**3,882**	**3,725**
Steel Packaging					
Beer & Soft Drink Cans	55	56	56	53	51
Food & Other Cans	971	1,007	1,015	991	957
Other Steel Packaging	71	80	88	94	99
Total Steel Packaging	**1,096**	**1,144**	**1,158**	**1,138**	**1,107**

Table C-1 (cont'd)

PROJECTED MUNICIPAL SOLID WASTE GENERATION
Tons/year

	Douglas County				
	1995	2000	2005	2010	2015
Aluminum Packaging					
Beer & Soft Drink Cans	758	851	926	978	1,021
Food & Other Cans	15	18	21	24	26
Foil & Closures	120	130	138	141	142
Total Aluminum Packaging	**893**	**999**	**1,085**	**1,142**	**1,190**
Paper & Paperboard Packaging					
Corrugated Boxes	10,086	11,543	12,821	13,808	14,708
Milk Cartons	57	52	46	39	33
Folding Cartons	1,795	1,938	2,031	2,063	2,073
Bags & Sacks	780	797	791	760	723
Other Packaging	530	562	579	578	571
Total Paper & Board Pkging	**13,249**	**14,893**	**16,267**	**17,249**	**18,109**
Plastics Packaging					
Soft Drink Bottles	303	331	352	362	369
Milk and Water Bottles	148	161	170	174	176
Other Containers	812	1,155	1,593	2,132	2,821
Bags & Sacks	397	467	533	591	647
Other Packaging	1,479	1,491	1,458	1,383	1,298
Total Plastics Packaging	**3,139**	**3,605**	**4,106**	**4,642**	**5,311**
Wood Packaging	3,547	4,077	4,547	4,919	5,262
Other Miscellaneous Packaging	80	87	92	94	95
Total Containers & Packaging	**25,889**	**28,807**	**31,259**	**33,066**	**34,798**
Total Product Wastes	**57,155**	**63,894**	**69,485**	**73,462**	**77,036**
Other Wastes					
Food Wastes	4,924	5,084	5,094	4,948	4,755
Yard Wastes	11,750	11,750	11,750	11,750	11,750
Miscellaneous Inorganic Wastes	1,109	1,198	1,256	1,277	1,284
Total Other Wastes	**17,783**	**18,032**	**18,100**	**17,975**	**17,789**
TOTAL GENERATION	**74,938**	**81,926**	**87,585**	**91,438**	**94,825**
Population (thousands)	88,786	95,849	100,419	102,015	102,503
Tons/day	205	224	240	251	260
Pounds per person per day	4.62	4.68	4.78	4.91	5.07

Source: Franklin Associates, Ltd.

Table C-2

PROJECTED MUNICIPAL SOLID WASTE GENERATION
Tons/year

	Jefferson County				
	1995	2000	2005	2010	2015
Durable Goods					
Major Appliances	133	137	143	149	154
Small Appliances	34	36	39	41	44
Furniture and Furnishings	419	441	471	500	526
Carpets and Rugs	127	132	140	148	154
Rubber Tires	128	135	145	154	163
Batteries, Lead-Acid	63	66	70	74	78
Miscellaneous Durables	816	855	907	957	1,002
Total Durable Goods	1,719	1,803	1,915	2,023	2,122
Nondurable Goods					
Newspapers	432	448	470	491	509
Books	60	65	72	78	85
Magazines	171	187	206	227	247
Office Papers	381	415	456	500	544
Third Class (Direct) Mail	185	198	216	233	251
Directories	19	21	22	24	26
Commercial Printing	264	284	310	336	362
Disposable Diapers	155	155	157	158	158
Textiles, footwear, misc.	496	522	558	592	624
Tissue & Other Misc. Paper	449	471	500	528	553
Total Nondurable Goods	2,612	2,766	2,967	3,168	3,359
Containers & Packaging					
Glass Packaging					
Beer & Soft Drink Bottles	304	292	284	275	265
Wine & Liquor Bottles	69	69	69	70	70
Food & Other Bottles & Jars	292	283	278	272	265
Total Glass Packaging	664	644	632	618	599
Steel Packaging					
Beer & Soft Drink Cans	5	5	5	4	4
Food & Other Cans	161	158	156	153	150
Other Steel Packaging	7	8	8	9	9
Total Steel Packaging	173	170	168	166	163

Table C-2 (cont'd)

PROJECTED MUNICIPAL SOLID WASTE GENERATION
Tons/year

	Jefferson County				
	1995	2000	2005	2010	2015
Aluminum Packaging					
Beer & Soft Drink Cans	116	123	131	139	147
Food & Other Cans	2	2	3	3	3
Foil & Closures	20	21	22	22	23
Total Aluminum Packaging	139	146	155	165	173
Paper & Paperboard Packaging					
Corrugated Boxes	462	498	542	588	634
Milk Cartons	10	9	7	6	6
Folding Cartons	261	265	273	279	284
Bags & Sacks	132	127	124	120	115
Other Packaging	79	79	80	80	80
Total Paper & Board Pkging	945	978	1,027	1,075	1,119
Plastics Packaging					
Soft Drink Bottles	78	80	84	87	89
Milk and Water Bottles	26	27	28	29	29
Other Containers	131	176	238	321	429
Bags & Sacks	67	75	84	93	103
Other Packaging	239	227	218	208	197
Total Plastics Packaging	542	584	651	738	848
Wood Packaging	345	373	409	445	482
Other Miscellaneous Packaging	12	13	13	13	14
Total Containers & Packaging	2,821	2,908	3,056	3,220	3,398
Total Product Wastes	7,153	7,477	7,937	8,411	8,879
Other Wastes					
Food Wastes	677	658	647	633	615
Yard Wastes	503	503	503	503	503
Miscellaneous Inorganic Wastes	153	155	160	163	166
Total Other Wastes	1,333	1,316	1,309	1,299	1,284
TOTAL GENERATION	8,485	8,793	9,246	9,711	10,163
Population (thousands)	16,486	16,746	17,220	17,622	17,897
Tons/day	23	24	25	27	28
Pounds per person per day	2.82	2.88	2.94	3.02	3.11

Source: Franklin Associates, Ltd.

APPENDIX D

SOLID WASTE MANAGEMENT COST TABLES FOR DOUGLAS AND JEFFERSON COUNTIES

Appendix Table D-1

JEFFERSON COUNTY HOUSEHOLD SWM COST ESTIMATES COMPARISON
BETWEEN CURRENT SYSTEM AND SCENARIO 2 ALTERNATIVES
(1995)

	Current System		With Drop-Off Recycling		With Drop-Off Recycling Plus HHW Program		For Rural Households With Drop-Off Recycling Plus HHW Program Plus Rural Wst. Drop-Offs	
	Household Quantity(1) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(1) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(1) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(2) (Tons/Year)	Household Cost ($/Ton)
Refuse & Bulky Waste Collection & Transport	1.057	68.35	1.036	69.04	1.036	69.04		
Refuse Landfilling	1.057	19.65	1.036	19.65	1.036	19.65		
Refuse Landfilled	1.057	88.00	1.036	88.69	1.036	88.69		
Existing Drop-Off Recyclables Collection	0.012		0.006		0.006		0.006	
Existing Recyclables Processing	0.012		0.006		0.006		0.006	
Existing Recyclables Recovery	0.012		0.006		0.006		0.006	
Existing Recyclables Revenues	0.012		0.006		0.006		0.006	
Existing Net Recycling	0.012	0.00	0.006	0.00	0.006	0.00	0.006	0.00
New Drop-Off Recyclables Collection & transport			0.027	151.4	0.027	151.4	0.027	151.4
New Recyclables Processing			0.027	0.00	0.027	0.00	0.027	0.00
New Recyclables Recovery			0.027	151.40	0.027	151.40	0.027	151.40
New Recyclables Revenues			0.027	82.15	0.027	82.15	0.027	82.15
New Net Recycling			0.027	69.25	0.027	69.25	0.027	69.25
HHW Collection & Processing					0.00055	3,083.00	0.00055	3,083.00
HHW Disposal					0.00055	1,870.00	0.00055	1,870.00
HHW Program					0.00055	4,953.00	0.00055	4,953.00
Rural Waste Drop-Off Collection & Transport							0.511	94.33
Rural Waste Landfilling							0.511	19.65
Rural Waste Drop-Off Program							0.511	113.98
Total SWM	1.069	87.01	1.069	87.70	1.069	90.25	0.544	115.51
Total SWM $/hshld/mo (City Hshlds)		7.75		7.81		8.04		
Total SWM $/hshld/mo (Rural Hshlds)		0.00		0.16		0.38		5.24
Incremental system cost increase ($/ton)(City Hshlds)				0.69		2.55		
Incremental system cost increase ($/Hshld/mo)(City Hshlds)				0.06		0.23		

(1) For an average single-family city household generating 41.12 pounds/week of MSW (including bulky durables).
(2) Average quantities per rural household estimated at rural waste drop-off sites and recyclables drop-offs.

Source: Franklin Associates, Ltd.

Appendix Table D-2

DOUGLAS COUNTY (OUTSIDE LAWRENCE) HOUSEHOLD SWM SYSTEM COST COMPARISON BETWEEN CURRENT SYSTEM AND SCENARIO 2 ALTERNATIVES (1995)

	Current System		With HHW Program		For Rural Households With HHW Program Plus Rural Wst. Drop-Offs	
	Household Quantity(1) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(1) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(2) (Tons/Year)	Household Cost ($/Ton)
Refuse & Bulky Waste Collection & Transport	1.195	58.35	1.195	58.35		
Refuse Landfilling	1.195	19.65	1.195	19.65		
Refuse Landfilled	1.195	78.00	1.195	78.00		
Existing Drop-Off Recyclables Collection	0.047		0.047		0.047	
Existing Recyclables Processing	0.047		0.047		0.047	
Existing Recyclables Recovery	0.047		0.047		0.047	
Existing Recyclables Revenues	0.047		0.047		0.047	
Existing Net Recycling	0.047	0.00	0.047	0.00	0.047	0.00
HHW Collection & Processing			0.00061	3,083.00	0.00061	3,083.00
HHW Disposal			0.00061	1,870.00	0.00061	1,870.00
HHW Program			0.00061	4,953.00	0.00061	4,953.00
Rural Waste Drop-Off Collection & Transport					0.532	94.33
Rural Waste Landfilling					0.532	19.65
Rural Waste Drop-Off Program					0.532	113.98
Total SWM	1.242	75.05	1.242	77.48	0.579	109.95
Total SWM $/hshld/mo (City Hshlds)		7.77		8.02		
Total SWM $/hshld/mo (Rural Hshlds)		0.00		0.25		5.30
Incremental system cost increase ($/ton)(City Hshlds)				2.43		
Incremental system cost increase ($/Hshld/mo)(City Hshlds)				0.25		

(1) For an average single-family city household generating 47.78 pounds/week of MSW (including bulky durables).
(2) Average quantities per rural household estimated at rural waste drop-off sites and recyclables drop-offs.

Source: Franklin Associates, Ltd.

Appendix Table D-3

JEFFERSON COUNTY
ESTIMATED RECYCLABLES DROP-OFF CENTER COST
WITH 10% HSHLD PARTICIPATION (1)
ONE-PERSON ATTENDANT WITH COLLECTION VEHICLE
1.0 LOAD (3.33 TONS) PER DAY
(1995)

COSTS AT DROP-OFF SITES:

Capital Cost Items:	**Costs (dollars)**
Truck Chassis & Body — 34 cubic yard with side-loading automated-lift hopper; 11 compartments	91,000
Spare Trucks — assume 15% backup	13,650
Subtotal Trucks	104,650
Total Equipment Capital Cost	104,650
Annual Cost Items:	
Truck Amortization — 8 years life, no resale, 6% Int.	16,852
Insurance, Licenses, Taxes, Etc. — 10% of truck capital costs	10,465
Maintenance (Repairs, Fuel, Tires) — $0.00/hour At Site	0
Labor (1-man crew) — $15.50/hour each + 50% fringes	48,546
Labor Supervision — $2.90/hour	6,055
Overhead (Building & Utilities) — 4% of above	3,277
Overhead (Administration, Office) — 10% of above except Bldg/Util	8,192
Promotion of Program — $1/hshld/year; 6600 hshlds	6,600
Subtotal	99,987
Profit @ 10%	9,999
Total Annual Cost	109,986
Cost Per Hour	52.68
Cost Per Ton Factors:	
Assume 3.33 tons/load X 1.0 loads/day=3.33 tons/day/crew	
Cost per day=$52.68/hour X 5 hours/day @ site=$263.38	
Cost Per Ton for Time @ Drop-Off Site	79.09

(1) Assumes collected materials divided by 11 truck compartments as follows: mixed paper; clear glass; green glass; amber glass; alum. cans; steel cans; PET plastics; HDPE clear; HDPE colored; ONP; Magazines.

TRAVEL/HAUL COSTS:

Capital Cost Items:	Costs (dollars)
Truck Chassis & Body — 34 cubic yard with side-loading automated-lift hopper; 11 compartments	91,000
Spare Trucks — assume 15% backup	13,650
Subtotal Trucks	104,650
Total Equipment Capital Cost	104,650
Annual Cost Items:	
Truck Amortization — 8 years life, no resale, 6% Int.	16,852
Insurance, Licenses, Taxes, Etc. — 10% of truck capital costs	10,465
Maintenance (Repairs, Fuel, Tires) — $22.00/hour for travel time	45,936
Labor (1-man crew) — $15.50/hour each + 50% fringes	48,546
Labor Supervision — $2.90/hour	6,055
Overhead (Building & Utilities) — 4% of above	5,114
Overhead (Administration, Office) — 10% of above except Bldg/Util	12,785
Promotion of Program — $1/hshld/year; 6600 hshlds	6,600
Subtotal	152,354
Profit @ 10%	15,235
Total Annual Cost	167,590
Cost Per Hour	80.26
Cost Per Ton Factors:	
Assume 3.33 tons/load X 1.0 loads/day=3.33 tons/day/crew Cost per day=$80.26/hour X 3 hours/day @ site=$240.79	
Cost Per Ton for Travel Time	72.31
TOTAL RECYCLABLES DROP-OFF COLLECTION & HAUL COSTS ($/ton)	151.40

(1) Assumes collected materials divided by 11 truck compartments as follows: mixed paper; clear glass; green glass; amber glass; alum. cans; steel cans; PET plastics; HDPE clear; HDPE colored; ONP; Magazines.

Source: Franklin Associates, Ltd.

Appendix Table D-4

ESTIMATED REVENUES FOR RECYCLABLES DELIVERED
FROM JEFFERSON COUNTY MOBILE DROP-OFF CENTERS
(1995)

Material	Recovery W/10% Participation (tons/week)	Prices Delivered to Processor(1) ($/ton)	Weekly Revenues ($)	Annual Revenues ($)
ONP (#6)	0.671	120	80.52	4,187
Magazines	0.192	80	15.36	799
Mixed Paper	0.959	60	57.54	2,992
Glass Containers:			0.00	0
Clear	0.590	10	5.90	307
Amber	0.212	7	1.48	77
Green	0.120	7	0.84	44
Aluminum Cans	0.107	900	96.30	5,008
Steel Cans	0.261	18	4.70	244
PET Soft Drink Bottles	0.115	40	4.60	239
HDPE Milk/Water Bottles	0.046	100	4.60	239
HDPE Colored Containers	0.057	30	1.71	89
Totals	3.33	82.15	273.55	14,225

(1) Prices for paper grades and aluminum cans from Jefferson Smurfit (delivered prices). Prices for other materials are FOB sellers dock prices from May 30th Recycling Times.

Source: Franklin Associates, Ltd.

Appendix Table D-5

ESTIMATED COST FOR MOBILE HOUSEHOLD HAZARDOUS WASTE PROGRAM
IN DOUGLAS COUNTY (OUTSIDE LAWRENCE) AND JEFFERSON COUNTY
WITH 3% ANNUAL HOUSEHOLD PARTICIPATION
EIGHT ONE-DAY COLLECTION EVENTS
(1995)

Capital Cost Items:	Costs (dollars) (1995)
Truck — one-ton; 8 day use per year with mobile trailer	23,000
Spare Trucks — assume 15% backup	3,450
Subtotal Trucks	26,450
Mobile Trailer — liquid tight; fully equiped	10,000
Total Equipment Cost	36,450
Annual Cost Items Allocated by Hours on HHW Collection and Processing:	
Truck Amortization — 8 years life, no resale, 6% Int.	4,259
Mobile Trailer — 10 years life, no resale, 6% Int.	1,359
Insurance, Licenses, Taxes, Etc. — 10% of truck capital costs	2,645
Maintenance (Repairs, Fuel, Tires) — $3.00/hour	6,264
Labor (4-man crew) — $11.00/hour each + 50% fringes	137,808
Labor — unloading, recording, storing at permanent site @ 15.50/hour + 50% fringes (assumes only 25% of one person)	12,137
Overhead (Building & Utilities) — 4% of above	6,579
Overhead (Administration, Office) — 10% of above except Bldg/Util	16,447
Contingency @ 10%	18,750
Subtotal Annual Cost	206,247
Subtotal Cost Per Hour	99
Annual Cost Items Allocated Only to HHW Collection, Processing and Disposal:	
Operating Expenses — supplies, training, trash removal @ $1.60/lb disposed	8,272
Disposal @$2.48/lb (includes transportation) for 5,170 lbs/yr disposed	12,822
Public Education	5,000
Subtotal Annual Cost	26,094
Subtotal Cost Per Hour	326
Total Cost Per Hour:	
Cost Per Hour Before Profit	425
Cost Per Hour With 10% Profit	467
Cost Factors:	
Assume 15,100 lbs/yr for 8 one-day events; 1,887.5 lbs/one-day event	
Cost per day=$467/hour X 10 hours/one-day event=$4,670	
Total Cost Per Pound for HHW Program	2.48
Total Cost Per Ton for HHW Program	4,953

Assumes 15,100 pounds total product; 9,930 pounds exchanged and 5,170 pounds disposed
Assumes a minimum of 6 Community Service volunteers and 3 technical volunteers from industry

Sources: Douglas County permanent household hazardous site 1994 data.
Information from KDH&E, Franklin County, Ellis County, Reno County.

Appendix Table D-6

ESTIMATED COST (BY COUNTY) FOR RURAL WASTE DROP-OFF PROGRAM
IN DOUGLAS COUNTY (OUTSIDE LAWRENCE) AND JEFFERSON COUNTY
FOUR SITES IN EACH COUNTY; 1,920 TONS PER YEAR EACH COUNTY
(1995)

COSTS AT SITES:	Costs (dollars) (1995)
Capital Cost Items:	
Sites — Four sites of 1/2 to 1 acre each w/shed, electricity, rock surface; $20,000 each	80,000
Stationary Compactors — one, 3 cubic yard compactor at each site; $15,000 each	60,000
Closed Roll-Off Containers — one, 42 cubic yard roll-off at each site; $4500 each	18,000
Open Roll-Off Containers — one, 42 cubic yard roll-off at each site; $2,500 each	10,000
Total Capital Cost	168,000
Annual Cost Items:	
Site & Equipment Amortization —10 years life, 6% interest	
Labor — 16 person-hours per week ea. site @ $9.00/hour+50% fringes	44,928
Insurance — use 2.5% of capital cost	4,200
Property Taxes — use 2.6% of capital cost	4,368
Equipment Maintenance — use 4% of equipment capital cost	3,520
Site Maintenance — (ref. Houston Co, MN)	10,000
Utilities — electricity for heating and cooling, telephone (ref. Houston Co, MN)	1,200
Lease of Property (ref. Houston Co, MN)	1,000
Promotion of Program — $1/rural hshld/year; 3600 hshlds	3,600
Overhead (Administration, Office) — 10% of above	7,282
Contingencies — 10% 0f above	8,010
Subtotal	88,107
Profit @ 10%	8,811
Total Annual Cost for Operation of Sites	96,918
Cost Per Ton for Operation of Sites	52.67
COSTS FOR COLLECTION & HAULING:	
Cost Per Ton for Refuse — 26.0 tons/week (4 loads), truck for 42-yard closed roll-off container at $70 per hour, 10.5 hours per week	28.27
Cost Per Ton for Bulky Waste — 9.0 tons/week (4 loads), truck for open 42-yard roll-off container at $65/hour, 10.5 hours/week	75.83
Total Annual Cost for Collection & Hauling	76,650
Cost Per Ton for Collection & Hauling	41.66
COSTS FOR DISPOSAL:	
Total Annual Cost for Disposal	36,156
Cost Per Ton for Disposal	19.65
TOTAL COSTS FOR RURAL WASTE DROP-OFFS PER COUNTY:	
Total Annual Cost	209,724
Total Cost Per Ton	113.98

Appendix Table D-7

CITIES IN JEFFERSON COUNTY
HOUSEHOLD SWM SYSTEM COST COMPARISON
BETWEEN CURRENT SYSTEM AND SCENARIO 3 ALTERNATIVES

	Current System		With Curbside Recycling		With Curbside Plus HHW Program	
	Household Quantity(1)(2) (Tons/Year)	Household Cost(3) ($/Ton)	Household Quantity(2)(4) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(2)(4) (Tons/Year)	Household Cost ($/Ton)
Refuse & Bulky Waste Collection & Transport	1.057	68.35	0.869	75.74	0.869	75.74
Refuse Landfilling	1.057	19.65	0.869	19.65	0.869	19.65
Refuse Landfilled	1.057	88.00	0.869	95.39	0.869	95.39
Recyclables Collection	0.012		0.200	118.00	0.200	118.00
Recyclables Processing	0.012		0.200	91.00	0.200	91.00
Recyclables Recovery	0.012		0.200	209.00	0.200	209.00
Recyclables Revenues	0.012		0.200	149.00	0.200	149.00
Net Recycling	0.012	0.00	0.200	60.00	0.200	60.00
HHW Collection & Processing					0.00055	3,083
HHW Disposal					0.00055	1,870
HHW Program					0.00055	4,953
Total SWM	1.069	87.01	1.069	88.77	1.069	91.32
Total SWM $/hshld/mo		7.75		7.91		8.14
Incremental system cost increase ($/ton)				1.76		4.31
Incremental system cost increase ($/hshld/mo)				0.16		0.39

(1)For an average single-family household generating 41.12 pounds/week of MSW (including bulky durables). 1995 dollars; 1995 quantities.
(2)Landfill assumed — Hamm Landfill
(3)Calculations 6-19-95 based on Chapters 1-4
(4)Assumes management of all single-family generated MSW. Assumes curbside recovery of ONP, OMG; mixed paper; glass; steel & aluminum beverage & food containers; PET soft drink bottles (with base cups), & HDPE natural & colored bottles. Landfill assumed — Hamm Landfill. Assumes MRF operating at 26 tons/day, 5 days/week.

Source: Franklin Associates, Ltd.

Appendix Table D-8

CITIES IN DOUGLAS COUNTY OUTSIDE OF LAWRENCE
HOUSEHOLD SWM SYSTEM COST COMPARISON
BETWEEN CURRENT SYSTEM AND SCENARIO 3 ALTERNATIVES

	Current System		With Curbside Recycling		With Curbside Plus HHW Program	
	Household Quantity(1)(2) (Tons/Year)	Household Cost(3) ($/Ton)	Household Quantity(2)(4) (Tons/Year)	Household Cost(3) ($/Ton)	Household Quantity (Tons/Year)	Household Cost ($/Ton)
Refuse & Bulky Waste Collection & Transport	1.195	58.51	1.011	63.83	1.011	63.83
Refuse Landfilling	1.195	19.65	1.011	19.65	1.011	19.65
Refuse Landfilled	1.195	78.16	1.011	83.48	1.011	83.48
Recyclables Collection	0.047		0.231	118.00	0.231	118.00
Recyclables Processing	0.047		0.231	91.00	0.231	91.00
Recyclables Recovery	0.047		0.231	209.00	0.231	209.00
Recyclables Revenues	0.047		0.231	150.00	0.231	150.00
Net Recycling	0.047	0.00	0.231	59.00	0.231	59.00
HHW Collection & Processing					0.00061	3,083
HHW Disposal					0.00061	1,870
HHW Program					0.00061	4,953
Total SWM	1.242	75.20	1.242	78.93	1.242	81.36
Total SWM $/hshld/mo		7.78		8.17		8.42
Incremental system cost increase ($/ton)				3.73		6.16
Incremental system cost increase ($/hshld/mo)				0.39		0.64

(1) For an average single-family household generating 47.78 pounds/week of MSW (including bulky durables). 1995 dollars; 1995 qu
(2) Landfill assumed — Hamm Landfill
(3) Calculations 6-19-95 based on Chapters 1-4
(4) Assumes management of all single-family generated MSW. Assumes curbside recovery of ONP, OMG; mixed paper; glass; steel & aluminum beverage & food containers; PET soft drink bottles (with base cups), & HDPE natural & colored bottles. Landfill assumed — Hamm Landfill. Assumes MRF operating at 26 tons/day, 5 days/week.

Source: Franklin Associates, Ltd.

Appendix Table D-9

DOUGLAS COUNTY CITIES OTHER THAN LAWRENCE
AND JEFFERSON COUNTY CITIES
ESTIMATED HOUSEHOLD RECYCLABLES COLLECTION COST
WITH 75% HSHLD PARTICIPATION
COLLECTION WITH 1-MAN CREW
1.0 LOAD (3.08 TONS; 600 PARTICIPATING HSHLDS 400 SETOUTS) PER DAY
(1995)

Capital Cost Items:	
Truck Chassis & Body — 23 cubic yard with side-loading automated-lift hopper; 3 compartments	64,225
Spare Trucks — assume 15% backup	9,634
Subtotal Trucks	73,859
Curbside Containers — 16 gallons @ $7 each; 800 @ 1/household	5,600
Total Equipment Capital Cost	79,459
Annual Cost Items:	
Truck Amortization — 8 years life, no resale, 6% Int.	11,894
Container Amortization — 10 years life, no resale, 6% Int.	761
Insurance, Licenses, Taxes, Etc. — 10% of truck capital costs	7,386
Maintenance (Repairs, Fuel, Tires) — $11.00/hour	22,968
Labor (1-man crew) — $9.00/hour each + 50% fringes	28,188
Labor Supervision — $1.65/hour	3,445
Container Replacement — 5%/year	280
Overhead (Building & Utilities) — 4% of above	2,997
Overhead (Administration, Office) — 10% of above except Bldg/Util	7,492
Promotion of Program — $1/hshld/year; 800 hshlds	800
Subtotal	86,211
Profit @ 10%	8,621
Total Annual Cost	94,832
Cost Per Hour	45.42
Cost Per Ton Factors:	
Assume 3.08 tons/load X 1.0 loads/day= 3.08 tons/day/crew	3.08
Cost per day=$45.42/hour X 8 hours/day=$363	363
Cost Per Ton	118

Source: Franklin Associates, Ltd.

Appendix Table D-10

CURBSIDE COLLECTION OF RECYCLABLES IN JEFFERSON COUNTY (1995 estimates)(1)

Material	Generation Jefferson Co. Residential (tons/yr)(2)	Generation per single family hshld (lbs/week)(3) A	Capture (%) B	Participation (%) C	All Hshlds Averaged Recovery (lbs/week) =A*B*C	Participating Household Recovery (lbs/week) =A*B	Processing Loss (%) D	Marketable Quantity (lbs/week) E=A*B*D	Revenue FOB seller's ($/ton)(4) F	Market Basket (% of ton) G=E+total lbs	Market Basket Revenue ($/ton recyclables) =F*G
ONP (#6 news)	367	2.18	0.95	0.75	1.56	2.07		2.07	140	21%	$30
Magazines	111	0.66	0.90	0.75	0.45	0.59		0.59	135	6%	$8
Mixed Paper (5)	554	3.30	0.90	0.75	2.22	2.97		2.97	80	30%	$24
Glass Containers	564										
Clear 64%	361	2.15	0.85	0.75	1.37	1.83	0.2	1.46	55	15%	$8
Amber 23%	130	0.77	0.85	0.75	0.49	0.66	0.2	0.53	40	5%	$2
Green 13%	73	0.44	0.85	0.75	0.28	0.37	0.2	0.30	15	3%	$0.46
Mixed											
Aluminum Cans	93	0.55	0.60	0.75	0.25	0.33		0.33	1200	3%	$41
Steel Cans	151	0.90	0.90	0.75	0.61	0.81		0.81	45	8%	$4
PET Soft Drink	63	0.37	0.95	0.75	0.27	0.36		0.36	500	4%	$18
HDPE Milk/Wtr Btls	25	0.15	0.95	0.75	0.11	0.14		0.14	490	1%	$7
HDPE Other Contnrs	37	0.22	0.80	0.75	0.13	0.18		0.18	300	2%	$5
Total Recyclables	1,966	11.7			7.7	10.3		9.7		100%	$149
Assume Participating Hshld set-out rate = 67%											
(hshld places recyclables at the curb 2 out of 3 times)						15.4	pounds per set-out				

(1) Assume curbside collection of recyclables from single family hshlds. (i.e., 1-4 hshld units/bldg. + trailer courts)
(2) from Table A-2 of Chapters 1-4 Report
(3) from Tables 1-5 and 2-3
(4) Revenue sources:
Paper prices from Paper Recycler Chicago Market. April 1995. Miller Freeman Inc. ONP & mixed paper from Jefferson Smurfitt K.C. plus value of baling ($20).
Glass and steel cans price from The Markets Page. End User West Central Region Market. Waste Age's Recycling Times. May 16, 1995.
Aluminum can prices from Reynolds Aluminum in K.C. May 31, 1995. 59¢ to 60¢ per pound FOB buyer. From KAB transportation costs equal $38 per ton.
This transportation cost could be avoided by contracting with a buyer who would site a trailer at the MRF.
PET revenue from Wellman 25¢ per pound. FOB seller's dock May 30, 1995.
HDPE revenue from Phillips 24¢ to 27¢ per pound natural; 15¢ to 17¢ per pound colored. FOB buyer's dock. May 30, 1995.
(5) residential office paper, 3rd class mail, folding cartons, bags & sacks

Appendix Table D-11

CURBSIDE COLLECTION OF RECYCLABLES IN DOUGLAS COUNTY OTHER THAN LAWRENCE (1995 estimates)(1)

Material	Generation Douglas Co. other cities Residential (tons/yr)(2)	Generation per single family hshld (lbs/week)(3) A	Capture (%) B	Participation (%) C	All Hshlds Averaged Recovery (lbs/week) =A*B*C	Participating Household Recovery (lbs/week) =A*B	Processing Loss (%) D	Marketable Quantity (lbs/week) E=A*B*D	Revenue FOB seller's ($/ton)(4) F	Market Basket (% of ton) G=E+total lbs	Market Basket Revenue ($/ton recyclables) =F*G
ONP (#6 news)	596	3.52	0.95	0.75	2.51	3.35		3.35	140	30%	$42
Magazines	122	0.72	0.90	0.75	0.49	0.65		0.65	135	6%	$8
OCC	0	0.00	0.75	0.75	0.00	0.00		0.00	195	0%	$0
Mixed Paper (5)	558	3.30	0.90	0.75	2.23	2.97		2.97	80	26%	$21
Glass Containers	606										
Clear 64%	388	2.29	0.85	0.75	1.46	1.95	0.2	1.56	55	14%	$8
Amber 23%	139	0.82	0.85	0.75	0.53	0.70	0.2	0.56	40	5%	$2
Green 13%	79	0.47	0.85	0.75	0.30	0.40	0.2	0.32	15	3%	$0.42
Mixed											
Aluminum Cans	115	0.68	0.60	0.75	0.31	0.41		0.41	1200	4%	$43
Steel Cans	164	0.97	0.90	0.75	0.65	0.87		0.87	45	8%	$3
PET Soft Drink	46	0.27	0.95	0.75	0.19	0.26		0.26	500	2%	$11
HDPE Milk/Wtr Btls	27	0.16	0.95	0.75	0.11	0.15		0.15	490	1%	$7
HDPE Other Contnrs	40	0.23	0.80	0.75	0.14	0.19		0.19	300	2%	$5
Total Recyclables	2,274	13.4			8.9	11.9		11.3		100%	$150

Assume Participating Hshld set-out rate = 67%
(hshld places recyclables at the curb 2 out of 3 times) 17.7 pounds per set-out

(1) Assume curbside collection of recyclables from single family hshlds. (i.e., 1-4 hshld units/bldg. + trailer courts)
(2) from Table A-2 of Chapters 1-4 Report
(3) from Tables 1-5 and 2-3
(4) Revenue sources:
Paper prices from Paper Recycler Chicago Market. April 1995. Miller Freeman Inc. ONP & mixed paper from Jefferson Smurfitt K.C. plus value of baling ($20).
Glass and steel cans price from The Markets Page. End User West Central Region Market. Waste Age's Recycling Times. May 16, 1995.
Aluminum can prices from Reynolds Aluminum in K.C. May 31, 1995. 59¢ to 60¢ per pound FOB buyer. From KAB transportation costs equal $38 per ton.
This transportation cost could be avoided by contracting with a buyer who would site a trailer at the MRF.
PET revenue from Wellman 25¢ per pound. FOB seller's dock May 30, 1995.
HDPE revenue from Phillips 24¢ to 27¢ per pound natural; 15¢ to 17¢ per pound colored. FOB buyer's dock. May 30, 1995.
(5) residential office paper, 3rd class mail, folding cartons, bags & sacks

Franklin Associates, Ltd.

Appendix Table D-12

LAWRENCE HOUSEHOLD SWM SYSTEM COST COMPARISON BETWEEN CURRENT SYSTEM AND SCENARIO 3 ALTERNATIVES (1)

	With ONP Drop-off Recycling & Composting		With Curbside Recycling & Composting	
	Household Quantity(2)(3) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(4)(5) (Tons/Year)	Household Cost ($/Ton)
Refuse & Bulky Waste Collection & Transport	0.975	77.35	0.820	85.00
Refuse Landfilling	0.975	19.65	0.820	19.65
Refuse Landfilled	0.975	97.00	0.820	104.65
Recyclables Collection	0.034	45.00	0.296	117.00
Recyclables Processing	0.034	0.00	0.296	91.00
Recyclables Recovery	0.034	45.00	0.296	208.00
Recyclables Revenues (1995)	0.034	80.00	0.296	146.00
Net Recycling	0.034	($35)	0.296	62.00
Yard Trimmings Collection	0.390	63.00	0.390	63.00
Yard Trimmings Composting	0.390	13.00	0.390	13.00
Yard Trimmings Recovery	0.390	76.00	0.390	76.00
Compost Revenues	0.390	0.00	0.390	0.00
Net Yard Trimmings Composting	0.390	76.00	0.390	76.00
Total SWM	1.399	87.94	1.506	88.85
Total SWM $/hshld/mo		10.25		11.15
Incremental system cost increase ($/ton)				0.91
Incremental system cost increase ($/hshld/mo)				0.90

(1) For an average single-family household generating 57.8 pounds/week of MSW (including bulky durables). 1995 dollars; 1995 quantities. 85% participation in curbside recycling. MSW recyclables taken to private drop-off centers not included in current system figures.
(2) Landfill assumed — Hamm Landfill
(3) Assume that the 659 ton ONP collected in1994 by the City was from single family homes.
(4) Assumes management of all single-family generated MSW. Assumes curbside recovery of ONP, OMG; mixed paper; glass; steel & aluminum beverage & food containers; PET soft drink bottles (with base cups), & HDPE natural & colored bottles. Landfill assumed — Hamm Landfill. Assumes MRF operating at 26 tons/day, 5 days/week.
(5) Assumes separate curbside collection of yard trimmings for composting. Curbside collection in 1994 recovered 7360 tons.

Source: Franklin Associates, Ltd.

Appendix Table D-12A

LAWRENCE HOUSEHOLD SWM SYSTEM COST COMPARISON
BETWEEN CURRENT SYSTEM AND SCENARIO 3 ALTERNATIVES (1)
WITHOUT RECYCLABLES REVENUES & WITH 1994 &1995 REVENUES

	With ONP Drop-off Recycling & Composting		With Curbside Recycling & Composting	
	Household Quantity(2)(3) (Tons/Year)	Household Cost ($/Ton)	Household Quantity(4)(5) (Tons/Year)	Household Cost ($/Ton)
Refuse Landfilled (collection & disposal)	0.975	97.00	0.820	104.65
Recyclables Collection	0.034	45.00	0.296	117.00
Recyclables Processing	0.034	0.00	0.296	91.00
Recyclables Recovery	0.034	45.00	0.296	208.00
Yard Trimmings Recovery (collection & composting)	0.390	76.00	0.390	76.00
Total SWM Costs	1.399	89.88	1.506	117.54
Total SWM Costs $/hshld/mo		10.48		14.75
Incremental system cost increase ($/ton)				27.66
Incremental system cost increase ($/hshld/mo)				4.27
Recyclables Revenues (1994)	0.034	20.00	0.296	50.00
Net SWM Costs (after revenues)	1.399	89.40	1.506	107.72
Net SWM Costs $/hshld/mo (after revenues)		10.42		13.52
Net Incremental system cost increase ($/ton)				18.32
Net Incremental system cost increase ($/hshld/mo)				3.10
Recyclables Revenues (1995)	0.034	80.00	0.296	146.00
Net SWM Costs (after revenues)	1.399	87.94	1.506	88.85
Net SWM Costs $/hshld/mo (after revenues)		10.25		11.15
Net Incremental system cost increase ($/ton)				0.91
Net Incremental system cost increase ($/hshld/mo)				0.90

(1) For an average single-family household generating 57.8 pounds/week of MSW (including bulky durables). 1995 dollars; 1995 quantities. 85% participation in curbside recycling. MSW recyclables taken to private drop-off centers not included in current system figures.
(2) Landfill assumed — Hamm Landfill
(3) Assume that the 659 ton ONP collected in1994 by the City was from single family homes.
(4) Assumes management of all single-family generated MSW. Assumes curbside recovery of ONP, OMG; mixed paper; glass; steel & aluminum beverage & food containers; PET soft drink bottles (with base cu & HDPE natural & colored bottles. Landfill assumed — Hamm Landfill. Assumes MRF operating at 26 tons/day, 5 days/week.
(5) Assumes separate curbside collection of yard trimmings for composting. Curbside collection in 1994 recovered 7360 tons.

Source: Franklin Associates, Ltd.

Appendix Table D-13

LAWRENCE
ESTIMATED HOUSEHOLD RECYCLABLES COLLECTION COST
WITH 85% HSHLD PARTICIPATION (1)
COLLECTION WITH 1-MAN CREW
1.0 LOAD (4.87 TONS; 485 SETOUTS) PER DAY
(1995)

Capital Cost Items:	
Truck Chassis & Body — 42 cubic yard with side-loading automated-lift hopper; 3 compartments	88,355
Spare Trucks — assume 15% backup	13,253
Subtotal Trucks	101,608
Curbside Containers — 18 gallons @ $7 each; 4,280 @ 1/household	29,960
Total Equipment Capital Cost	131,568
Annual Cost Items:	
Truck Amortization — 8 years life, no resale, 6% Int.	16,363
Container Amortization — 10 years life, no resale, 6% Int.	4,071
Insurance, Licenses, Taxes, Etc. — 10% of truck capital costs	10,161
Maintenance (Repairs, Fuel, Tires) — $11.00/hour	22,968
Labor (1-man crew) — $15.50/hour each + 50% fringes	48,546
Labor Supervision — $2.90/hour	6,055
Container Replacement — 5%/year	1,498
Overhead (Building & Utilities) — 4% of above	4,386
Overhead (Administration, Office) — 10% of above except Bldg/Util	10,966
Promotion of Program — $1/hshld/year; 4,280 hshlds	4,095
Subtotal	129,109
Profit @ 10%	12,911
Total Annual Cost	142,020
Cost Per Hour	68.02
Cost Per Ton Factors:	
Assume 4.87 tons/load X 1.0 loads/day= 4.87 tons/day/crew	4.66
Cost per day=$68.02/hour X 8 hours/day=$544.14	544.14
Cost Per Ton	116.77

(1) Assumes collected materials divided by 3 truck compartments as follows: newspapers and OMG; mixed paper; commingled containers.

Source: Franklin Associates, Ltd.

Appendix Table D-14

CURBSIDE COLLECTION OF RECYCLABLES IN LAWRENCE (1995 estimates)(1)

Material	Generation Residential (tons/yr)(2)	Generation per single family hshld (lbs/week)(3) A	Capture (%) B	Participation (%) C	All Hshlds Averaged Recovery (lbs/week) =A*B*C	Participating Household Recovery (lbs/week) =A*B	Processing Loss (%) D	Marketable Quantity (lbs/week) E=A*B*D	Revenue FOB seller's ($/ton)(4) F	Market Basket (% of ton) G=E+total lbs	Market Basket Revenue ($/ton recyclables) =F*G
ONP (#6 news)	2,550	4.00	0.95	0.85	3.23	3.80		3.80	140	30%	$42
Magazines	523	0.82	0.90	0.85	0.63	0.74		0.74	135	6%	$8
OCC	739	0.00	0.75	0.85	0.00	0.00		0.00	195	0%	$0
Mixed Paper (5)	2,695	4.23	0.90	0.85	3.24	3.81		3.81	80	30%	$24
Glass Containers 2,356											
Clear 64%	1,508	2.37	0.85	0.85	1.71	2.01	0.2	1.61	55	13%	$7
Amber 23%	542	0.85	0.85	0.85	0.61	0.72	0.2	0.58	40	5%	$2
Green 13%	306	0.48	0.85	0.85	0.35	0.41	0.2	0.33	15	3%	$0.38
Mixed											
Aluminum Cans	447	0.70	0.60	0.85	0.36	0.42		0.42	1200	3%	$39
Steel Cans	640	1.00	0.90	0.85	0.77	0.90		0.90	45	7%	$3
PET Soft Drink	179	0.28	0.95	0.85	0.23	0.27		0.27	500	2%	$10
HDPE Milk/Wtr Btls	104	0.16	0.95	0.85	0.13	0.16		0.16	490	1%	$6
HDPE Other Contnrs	155	0.24	0.80	0.85	0.17	0.19		0.19	300	2%	$5
Total Recyclables	10,388	15.1			11.4	13.4		12.8		100%	$146

Assume Participating Hshld set-out rate = 67%
(hshld places recyclables at the curb 2 out of 3 times) 20.1 pounds per set-out

(1) Assume curbside collection of recyclables from single family hshlds. (i.e., 1-4 hshld units/bldg. + trailer courts)
(2) assumes 62,481 persons in occupied households
(3)Assume 49,598 persons in occupied single family households; 2.55 persons per single family household; 19,450 single family hsholds
(4) Revenue sources:
Paper prices from Paper Recycler Chicago Market. April 1995. Miller Freeman Inc. ONP & mixed paper from Jefferson Smurfitt K.C. plus value of baling ($20).
Glass and steel cans price from The Markets Page. End User West Central Region Market. Waste Age's Recycling Times. May 16, 1995.
Aluminum can prices from Reynolds Aluminum in K.C. May 31, 1995. 59¢ to 60¢ per pound FOB buyer. From KAB transportation costs equal $38 per ton.
This transportation cost could be avoided by contracting with a buyer who would site a trailer at the MRF.
PET revenue from Wellman 25¢ per pound. FOB seller's dock May 30, 1995.
HDPE revenue from Phillips 24¢ to 27¢ per pound natural; 15¢ to 17¢ per pound colored. FOB buyer's dock. May 30, 1995.
(5) residential office paper, 3rd class mail, folding cartons, bags & sacks

Franklin Associates, Ltd.

Appendix Table D-15
ESTIMATED MATERIALS RECOVERY FACILITY COSTS
WITH CURBSIDE SORT RECYCLING PROGRAM
5,775 TONS PER YEAR FROM LAWRENCE,
521 TONS PER YEAR FROM OTHER DOUGLAS COUNTY CITIES
AND 466 TONS PER YEAR FROM CITIES IN JEFFERSON COUNTY
(26 TONS PER DAY) (1995)

Capital Cost Items:	Costs (in dollars)
Land — 5 acres @ $10,250/acre	51,250
Site Development Costs:	
Surface Preparation (grading & roads)	
16,200 sq ft @ $3.00/sq ft floor area	48,600
Fencing & Gates — 1900 linear feet @ $13.30/foot	25,268
Utilities (water, sewers, electricity) @ $1.00/sq ft floor area	16,200
Buildings:	
Gate House, Office, Rest Rooms — 600 sq ft @ $73	43,801
Processing/storage Building — 16,200 sq ft @ $49	793,774
Subtotal: Site Development Costs	927,644
Equipment Costs:	
Scales — 1 @ $3,690 4x6 platform	3,690
Pit conveyor — $2500	2,500
Platforms — 60 ft @ $1230/ft (10 stations)	73,800
Conveyor — negative sort 24 ft @ 1,025/ft	24,600
Baler with conveyor — 1 multimaterial	111,200
Magnetic separator — 1@$15,375	15,375
Aluminum can flattener/blower system	7,175
Eddy Current	43,050
Air classifier — 1 @ 20,500	20,500
Screen — 1 @ $20,500	20,500
Glass crushers — 1 @ $15,000	17,000
Conveyors to crusher 20 ft @ $1,025/ft	20,500
Containers	15,000
Front-end loader (Bobcat) — 1 @ $23,000	23,000
Forklift — 1 @ $12,300	12,300
Misc. Equipment & Supplies @ 5% of rolling & non-rolling stock equipment	20,510
Installation @ 10% of non-rolling stock equipment	14,727
Contingincy @ 10%	21,780
Subtotal: Equipment Costs	467,207
Engineering & Construction Management — use 8% of	
site development costs & non-rolling stock equipment costs	108,764
Startup Expenses — 1% of site development & non-rolling stock	
equipment costs	13,595
Interest During Construction — use 2% of site development costs,	
non-rolling stock costs, & engineering costs assuming 6 months constr.	29,366
Debt Service Reserve Fund — 0% of site development &	
non-rolling stock costs	0
Legal & Financial Costs — 5% of site development & non-rolling stock costs	67,977
Total Capital Cost	**1,665,803**

Appendix Table D-15 (continued)

Annual Cost Items:	Costs (in dollars)
Debt service Costs:	
Land — 6% interest only	3,075
Site Development — 20 years life, 6% interest (includes Site Devel. Costs, Engin. & Const. Management, & Interest during Const.)	92,919
Other Financial Debt — 20 years life, 6% interest (includes Startup, Debt Service Reserve Fund & Legal & Financial Costs)	7,112
Front end Loader, Forklift — 7 years life, no resale, 6% int.	6,324
Other Equipment — 10 years life, no resale, 6% interest	50,936
Subtotal: Debt Service	160,365
Operating & Maintenance Costs:	
Labor:	
Foreman/Equipment Operator (1) — $16.25/hour + 40% fringes	47,502
Sorters (6) — $7.36/hour + 40% fringes	129,089
Baler/crusher operator (1) — $13.25/hour + 40% fringes	38,732
Maintenance & Clean-up (1) — $7.36/hour + 40% fringes	21,515
Subtotal: Labor Costs	236,838
Insurance:	
Equipment — 4.5% of equipment capital costs	21,024
Buildings — 2% of building capital costs	16,752
Subtotal: Insurance Costs	37,776
Property Taxes:	
Equipment — 2.65% of equipment capital costs	12,381
Site — 2.3% of site development & land capital costs	22,515
Subtotal: Property Taxes	34,896
Equipment Maintenance — 4% of equipment capital costs	18,688
Site & Bldg Maintenance — 1% of site development costs	9,276
Fuel — 0.2 gal/ton @ $1.20/gal	1,622
Utilities —electricy 15KWH/ton @$0.04/KWH,+ water 70gpd/person @ $2.00/1000gal, + heating .025 MBTU/ton @ $4.00/MBTU	5,060
Residue Disposal — 5% residue (338 tons) @$19.65/ton	6,642
Overhead (Administration, Office) — 10% of above	51,116
Subtotal: Operating & Maintenance Costs	401,914
Subtotal: Debt Service + O & M Costs	562,279
Profit @ 10%	56,228
Total Annual Cost	**618,507**
Cost Per Ton	**91**

Source: Franklin Associates, Ltd.

Appendix Table D-16

ESTIMATED SCENARIO 1 (EXISTING SYSTEM) SWM COSTS
FOR JEFFERSON COUNTY SINGLE-FAMILY CITY HOUSEHOLDS(1)(2)(3)(4)

Year	Collection & Transportation Cost ($/ton disposed)	Disposal Cost ($/ton disposed)	Drop-Off Recycling Cost ($/ton recycled)	Total Management Cost ($/ton generated)	Total Management Cost ($/Hshld/Mo)	Present Value Cost (5) ($/ton generated)	Present Value Cost (5) ($/Hshld/Mo)
1995	68.35	19.65	0.00	87.01	7.75	87.01	7.75
1996	70.40	20.24	0.00	89.62	7.98	84.55	7.53
1997	72.51	20.85	0.00	92.31	8.22	82.16	7.32
1998	74.69	21.47	0.00	95.08	8.47	79.83	7.11
1999	76.93	22.12	0.00	97.93	8.72	77.57	6.91
2000	79.24	22.78	0.00	100.87	8.99	75.38	6.71
2001	81.61	23.46	0.00	103.90	9.26	73.24	6.52
2002	84.06	24.17	0.00	107.01	9.53	71.17	6.34
2003	86.58	24.89	0.00	110.22	9.82	69.16	6.16
2004	89.18	25.64	0.00	113.53	10.11	67.20	5.99
2005	91.86	26.41	0.00	116.94	10.42	65.30	5.82
2006	94.61	27.20	0.00	120.45	10.73	63.45	5.65
2007	97.45	28.02	0.00	124.06	11.05	61.65	5.49
2008	100.37	28.86	0.00	127.78	11.38	59.91	5.34
2009	103.39	29.72	0.00	131.61	11.72	58.21	5.19
2010	106.49	30.61	0.00	135.56	12.08	56.57	5.04
2011	109.68	31.53	0.00	139.63	12.44	54.96	4.90
2012	112.97	32.48	0.00	143.82	12.81	53.41	4.76
2013	116.36	33.45	0.00	148.13	13.20	51.90	4.62
2014	119.85	34.46	0.00	152.58	13.59	50.43	4.49
	TOTALS			2,338	208.28	1,343	119.64
	AVERAGES			116.90	10.41	67.15	5.98
	TOTAL 20 YEARS COST ($/HSHLD)				2,499		
	TOTAL 20 YEARS PRESENT VALUE COST ($/HSHLD)						1,436

(1) For management of all MSW (1.069 tons/year including bulky durables) from an average single-family city household.
(2) For households with individual collection service, i.e., 1-4 households per building.
(3) Assumes a 3 percent annual inflation factor for estimating costs after 1995.
(4) Estimated costs for household MSW with current system of collection and disposal, and drop-off recycling.
(5) Assumes a 6 percent discount factor to equate future year dollars to 1995.

Source: Franklin Associates, Ltd.

Appendix Table D-17

ESTIMATED SCENARIO 2 SWM COSTS FOR JEFFERSON COUNTY SINGLE-FAMILY CITY HOUSEHOLDS(1)(2)(3)(4)

Year	Collection & Transportation Cost ($/ton disposed)	Disposal Cost ($/ton disposed)	Existing Drop-Off Recycling Cost ($/ton recycled)	New Drop-Off Recycling Cost ($/ton recycled)	HHW Program Cost ($/ton collected)				Total Management Cost With Drop-Off Recycling Plus HHW Program		Present Value Cost (5)	
					Vehicle & Trailer Debt Service		O&M Cost	Total HHW Cost	($/ton generated)	($/Hshld/Mo)	($/ton generated)	($/Hshld/Mo)
					8-Year	10-year						
1995	69.04	19.65	0.00	69.25	23.83	7.60	4,921.57	4,953.00	90.25	8.04	90.25	8.04
1996	71.11	20.24	0.00	71.33	23.83	7.60	5,069.22	5,100.65	92.96	8.28	87.69	7.81
1997	73.24	20.85	0.00	73.47	23.83	7.60	5,221.29	5,252.72	95.74	8.53	85.21	7.59
1998	75.44	21.47	0.00	75.67	23.83	7.60	5,377.93	5,409.36	98.62	8.79	82.80	7.38
1999	77.71	22.12	0.00	77.94	23.83	7.60	5,539.27	5,570.70	101.57	9.05	80.46	7.17
2000	80.04	22.78	0.00	80.28	23.83	7.60	5,705.45	5,736.88	104.62	9.32	78.18	6.96
2001	82.44	23.46	0.00	82.69	23.83	7.60	5,876.61	5,908.04	107.76	9.60	75.97	6.77
2002	84.91	24.17	0.00	85.17	23.83	7.60	6,052.91	6,084.34	110.99	9.89	73.82	6.58
2003	87.46	24.89	0.00	87.72	30.19	7.60	6,234.50	6,272.28	114.32	10.18	71.73	6.39
2004	90.08	25.64	0.00	90.36	30.19	7.60	6,421.53	6,459.32	117.75	10.49	69.70	6.21
2005	92.78	26.41	0.00	93.07	30.19	10.21	6,614.18	6,654.58	121.29	10.80	67.73	6.03
2006	95.57	27.20	0.00	95.86	30.19	10.21	6,812.60	6,853.00	124.92	11.13	65.81	5.86
2007	98.43	28.02	0.00	98.73	30.19	10.21	7,016.98	7,057.38	128.67	11.46	63.95	5.70
2008	101.39	28.86	0.00	101.70	30.19	10.21	7,227.49	7,267.89	132.53	11.81	62.14	5.54
2009	104.43	29.72	0.00	104.75	30.19	10.21	7,444.32	7,484.72	136.51	12.16	60.38	5.38
2010	107.56	30.61	0.00	107.89	30.19	10.21	7,667.65	7,708.05	140.60	12.53	58.67	5.23
2011	110.79	31.53	0.00	111.13	38.24	10.21	7,897.68	7,946.13	144.82	12.90	57.01	5.08
2012	114.11	32.48	0.00	114.46	38.24	10.21	8,134.61	8,183.06	149.17	13.29	55.40	4.93
2013	117.54	33.45	0.00	117.89	38.24	10.21	8,378.64	8,427.09	153.64	13.69	53.83	4.80
2014	121.06	34.46	0.00	121.43	38.24	10.21	8,630.00	8,678.45	158.25	14.10	52.30	4.66
	TOTALS								2,425	216.03	1,393	124.09
	AVERAGES								121.25	10.80	69.65	6.20
	TOTAL 20 YEARS COST ($/HSHLD)									2,592		
	TOTAL 20 YEARS PRESENT VALUE COST ($/HSHLD)											1,489

(1) For management of all MSW (1.069 tons/year including bulky durables) from an average single-family city household.
(2) For households with individual collection service, i.e., 1-4 households per building.
(3) Assumes a 3 percent annual inflation factor for estimating costs after 1995.
(4) Estimated costs for household MSW with current system of collection and disposal plus mobile drop-off recycling program and HHW collection.
(5) Assumes a 6 percent discount factor to equate future year dollars to 1995.

Source: Franklin Associates, Ltd.

Appendix Table D-18

ESTIMATED SCENARIO 1 (EXISTING SYSTEM) SWM COSTS FOR LAWRENCE SINGLE-FAMILY CITY HOUSEHOLDS(1)(2)(3)(4)

Year	Collection & Transportation Cost ($/ton disposed)	Disposal Cost ($/ton disposed)	Drop-Off Recycling Cost ($/ton recycled)	City ONP Drop-Off Recycling Cost/(Revenue) ($/ton recycled)	City Yard Wst. Composting Program Cost ($/ton composted)	Total Management Cost ($/ton generated)	Total Management Cost ($/Hshld/Mo)	Present Value Cost (5) ($/ton generated)	Present Value Cost (5) ($/Hshld/Mo)
1995	77.35	19.65	0.00	(35.00)	76.00	81.69	10.25	81.69	10.25
1996	79.67	20.24	0.00	(36.05)	78.28	84.14	10.56	79.38	9.96
1997	82.06	20.85	0.00	(37.13)	80.63	86.66	10.88	77.13	9.68
1998	84.52	21.47	0.00	(38.25)	83.05	89.26	11.20	74.95	9.41
1999	87.06	22.12	0.00	(39.39)	85.54	91.94	11.54	72.83	9.14
2000	89.67	22.78	0.00	(40.57)	88.10	94.70	11.88	70.77	8.88
2001	92.36	23.46	0.00	(41.79)	90.75	97.54	12.24	68.76	8.63
2002	95.13	24.17	0.00	(43.05)	93.47	100.47	12.61	66.82	8.39
2003	97.98	24.89	0.00	(44.34)	96.27	103.48	12.99	64.93	8.15
2004	100.92	25.64	0.00	(45.67)	99.16	106.59	13.38	63.09	7.92
2005	103.95	26.41	0.00	(47.04)	102.14	109.78	13.78	61.30	7.69
2006	107.07	27.20	0.00	(48.45)	105.20	113.08	14.19	59.57	7.48
2007	110.28	28.02	0.00	(49.90)	108.36	116.47	14.62	57.88	7.26
2008	113.59	28.86	0.00	(51.40)	111.61	119.96	15.06	56.24	7.06
2009	117.00	29.72	0.00	(52.94)	114.96	123.56	15.51	54.65	6.86
2010	120.51	30.61	0.00	(54.53)	118.41	127.27	15.97	53.11	6.66
2011	124.12	31.53	0.00	(56.16)	121.96	131.09	16.45	51.60	6.48
2012	127.85	32.48	0.00	(57.85)	125.62	135.02	16.95	50.14	6.29
2013	131.68	33.45	0.00	(59.59)	129.38	139.07	17.45	48.72	6.11
2014	135.63	34.46	0.00	(61.37)	133.27	143.24	17.98	47.34	5.94
	TOTALS					2,195	275.48	1,261	158.24
	AVERAGES					109.75	13.77	63.05	7.91
	TOTAL 20 YEARS COST ($/HSHLD)						3,306		
	TOTAL 20 YEARS PRESENT VALUE COST ($/HSHLD)								1,899

(1) For management of all MSW (1.506 tons/year including bulky durables) from an average single-family Lawrence household.
(2) For households with individual collection service, i.e., 1-4 households per building.
(3) Assumes a 3 percent annual inflation factor for estimating costs after 1995.
(4) Estimated costs for household MSW with current system of collection and disposal, non-city operated drop-off recycling, city operated old newspaper (ONP) drop-off recycling, and city operated yard waste collection and composting.
(5) Assumes a 6 percent discount factor to equate future year dollars to 1995.

Source: Franklin Associates, Ltd.

Appendix Table D-19

ESTIMATED SCENARIO 3 SWM COSTS FOR LAWRENCE SINGLE-FAMILY CITY HOUSEHOLDS(1)(2)(3)(4)

Year	Collection & Transportation Cost ($/ton disposed)	Disposal Cost ($/ton disposed)	City Yard Wst. Composting Program Cost ($/ton composted)	Curbside Recycling Cost ($/ton of recyclables collected)								
				Collection System Debt Service		O&M Cost	Total Collection Cost	MRF Debt Service				O&M Cost
				8-Year	10-year			Land Interest	20-Year	10-Year	7-Year	
1995	85.00	19.65	76.00	14.80	3.68	98.29	116.77	0.50	16.27	8.29	1.03	65.30
1996	87.55	20.24	78.28	14.80	3.68	101.24	119.72	0.50	16.27	8.29	1.03	67.26
1997	90.18	20.85	80.63	14.80	3.68	104.28	122.76	0.50	16.27	8.29	1.03	69.28
1998	92.88	21.47	83.05	14.80	3.68	107.40	125.88	0.50	16.27	8.29	1.03	71.36
1999	95.67	22.12	85.54	14.80	3.68	110.63	129.11	0.50	16.27	8.29	1.03	73.50
2000	98.54	22.78	88.10	14.80	3.68	113.95	132.43	0.50	16.27	8.29	1.03	75.70
2001	101.49	23.46	90.75	14.80	3.68	117.36	135.84	0.50	16.27	8.29	1.03	77.97
2002	104.54	24.17	93.47	14.80	3.68	120.88	139.36	0.50	16.27	8.29	1.27	80.31
2003	107.68	24.89	96.27	18.75	3.68	124.51	146.94	0.50	16.27	8.29	1.27	82.72
2004	110.91	25.64	99.16	18.75	3.68	128.25	150.68	0.50	16.27	8.29	1.27	85.20
2005	114.23	26.41	102.14	18.75	4.95	132.09	155.79	0.50	16.27	11.14	1.27	87.76
2006	117.66	27.20	105.20	18.75	4.95	136.06	159.76	0.50	16.27	11.14	1.27	90.39
2007	121.19	28.02	108.36	18.75	4.95	140.14	163.84	0.50	16.27	11.14	1.27	93.10
2008	124.83	28.86	111.61	18.75	4.95	144.34	168.04	0.50	16.27	11.14	1.27	95.90
2009	128.57	29.72	114.96	18.75	4.95	148.67	172.37	0.50	16.27	11.14	1.56	98.77
2010	132.43	30.61	118.41	18.75	4.95	153.13	176.83	0.50	16.27	11.14	1.56	101.74
2011	136.40	31.53	121.96	23.75	4.95	157.73	186.43	0.50	16.27	11.14	1.56	104.79
2012	140.49	32.48	125.62	23.75	4.95	162.46	191.16	0.50	16.27	11.14	1.56	107.93
2013	144.71	33.45	129.38	23.75	4.95	167.33	196.03	0.50	16.27	11.14	1.56	111.17
2014	149.05	34.46	133.27	23.75	4.95	172.35	201.05	0.50	16.27	11.14	1.56	114.50

(1) For management of all MSW (1.506 tons/year including bulky durables) from an average single-family Lawrence household.
(2) For households with individual collection service, i.e., 1-4 households per building.
(3) Assumes a 3 percent annual inflation factor for estimating costs after 1995.
(4) Estimated costs for household MSW with current system of collection and disposal, city operated yard waste collection and composting, and city operated curbside recycling program.
(5) Assumes a 6 percent discount factor to equate future year dollars to 1995.

Source: Franklin Associates, Ltd.

Appendix Table D-19
Lawrence Scenario 3 (continued)

Curbside Recycling Cost ($/ton of recyclables collected)								
					Total Management Cost		Present Value Cost (5)	
Year	Total MRF Cost	Recyclables Collection & Processing Cost	Revenues From Recyclables	Net Curbside Recycling Cost	($/ton generated)	($/Hshld/Mo)	($/ton generated)	($/Hshld/Mo)
1995	91.39	208.16	146.00	62.16	88.88	11.15	88.88	11.15
1996	93.35	213.07	150.38	62.69	91.28	11.46	86.12	10.81
1997	95.37	218.12	154.89	63.23	93.76	11.77	83.44	10.47
1998	97.45	223.33	159.54	63.79	96.31	12.09	80.86	10.15
1999	99.59	228.69	164.32	64.37	98.94	12.42	78.37	9.83
2000	101.79	234.22	169.25	64.96	101.64	12.76	75.95	9.53
2001	104.06	239.91	174.33	65.57	104.43	13.11	73.62	9.24
2002	106.64	246.00	179.56	66.44	107.34	13.47	71.39	8.96
2003	109.05	255.99	184.95	71.04	111.08	13.94	69.69	8.75
2004	111.53	262.20	190.50	71.71	114.12	14.32	67.55	8.48
2005	116.94	272.72	196.21	76.51	118.07	14.82	65.93	8.27
2006	119.57	279.32	202.10	77.23	121.30	15.22	63.90	8.02
2007	122.28	286.12	208.16	77.96	124.62	15.64	61.93	7.77
2008	125.07	293.12	214.41	78.71	128.05	16.07	60.04	7.53
2009	128.24	300.61	220.84	79.78	131.64	16.52	58.22	7.31
2010	131.20	308.04	227.46	80.57	135.27	16.98	56.44	7.08
2011	134.26	320.68	234.29	86.40	140.00	17.57	55.11	6.92
2012	137.40	328.56	241.32	87.24	143.86	18.05	53.42	6.70
2013	140.64	336.67	248.56	88.11	147.83	18.55	51.79	6.50
2014	143.97	345.03	256.01	89.01	151.92	19.07	50.21	6.30
				TOTALS	2,350	294.97	1,353	169.78
				AVERAGES	117.52	14.75	67.64	8.49
			TOTAL 20 YEARS COST ($/HSHLD)			3,540		
			TOTAL 20 YEARS PRESENT VALUE COST ($/HSHLD)					2,037