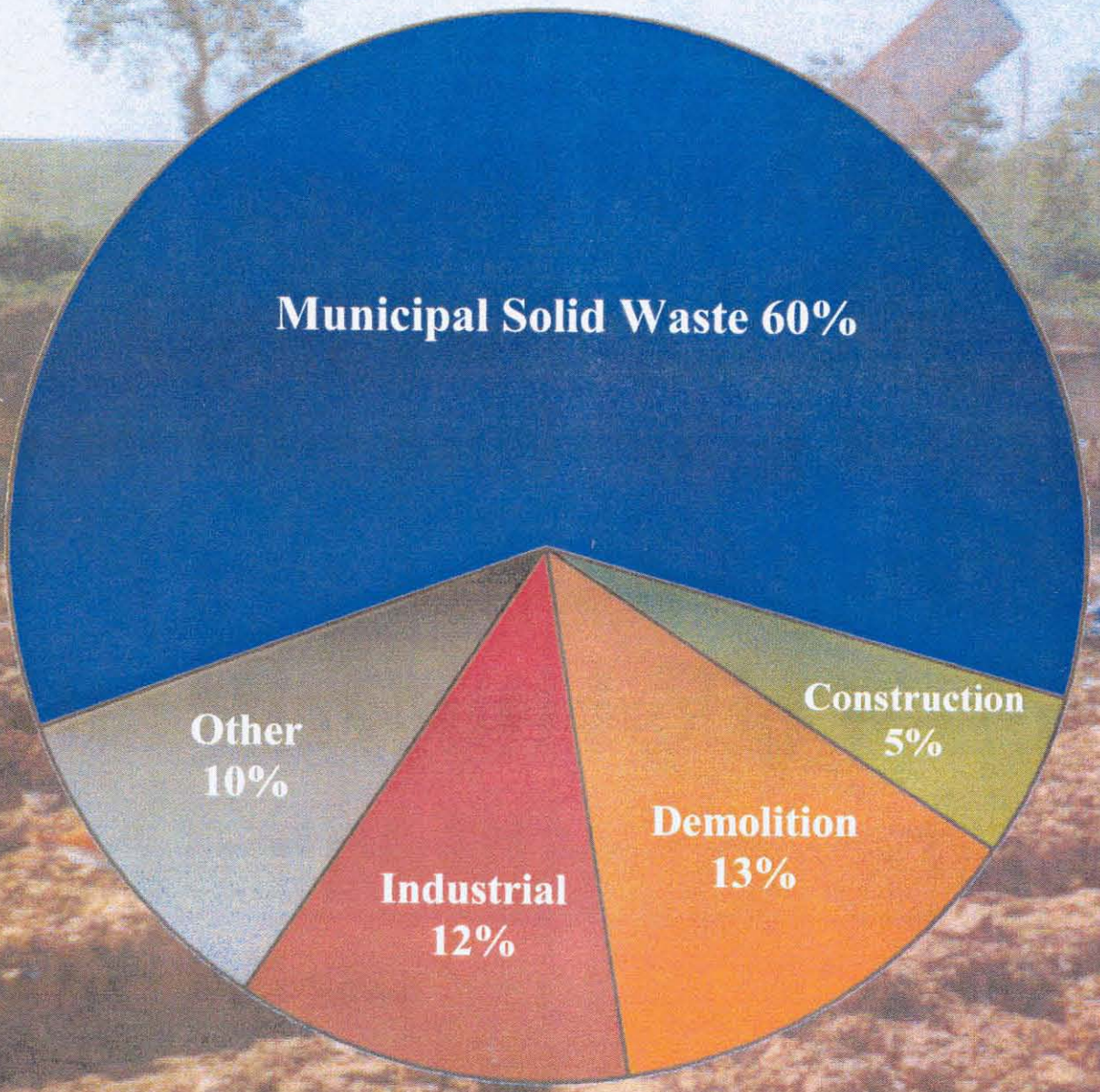
The Missouri Solid Waste Composition Study



Midwest Assistance Program

1999

THE MISSOURI SOLID WASTE COMPOSITION STUDY

Conducted by:
MIDWEST ASSISTANCE PROGRAM, Inc.
The Midwestern Rural Community Assistance Program

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INTRODUCTION

The Missouri Waste Composition Study was a three-year effort to characterize and understand solid waste disposal in Missouri. The study was divided into two phases.

The first phase examined Municipal Solid Waste (MSW) at 19 landfills and transfer stations throughout Missouri. Municipal Solid Waste was separated, weighed, and recorded into 26 material categories. The methodology used, and the findings of phase I begin on page 93.

The second phase observed solid waste received at 14 Missouri landfills (actually 15 landfills were observed but the scale data from the Lee's Summit landfill was not useable and therefore that data is not included). Each solid waste load was classified into one of five components (Municipal Solid Waste, Construction, Demolition, Industrial, and Other waste) and the percentage of each material, within that component, was visually estimated and recorded. The methodology and findings of phase II begin on page 3.

Purpose of the Study

The Missouri Waste Composition Study was commissioned for the following reasons:

- Provide Information on changes in the Missouri solid waste components. In the 1987 Environmental Improvement and Energy Resources Authority (EIERA) commissioned a limited baseline waste composition study. This study examined MSW at four locations in 1987and estimated industrial waste based on SIC data. A comparison of the two waste components composition studies is listed on Pg. 113.
- Provide an estimate of the volume of recyclable materials still in the Missouri solid waste. The percentage of recyclable materials presently disposed into Missouri landfills offers opportunities for future recycling and waste reductions efforts.
- Provide data for the formulation of a statewide solid waste plan. The waste composition data provides detailed information, which is essential in planning solid waste policy for the next decade.
- Provide information on the current solid waste components which can be used by grant applicants to estimate available waste materials used by state agencies to evaluate grant applications, and by solid waste planners to target waste materials for future funding.
- Provide essential information for municipal and private recycling programs. Municipal and private recycling companies can use the data to predict material flows, route collection vehicles, plan processing and end market capacities, project revenues and operating expenses, and target educational materials.

Funding, Development, and Implementation

The Missouri Waste Composition Study was funded through grants from the Missouri Department of Natural Resources (DNR). The methodology for the study was developed jointly by the DNR Solid Waste Planners and the Midwest Assistance Program, Inc.(MAP). MAP conducted the study under the direction of Dennis Siders, Project Manager.

LANDFILLS OBSERVED

Landfill observation was actually the second phase of The Missouri Waste Composition Study. The hand sorting and categorizing of MSW was done prior to observing the landfills. However it is necessary to identify and understand the percentage each of the solid waste components (MSW, Construction, Demolition, Industrial, and Other) before examining the components separately. Therefore, phase II (landfill observations) will be discussed before phase I (MSW characterization).

The Problem

Many studies have been conducted throughout the United States to determine MSW composition. Some of these are discussed on page 111. However MSW is only one component of the overall solid waste problem. Until the entire solid waste component is examined and quantified, the volume of any one component cannot be accurately estimated. After completing phase I (MSW) it was known how much of each material was in Missouri's MSW component. For instance, about 18.7% of the MSW was food waste. But what did that percentage mean and what percentage of the total waste stream was MSW food waste?

Each landfill and transfer station reports their total waste received to DNR each quarter. After estimating import and export waste, DNR publishes a report on the total waste disposed in Missouri. However, it cannot be assumed that 18.7% of this total is food waste because the total is not exclusively MSW. There are other components of the waste stream included in the total. But how do we know what portion each of these components comprise, and what materials make up these other components?

Methodology

Several studies have been conducted to determine the composition of solid waste. Many states have conducted MSW waste sorts with methodologies similar to those used in phase I (page 93). This is a great way to characterize the MSW component but does not quantify the MSW component (40% - 90% of the local waste stream), or characterize the remaining solid waste components.

Franklin and Associates have developed a methodology to estimate waste flows based on production data. This method assumes that every manufactured item has a limited life cycle and then becomes waste. This methodology works great for national or international waste projections, but become less useful on a smaller scale.

The Missouri Waste Composition Study determined that the best way to estimate waste components (not waste generation or recovery) delivered to Missouri landfills, and the materials within these components, was to observe and record waste unloaded at Missouri landfills.

Landfill Selection

As of June 1st 1999, Missouri had 30 active landfills. Fifteen landfills were selected as being representative of all Missouri landfills (The City of Lee's Summit Landfill was observed but the data was not useable due to errors in the scale software program). The 14 observed landfills are listed below with the tonnage they received in 1998. A map of the 14 landfills, that were observed, is on page 5.

Landfills Observed	1998 Tonnage	% of Total State Tonnage
Black Oak	283,475	6.3%
Bridgeton	913,621	20.4%
Butler County	122,185	2.7%
City of Columbia	125,867	2.8%
City of St. Joseph	120,158	2.7%
Courtney Ridge	418,625	9.3%
Fred Weber	321,269	7.2%
Lamar	168,591	3.8%
Lemons	196,092	4.4%
Maple Hill	114,982	2.6%
Oak Ridge	262,365	5.8%
Peerless C&D	146,249	3.3%
Rockhill C&D	123,849	2.8%
Southeast	348,260	7.8%
Total observed landfills	**3,665,588**	**81.7%**
City of Lee's Summit*	80,682	1.8%
City of Springfield**	101,284	2.3%
14 rural landfills (not observed)***	628,512	13.9%
2 C&D landfills (not observed)****	12,557	00.3%
Total unobserved landfills	**823,035**	**18.3%**
Total for all Missouri Landfills (1998)	**4,488,623**	**100%**

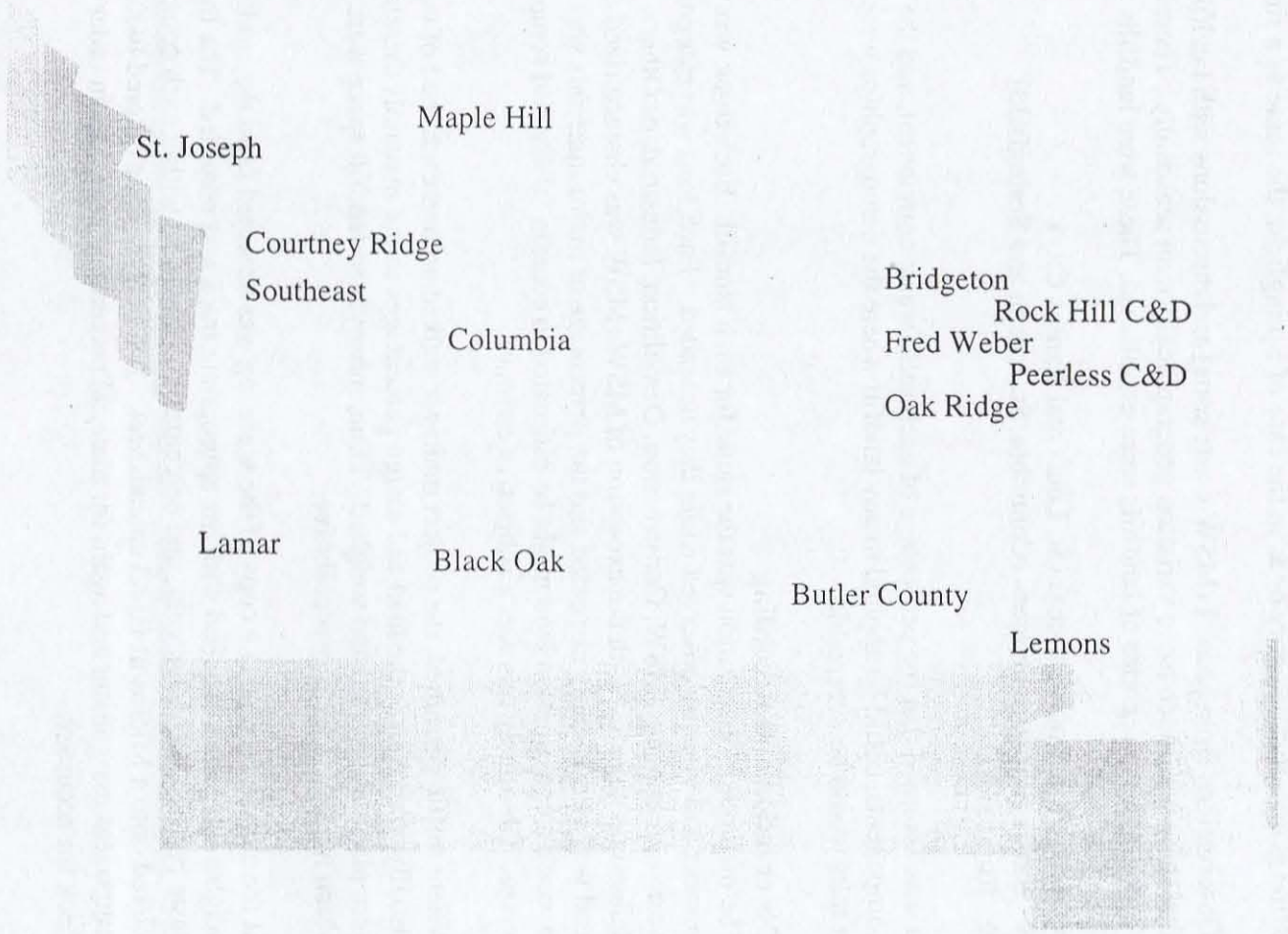
*The City of Lee's Summit landfill was observed but the scale data was not useable. A weighted average from Southeast and Courtney Ridge was used to estimate waste composition.

**The City of Springfield's landfill was not observed. Demographics and waste contracts are similar to the City of St. Joseph and therefore the waste composition was estimated to be similar to the City of St. Joseph Landfill.

***A weighted average from the 5 rural landfills, which were observed, was used to estimate waste composition.

**** A weighted average from the 2 C&D landfills which were observed was used to estimate waste composition.

Landfills Observed



Each of the 14 landfills listed on page four was observed for a one-week period. The only exception was the Peerless C&D, which was observed for two weeks in order to get seasonal data on C&D material flows. The premise, agreed upon by DNR and MAP, assumed that the waste received at each of the fourteen observed landfills during a randomly selected week would be similar to the waste received at that landfill during the entire year. Smaller landfills would be assumed to have the same composition as the weighted average of others landfills within their same geographic category or as in the case of Springfield, the same as a similar City.

Observations from phase I (MSW waste sorts) and discussions with landfill managers implied that there was much more variation geographically than seasonally. Therefore, three major demographic categories of landfills were established. These were landfills in:

- Large metropolitan areas (St. Louis and Kansas City)
- Small metropolitan areas (Columbia, St. Joseph and Springfield)
- Rural areas

It was assumed that the percentage of each solid waste component, and the materials within those components, could be applied to any landfill where the demographics were similar, and the results would be acceptable.

Observation and Recording

The method of observation was the same for each landfill. Each truck was recorded by name and number and visually observed while they unloaded. Each load was categorized into one of five waste components (MSW, Construction, Demolition, Industrial, or Other). These categories are defined on page 7. With the exception of MSW (MSW was characterized during phase I) each load was also visually inspected and the percentage of major materials was estimated. For instance a construction load might be estimated to contain 50% wood scraps and 50% dry wall scraps. Obviously this was a subjective estimate.

Where traffic permitted, the project manager walked around each load of waste several times to visually characterize the load and assign percentages to the materials therein. None of the loads were physically sorted and weighed. Time, money, and landfill space were all limiting factors, which made this activity prohibitive.

At the close of each day a copy of the scale log was obtained from the landfill staff. The scale weights were then matched with the appropriate truck and recorded. The truck number, weight, waste component assignment, and percentage of materials within each component were then entered onto a Microsoft Excel spreadsheet. All weights were entered twice, once for waste component assignment and again for material percentage estimates in order to assure a double check for accuracy.

The following table summarizes the observation data. In order to maintain consistency, the project manager personally observed all loads, made all estimates on waste composition, and assigned all material percentages.

Observation Data

Landfill	Observation hours	Trucks Observed	Total tonnage observed
Black Oak	38	249	3,735
Bridgeton	47	1,063	9,196
Butler County	50	182	2,077
City of Columbia	55	470	1,808
City of St. Joseph	47	667	2,109
Courtney Ridge	45	733	4,350
Fred Weber	36	797	3,040
Lamar	47	197	2,769
Lemons	49	257	3,000
Maple Hill	38	221	1,757
Oak Ridge	44	720	6,172
Peerless C&D	96	777	5,355
Rockhill C&D	38	420	1,697
Southeast	44	660	4,485
Total	**674**	**7,413**	**51,550**

Definition of Waste Components

The solid waste stream is made up of a number of waste components. Identifying and defining these components is always difficult. There are no national guidelines or norms on how to categorize waste components. In order to accomplish the purposes outlined on page 1, the following guidelines were used to categorize solid waste into waste components:

Municipal Solid Waste (MSW)

For the purpose of this study MSW is defined as residential, institutional, or commercial waste that is disposed in small containers or plastic bags. This is a somewhat simplistic definition but is inclusive enough to cover most of the materials found in the MSW component. MSW is normally collected in packer trucks, which collect from residential, institutional, and commercial generators. In many cases the same truck will collect MSW from all three generators in the same load. MSW is generally delivered to the landfill in packer trucks or transfer trailers. Some rural landfills still receive MSW in open top trucks or trailers. Definitions of the sort categories contained within the MSW component are on page 97.

Construction Waste

The construction waste component was identified by interviewing the driver, when possible, concerning the origin of the load, and examining the contents of each load. Construction waste loads were primarily transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Construction waste consists of mostly new construction material, which was a waste product of the construction process. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood or dry wall, etc.) than demolition loads. As a

general rule construction waste materials are easier to recover and recycle than demolition waste materials. Definitions of the major materials contained within the construction waste component are on page 123.

Demolition Waste

Demolition waste materials are similar to construction waste materials and are traditionally included together as "construction and demolition (C&D)". Demolition materials are older, usually mixed with other materials, and more difficult to recover or recycle. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. Demolition wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste component than the construction waste component. Definitions of the major materials contained within the demolition waste component are on page 127.

Industrial Waste

The industrial waste component is a waste product of industrial processing or industrial activity. Materials were identified and estimated when there was large volumes of the same material in a packer, compactor unit, or roll-off container. Industrial waste loads were normally homogeneous, containing a single waste product from a manufacturing process. Definitions of the major materials contained within the industrial waste component are on page 131.

Other Waste

Other waste is defined as waste which does not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items such as furniture, mattresses, appliances, bicycles, shelving etc. are included in the other waste category. Commercial yard waste such as brush, stumps, sewage sludge, and hay are also included in this category. Definitions of the major materials contained within the other waste component are on page 135

The results of each landfill observation are included on pages 9- 92. Each landfill profile contains a description of the facility, information about the observation period, tonnage and percentages of waste received during the observation period.

The summary table in each profile lists the tonnage of each material received during the observation period and the percentage of that material. The Percentages are applied to the total waste received by that facility in 1998 to provide an estimate of the total tonnage for each material received during 1998.

The charts in each profile illustrate the percentage of each waste component for that facility, the materials received within each waste component and percentage comparisons to other landfills and the state average.

Black Oak Landfill

The Black Oak Landfill is located in Wright County, approximately 5 miles east of Hartville, MO. It is owned and operated by Waste Management Inc. The disposal facility covers 82 acres and is permitted to accept all municipal solid waste (MSW) and some other wastes such as asbestos, contaminated soils and waste water treatment sludge.

The Black Oak Landfill accepted 234,846 tons in 1996, 244,174 tons in 1997 and 283,475 tons in 1998. The landfill operation was observed from Monday April 12th through Thursday April 15th, 1999. The weather was fair for the first two days but rained and turned cold on Wednesday and Thursday. Observation took place from 7 AM till 4:30 PM on the above dates. The composition of the waste was so predictable that the observation period was shortened from five days down to four days . During the four-day observation period 249 trucks, delivered 3,735 tons of waste to the landfill. The landfill staff felt the material received during the observation period was typical of material received year round. They occasionally receive small quantities of asbestos and contaminated soil but those quantities are statistically nil.

All loads could be classified visually, without any driver data.

The Total Waste Stream - 3,735 tons

The total waste stream was overwhelmingly Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in trailers from company owned transfer stations and local packer trucks.

Total waste received during the observation period was 3,735 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
95.4%	0.5%	1.0%	1.6%	1.4%
3565 tons	18 tons	38 tons	61 tons	53 tons

Municipal Solid Waste - 3,565 Tons

Municipal Solid Waste (MSW) accounted for 95% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing

an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 3,565 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.8%	6.9%	14.4%	30.8%	4.8%
1330 tons	207 tons	246 tons	513 tons	1098 tons	171 tons

Construction Waste - 18 Tons

Only about 0.5% of the total waste received was from new construction sources. Construction waste loads are typically transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Only two roll-off trucks delivered construction waste during the observation period. One was primarily masonry materials (bricks, concrete blocks, and gravel). The other was a combination of wood dry wall and cardboard.

Total construction waste received during the observation period was 18 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	**Dry Wall**	**Masonry**	**Metal**	**Plas.**	**Cardbrd**	**Other**
20%	4%	72%	0%	0%	4%	0%
4 tons	1 ton	12 tons	0 tons	0 tons	1 ton	0 tons

Demolition Waste - 38 Tons

About 1% of the total waste was from demolition sources. Demolition waste loads are usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. However at this landfill most demolition materials were received in the transfer trailers and those materials were estimated and recorded as part of the demolition component. Two roofing waste loads were delivered to the landfill by independent contractors and were not mixed with other materials. The remaining demolition loads contained more mixed materials. The other category was primarily wet insulation brought in by a local packer.

Total demolition waste received during the observation period was 38 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on page 11.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
26%	9%	27%	4%	4%	16%	14%
10 tons	3 tons	11 tons	2 tons	1 ton	6 tons	5 tons

Industrial Waste - 61 Tons

About 1.6% of the total waste was from industrial sources. Almost all industrial materials came in on transfer trailers. Large quantities of industrial paper, cardboard and wood within the transfer trailers were identified as part of the industrial component and materials were estimated and recorded as a portion of the total weight of the trailer. Most wood was in the form of pallets and crates.

Total industrial waste received during the observation period was 61 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
40%	18%	0%	0%	36%	6%	0%	0%	0%
25 tons	11 tons	0 tons	0 tons	21 tons	4 tons	0 tons	0 tons	0 tons

Other Waste - 53 Tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items were the only other waste observed. They include furniture, mattresses, appliances, bicycles, etc. Most of these bulky items were received in transfer trailers.

Total other waste received during the observation period was 53 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

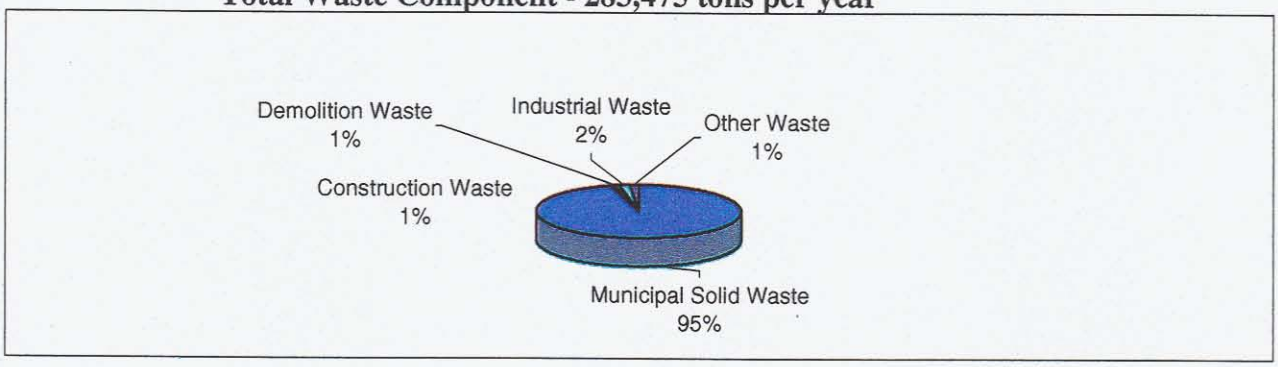
Bulky Items
100%
53 tons

BLACK OAK LANDFILL 283,475 TONS IN 1998

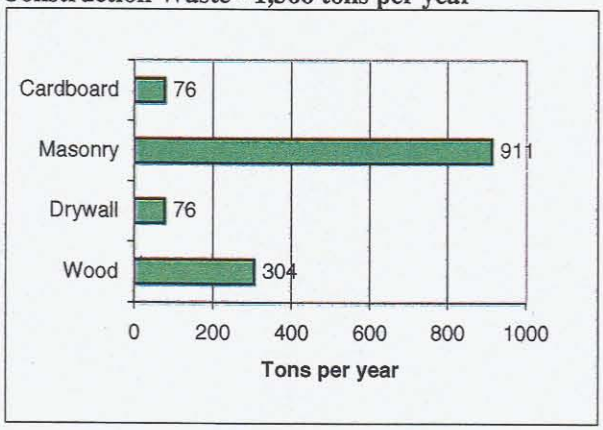
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	1330 Tons	35.6%	100,943 Tons
Glass	207 Tons	5.5%	15,711 Tons
Metals	246 Tons	6.6%	18,671 Tons
Plastics	513 Tons	13.7%	38,935 Tons
Organics	1098 Tons	29.4%	83,335 Tons
Inorganics	171 Tons	4.6%	12,978 Tons
TOTAL MSW	3565 Tons	95.4%	270,573 Tons
Construction Waste			
Wood	4 Tons	0.1%	304 Tons
Dry Wall	1 Tons	0.0%	76 Tons
Masonry	12 Tons	0.3%	911 Tons
Metal	0 Tons	0.0%	- Tons
Plastic	0 Tons	0.0%	- Tons
Cardboard	1 Tons	0.0%	76 Tons
Other	0 Tons	0.0%	- Tons
TOTAL CONSTRUCTION	18 Tons	0.5%	1,366 Tons
Demolition Waste			
Wood	10 Tons	0.3%	759 Tons
Dry Wall	3 Tons	0.1%	228 Tons
Roofing	11 Tons	0.3%	835 Tons
Masonry	2 Tons	0.1%	152 Tons
Metal	1 Tons	0.0%	76 Tons
Carpet	6 Tons	0.2%	455 Tons
Other	5 Tons	0.1%	379 Tons
TOTAL DEMOLITION	38 Tons	1.0%	2,884 Tons
Industrial Waste			
Cardboard	25 Tons	0.7%	1,897 Tons
Paper	11 Tons	0.3%	835 Tons
Food	0 Tons	0.0%	- Tons
Metal	0 Tons	0.0%	- Tons
Wood	21 Tons	0.6%	1,594 Tons
Plastic	4 Tons	0.1%	304 Tons
Textiles	0 Tons	0.0%	- Tons
Rubber	0 Tons	0.0%	- Tons
Other	0 Tons	0.0%	- Tons
TOTAL INDUSTRIAL	61 Tons	1.6%	4,630 Tons
Other Wastes			
Bulky Items	53 Tons	1.4%	4,023 Tons
Soil and Inert Materials	0 Tons	0.0%	- Tons
Asbestos	0 Tons	0.0%	- Tons
Commercial yard waste	0 Tons	0.0%	- Tons
TOTAL OTHER WASTE	53 Tons	1.4%	4,023 Tons
TOTAL WASTE STREAM	3735 Tons	100%	283,475 Tons

The Black Oak Landfill

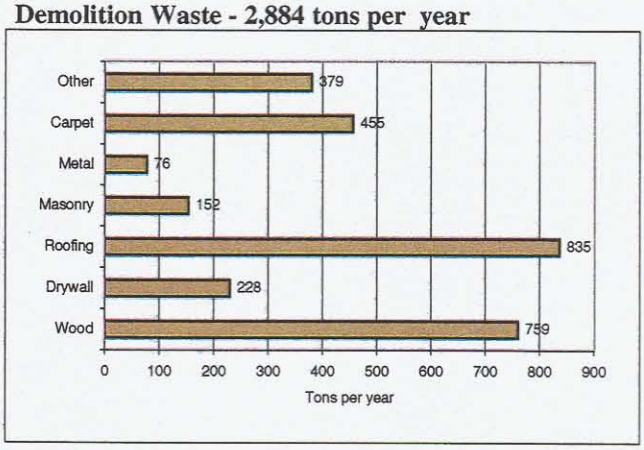
Total Waste Component - 283,475 tons per year



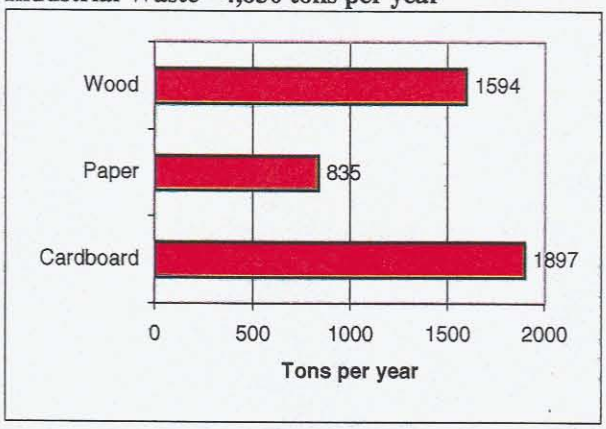
Construction Waste - 1,366 tons per year



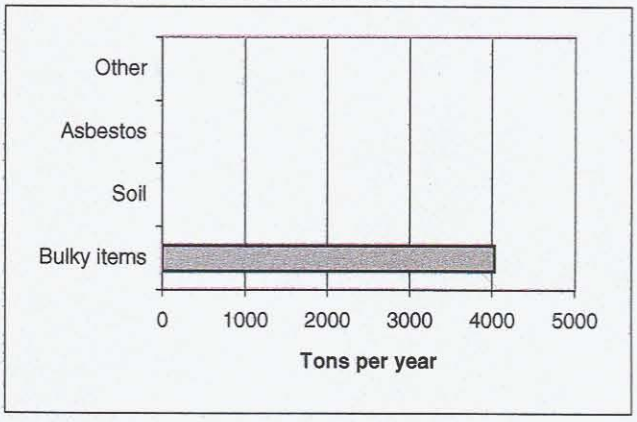
Demolition Waste - 2,884 tons per year



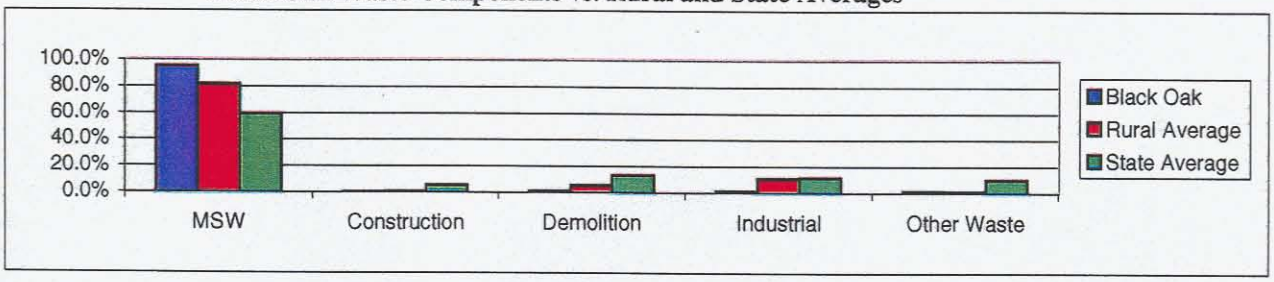
Industrial Waste - 4,630 tons per year



Other Waste - 4,023 tons per year



Black Oak Waste Components vs. Rural and State Averages



Bridgeton Landfill

The Bridgeton Landfill is located in Bridgeton, MO., approximately 20 miles west of St. Louis, MO. It is owned and operated by Allied Waste Industries Inc. The disposal facility covers 52 acres and is permitted to accept all municipal solid waste (MSW) and other wastes such as asbestos, fly ash, contaminated soils and waste water treatment sludge.

The Bridgeton Landfill accepted 797,280 tons in 1996, 912,287 tons in 1997 and 913,621 tons in 1998. The landfill operation was observed from Monday May 17th through Friday May 21st, 1999. The weather was sunny and fair for the entire observation period. Observation took place from 7 AM till 4:00 PM on the above dates. The Bridgeton Landfill is open 24 hours a day and therefore not all trucks were observed. During the five-day period 1,063 trucks (54% of the total trucks)were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Due to the heavy traffic and small dumping area drivers were not asked where the loads originated. However, all loads could be classified visually, without any driver data.

The Total Waste Stream - 9,196 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in local packer trucks and transfer trucks from the City of St. Louis's North Transfer Station. Total waste observed during the period was 9,196 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
67%	5%	6%	11%	12%
6137 tons	416 tons	565 tons	1022 tons	1056 tons

Municipal Solid Waste - 6,137 tons

Municipal Solid Waste (MSW) accounted for 67% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples was hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and

volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 6137 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.8%	6.9%	14.4%	30.8%	4.8%
2289 tons	356 tons	423 tons	884 tons	1890 tons	295 tons

Construction Waste - 416 tons

About 5% of the total waste was received from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall).

Total construction waste received during the observation period was 416 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	**Dry Wall**	**Masonry**	**Metal**	**Plas.**	**Cardboard**	**Other**
47%	17%	18%	0%	5%	11%	2%
194 tons	72 tons	76 tons	1 tons	21 tons	45 tons	7 tons

Demolition Waste - 565 tons

About 6% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 565 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
34%	12%	9%	32%	4%	7%	2%
189 tons	69 tons	53 tons	179 tons	23 tons	42 tons	10 tons

Industrial Waste - 1,022 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing single waste products from a manufacturing process. A large portion of the wood waste was sawdust and wood shavings from a local firm that manufactures commercial fixtures from presswood materials. The materials in the "other" category listed below were primarily a sludge product from a manufacturer.

Total industrial waste received during the observation period was 1,022 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardboard	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
43%	6%	0%	0%	36%	8%	2%	0%	4%
437 tons	66 tons	0 tons	1 ton	365 tons	87 tons	23 tons	2 tons	41 tons

Other Waste - 1,056 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received in open top roll-off containers. The soil was not contaminated and was used for cover. The "Other" category consisted mostly of fly ash.

Total Other waste received during the observation period was 1056 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

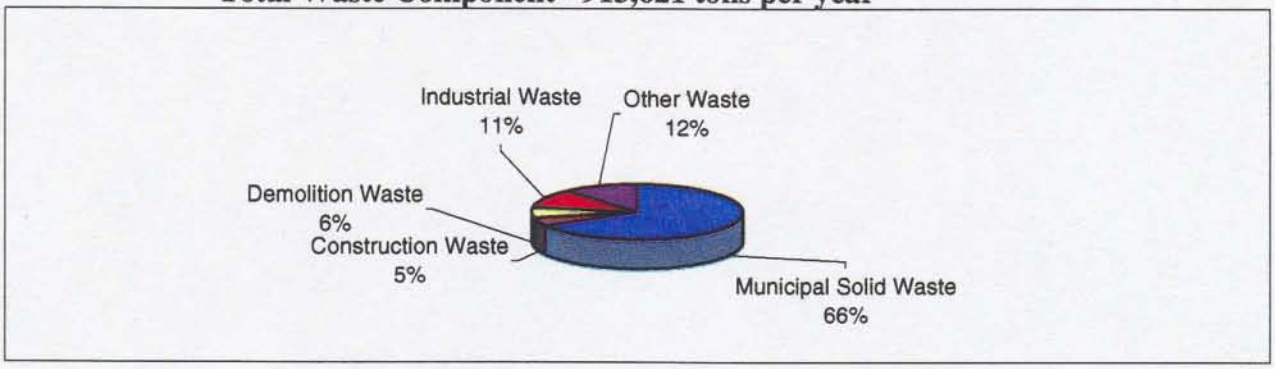
Bulky Items	Sewage Sludge	Soil	Asbestos	Other
6%	8%	70%	10%	5%
62 tons	88 tons	738 tons	109 tons	59 tons

BRIDGETON LANDFILL 913,621 TONS IN 1998

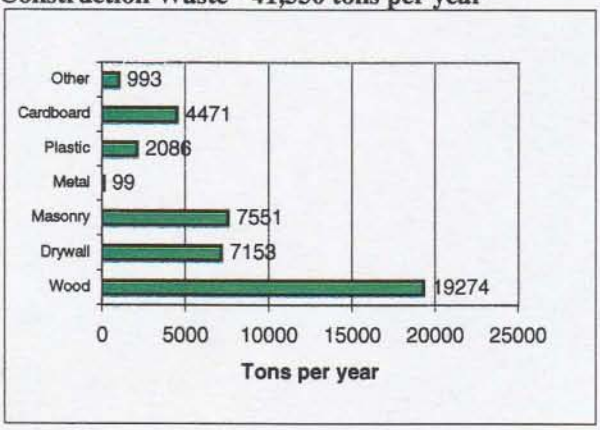
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	2289 Tons	24.9%	227,412 Tons
Glass	356 Tons	3.9%	35,369 Tons
Metals	423 Tons	4.6%	42,025 Tons
Plastics	884 Tons	9.6%	87,825 Tons
Organics	1890 Tons	20.6%	187,771 Tons
Inorganics	295 Tons	3.2%	29,308 Tons
TOTAL MSW	6137 Tons	66.7%	609,710 Tons
Construction Waste			
Wood	194 Tons	2.1%	19,274 Tons
Dry Wall	72 Tons	0.8%	7,153 Tons
Masonry	76 Tons	0.8%	7,551 Tons
Metal	1 Tons	0.0%	99 Tons
Plastic	21 Tons	0.2%	2,086 Tons
Cardboard	45 Tons	0.5%	4,471 Tons
Other	7 Tons	0.1%	695 Tons
TOTAL CONSTRUCTION	416 Tons	4.5%	41,330 Tons
Demolition Waste			
Wood	189 Tons	2.1%	18,777 Tons
Dry Wall	69 Tons	0.8%	6,855 Tons
Roofing	53 Tons	0.6%	5,266 Tons
Masonry	179 Tons	1.9%	17,784 Tons
Metal	23 Tons	0.3%	2,285 Tons
Carpet	42 Tons	0.5%	4,173 Tons
Other	10 Tons	0.1%	993 Tons
TOTAL DEMOLITION	565 Tons	6.1%	56,133 Tons
Industrial Waste			
Cardboard	437 Tons	4.8%	43,416 Tons
Paper	66 Tons	0.7%	6,557 Tons
Food	0 Tons	0.0%	- Tons
Metal	1 Tons	0.0%	99 Tons
Wood	365 Tons	4.0%	36,263 Tons
Plastic	87 Tons	0.9%	8,643 Tons
Textiles	23 Tons	0.3%	2,285 Tons
Rubber	2 Tons	0.0%	199 Tons
Other	41 Tons	0.4%	4,073 Tons
TOTAL INDUSTRIAL	1022 Tons	11.1%	101,536 Tons
Other Waste			
Bulky Items	62 Tons	0.7%	6,160 Tons
Soil and Inert Materials	738 Tons	8.0%	73,320 Tons
Asbestos	109 Tons	1.2%	10,829 Tons
Other	147 Tons	1.6%	14,604 Tons
TOTAL OTHER WASTE	1056 Tons	11.5%	104,913 Tons
TOTAL WASTE STREAM	9196 Tons	100%	913,621 Tons

The Bridgeton Landfill

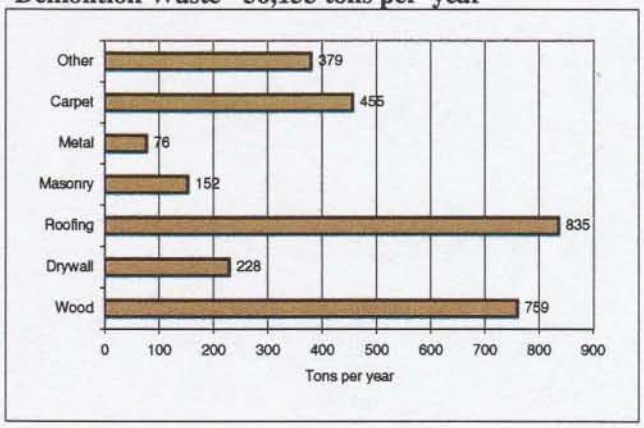
Total Waste Component - 913,621 tons per year



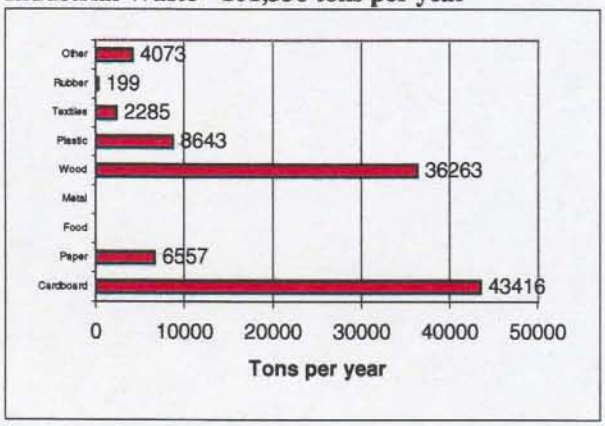
Construction Waste - 41,330 tons per year



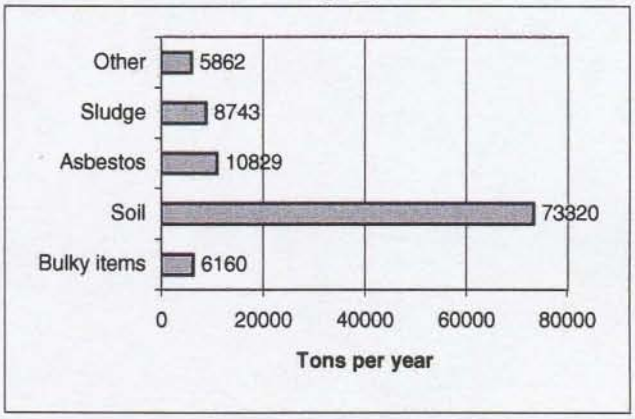
Demolition Waste - 56,133 tons per year



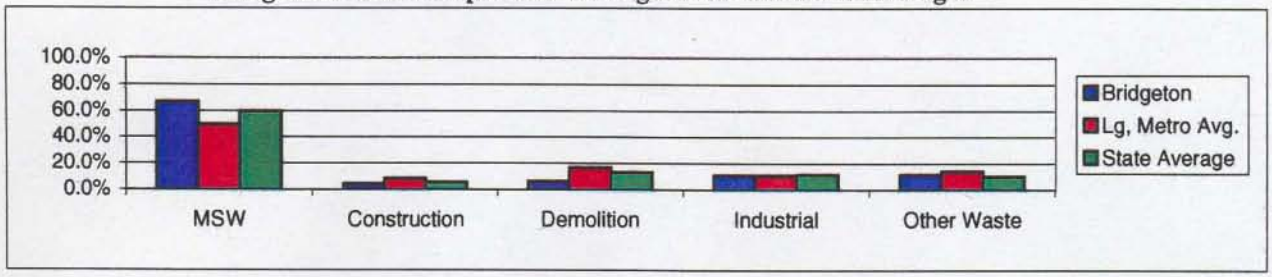
Industrial Waste - 101,536 tons per year



Other Waste - 104,913 tons per year



Bridgeton Waste Components vs.Large Metro and State Averages



Butler County Landfill

The Butler County Landfill is located in Butler County, MO., approximately 10 miles north of Poplar Bluff. It is owned and operated by Allied Waste Industries Inc. The disposal facility covers 80 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as contaminated soils and waste water treatment sludge.

Butler County Landfill accepted 101,087 tons in 1996, 127,575 tons in 1997 and 122,185 tons in 1998. The landfill operation was observed from Monday October 5th through Friday October 9th. The weather was rainy on Monday and Tuesday but fair the remainder of the week. The rain seemed to reduce construction and demolition waste during the period. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 182 trucks, delivered 2,077 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Each driver was asked where the load originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or Other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The Butler County Landfill accepts waste from three transfer stations. The St.Francois County Environmental Corp. in Park Hills, the Tri County transfer station in the bootheel area, and the City of Fredericktown transfer station in Fredericktown. These three sources represented 27% (46 trailers and roll-offs) of the traffic and 55% of the total waste. There were some demolition materials observed and recorded in these transfer loads but the overwhelming majority of the transfer station waste was MSW.

The Total Waste Stream - 2,077 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in transfer trailers and local packer trucks.

Total waste received during the observation period was 2,077 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
76%	2%	8%	5%	9%
1586 tons	39 tons	161 tons	109 tons	180 tons

Municipal Solid Waste - 1,586 tons

Municipal Solid Waste (MSW) accounted for 76% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, three MSW sorts were conducted at the Butler County landfill in 1997. During the three waste sorts 32 samples, weighing an average of 255 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 1586 tons. The percentage of each major material category found in the 1997 sort was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
36%	5.5%	8.1%	14.3%	31.1%	4.5%
573 tons	87 tons	128 tons	227 tons	493 tons	71 tons

Construction Waste - 39 tons

About 2% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The area served by the landfill is not a fast growing area and open burning is permitted in most municipalities and all counties. Both of these factors may have contributed to the low amount of construction waste. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 39 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	**Dry Wall**	**Masonry**	**Metal**	**Plas.**	**OCC**	**Other**
37%	43%	0%	0%	0%	7%	13%
14 tons	17 tons	0 tons	0 tons	0 tons	3 tons	5 tons

Demolition Waste - 161 tons

About 8% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Almost

half (49%) of the of the demolition waste was roofing shingles. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.
Total demolition waste received during the observation period was 161 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
14%	23%	49%	3%	1%	10%	0%
23 tons	37 tons	77 tons	5 tons	0 tons	16 tons	0 tons

Industrial Waste - 267 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing single waste products from a manufacturing process. The rubber waste was defective auto hose material from gates and the textile was from a furniture manufacturer. The "other" industrial waste was rock dust, black char, and firebricks from local manufacturers.
Total industrial waste received during the observation period was 267 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
3%	2%	0%	0%	3%	3%	10%	19%	59%
9 tons	5 tons	0 tons	0 tons	7 tons	9 tons	28 tons	51 tons	158 tons

Other Waste - 22 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.
Total Other waste received during the observation period was 22 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

Bulky
100%
22 tons

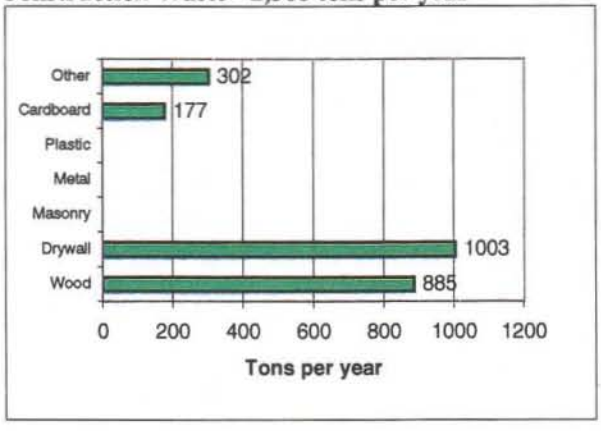
BUTLER COUNTY LANDFILL 122,185 TONS IN 1998

MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	573 Tons	27.7%	33,823 Tons
Glass	87 Tons	4.2%	5,135 Tons
Metals	128 Tons	6.2%	7,556 Tons
Plastics	227 Tons	11.0%	13,399 Tons
Organics	493 Tons	23.8%	29,101 Tons
Inorganics	72 Tons	3.5%	4,250 Tons
TOTAL MSW	1580 Tons	76.3%	93,263 Tons
Construction Waste			
Wood	15 Tons	0.7%	885 Tons
Dry Wall	17 Tons	0.8%	1,003 Tons
Masonry	0 Tons	0.0%	- Tons
Metal	0 Tons	0.0%	- Tons
Plastic	0 Tons	0.0%	- Tons
Cardboard	3 Tons	0.1%	177 Tons
Other	5 Tons	0.2%	302 Tons
TOTAL CONSTRUCTION	40 Tons	1.9%	2,368 Tons
Demolition Waste			
Wood	23 Tons	1.1%	1,328 Tons
Dry Wall	39 Tons	1.9%	2,278 Tons
Roofing	79 Tons	3.8%	4,657 Tons
Masonry	5 Tons	0.2%	285 Tons
Metal	0 Tons	0.0%	- Tons
Carpet	16 Tons	0.8%	950 Tons
Other	0 Tons	0.0%	- Tons
TOTAL DEMOLITION	161 Tons	7.8%	9,499 Tons
Industrial Waste			
Cardboard	9 Tons	0.4%	515 Tons
Paper	5 Tons	0.3%	322 Tons
Food	0 Tons	0.0%	- Tons
Metal	0 Tons	0.0%	- Tons
Wood	7 Tons	0.3%	386 Tons
Plastic	9 Tons	0.4%	515 Tons
Textiles	28 Tons	1.4%	1,670 Tons
Rubber	51 Tons	2.5%	3,022 Tons
Other	158 Tons	7.7%	9,350 Tons
TOTAL INDUSTRIAL	267 Tons	12.9%	15,780 Tons
Other Wastes			
Bulky Items	22 Tons	1.0%	1,275 Tons
Soil and Inert Materials	0 Tons	0.0%	- Tons
Asbestos	0 Tons	0.0%	- Tons
Other	0 Tons	0.0%	- Tons
TOTAL OTHER WASTE	22 Tons	1.0%	1,275 Tons
TOTAL WASTE STREAM	2070 Tons	100%	122,185 Tons

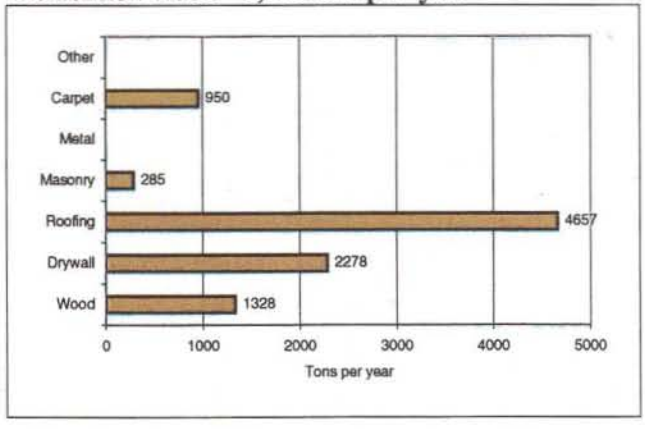
The Butler County Landfill

Total Waste Component - 122,185 tons per year

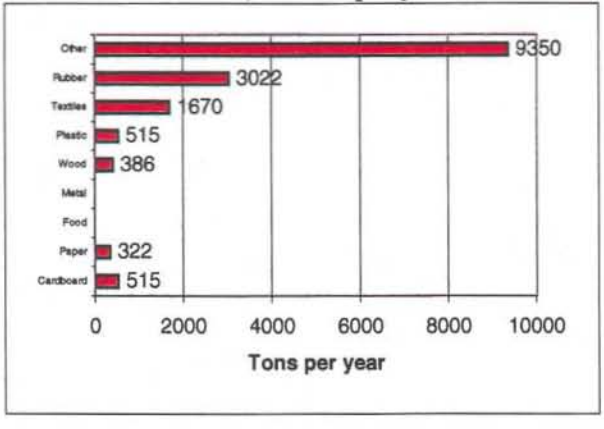
Construction Waste - 2,368 tons per year



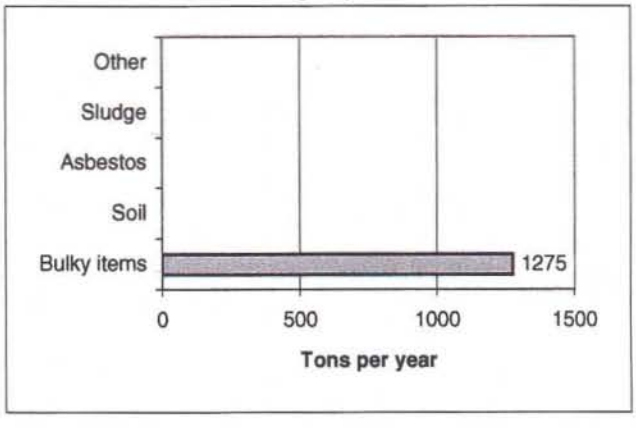
Demolition Waste - 9,499 tons per year



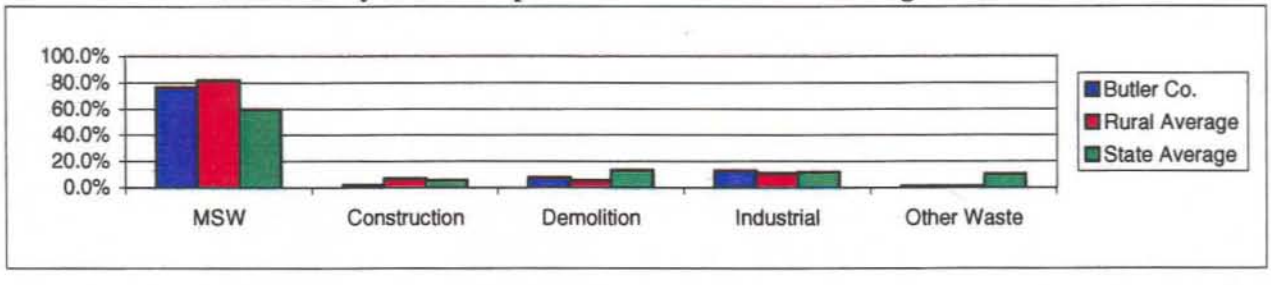
Industrial Waste - 15,780 tons per year



Other Waste - 1,275 tons per year



Butler County Waste Components vs Rural and State Averages



City of Columbia Landfill

The City of Columbia Landfill is located in Boone County, approximately 5 miles northeast of Columbia, MO. It is owned and operated by the City of Columbia. The disposal facility covers 107 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as asbestos, contaminated soils and waste water treatment sludge. The City of Columbia operates a fleet of collection vehicles which collects all of the residential and most of the commercial and industrial waste within the City of Columbia. The City also operates a state of the art composting facility at the same location.

The City of Columbia Landfill accepted 122,892 tons in 1996, 181,147 tons in 1997 and 125,867 tons in 1998. The landfill operation was observed from Monday October 19th through Friday October 23rd, 1998. The weather was sunny and fair for the entire week. Observation took place from 4 AM till 5 PM on the above dates. During the five-day observation period 470 trucks, delivered 1,791 tons of waste to the landfill. The landfill staff felt the material received during the observation period was typical of material received year round. They occasionally receive small quantities of asbestos and contaminated soil but those quantities are statistically nil.

All loads could be classified visually, without any driver data.

The Total Waste Stream - 1,791 tons

The total waste stream was overwhelmingly Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. Most of the MSW was delivered to the landfill in City of Columbia trucks.

Total waste received during the observation period was 1,791 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
58%	7%	14%	18%	3%
1035 tons	133 tons	246 tons	325 tons	52 tons

Municipal Solid Waste - 1,035 Tons

Municipal Solid Waste (MSW) accounted for 58% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, the City of Columbia and the University of Missouri

conducted four seasonal waste sorts of MSW at the landfill in 1996. The materials were sorted and recorded by weight. Further details are available through the City of Columbia Sanitation Department.

The total MSW received during the observation period was 1,035 tons. The average percentage of each major material category found in the 1996waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
41.6%	3.7%	5.3%	12.5%	28.2%	8.7%
431 tons	38 tons	55 tons	129 tons	292 tons	90 tons

Construction Waste - 133 Tons

About 7.4% of the total waste received was from new construction sources. Construction waste loads are typically transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Only two roll-off trucks delivered construction waste during the observation period. One was primarily masonry materials (bricks, concrete blocks, and gravel). The other was a combination of wood dry wall and cardboard.

Total construction waste received during the observation period was 133tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardbrd	Other
53%	18%	5%	3%	3%%	9%	10%
71 tons	24 tons	6 tons	4 tons	4 tons	12 tons	13 tons

Demolition Waste - 246 Tons

About 13.7% of the total waste was from demolition sources. Demolition waste loads are usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. However at this landfill most demolition materials were received in the transfer trailers and those materials were estimated an recorded as part of the demolition component. Most roofing waste loads were delivered to the landfill by independent contractors and were not mixed with other materials. The remaining demolition loads contained more mixed materials. The other category was primarily insulation board from roof tear-offs.

Total demolition waste received during the observation period was 246 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
30%	9%	27%	22%	3%	2%	7%
74 tons	21 tons	67 tons	53 tons	8 tons	6 tons	17 tons

Industrial Waste - 325 Tons

About 18.1% of the total waste was from industrial sources. The overwhelming majority of industrial waste was delivered in open top roll offs, or compactor units and in most cases it was delivered in City of Columbia trucks. Cardboard came from a variety of manufacturers. Most wood was in the form of pallets and crates.

Total industrial waste received during the observation period was 325 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
29%	6%	8%	1%	17%	26%	1%	4%	9%
95 tons	21 tons	26 tons	2 tons	54 tons	83 tons	4 tons	11 tons	30 tons

Other Waste - 52 Tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items were the only other waste observed. They include furniture, mattresses, appliances, bicycles, etc. Most of these bulky items were received in self-haul vehicles. The "other" waste was mainly organic materials (hay and straw) which were mixed with animal manure and under DNR regulations could not be composted.

Total other waste received during the observation period was 52 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

Bulky Items	Other
60%	40%
31tons	21 tons

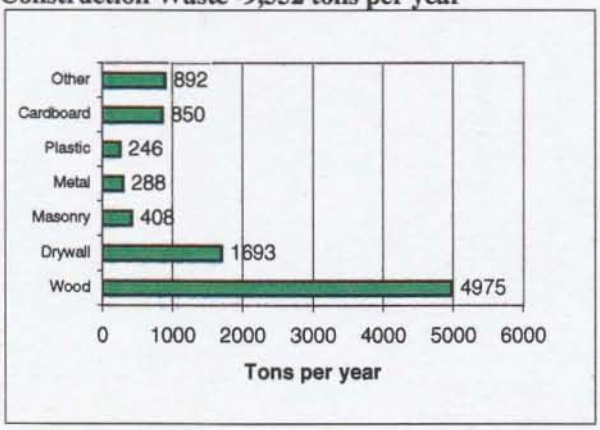
CITY OF COLUMBIA LANDFILL 125,867 TONS IN 1998

MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	431 Tons	24.1%	30,285 Tons
Glass	38.3 Tons	2.1%	2,691 Tons
Metals	54.9 Tons	3.1%	3,858 Tons
Plastics	129 Tons	7.2%	9,064 Tons
Organics	292 Tons	16.3%	20,518 Tons
Inorganics	90 Tons	5.0%	6,324 Tons
TOTAL MSW	1035 Tons	57.8%	72,739 Tons
Construction Waste			
Wood	71 Tons	4.0%	4,975 Tons
Dry Wall	24 Tons	1.3%	1,693 Tons
Masonry	6 Tons	0.3%	408 Tons
Metal	4 Tons	0.2%	288 Tons
Plastic	4 Tons	0.2%	246 Tons
Cardboard	12 Tons	0.7%	850 Tons
Other	13 Tons	0.7%	892 Tons
TOTAL CONSTRUCTION	133 Tons	7.4%	9,352 Tons
Demolition Waste			
Wood	74 Tons	4.1%	5,200 Tons
Dry Wall	21 Tons	1.1%	1,440 Tons
Roofing	67 Tons	3.8%	4,722 Tons
Masonry	53 Tons	3.0%	3,724 Tons
Metal	8 Tons	0.5%	576 Tons
Carpet	6 Tons	0.3%	415 Tons
Other	17 Tons	1.0%	1,209 Tons
TOTAL DEMOLITION	246 Tons	13.7%	17,285 Tons
Industrial Waste			
Cardboard	95 Tons	5.3%	6,682 Tons
Paper	21 Tons	1.2%	1,462 Tons
Food	26 Tons	1.4%	1,806 Tons
Metal	2 Tons	0.1%	155 Tons
Wood	54 Tons	3.0%	3,787 Tons
Plastic	83 Tons	4.6%	5,818 Tons
Textiles	4 Tons	0.2%	253 Tons
Rubber	11 Tons	0.6%	752 Tons
Other	30 Tons	1.7%	2,101 Tons
TOTAL INDUSTRIAL	325 Tons	18.1%	22,815 Tons
Other wastes			
Bulky Items	31 Tons	1.7%	2,185 Tons
Soil and Inert Materials	0 Tons	0.0%	- Tons
Asbestos	0 Tons	0.0%	- Tons
Other	21 Tons	1.2%	1,490 Tons
TOTAL OTHER WASTE	52 Tons	2.9%	3,675 Tons
TOTAL WASTE STREAM	1791 Tons	100%	125,867 Tons

The City of Columbia Landfill

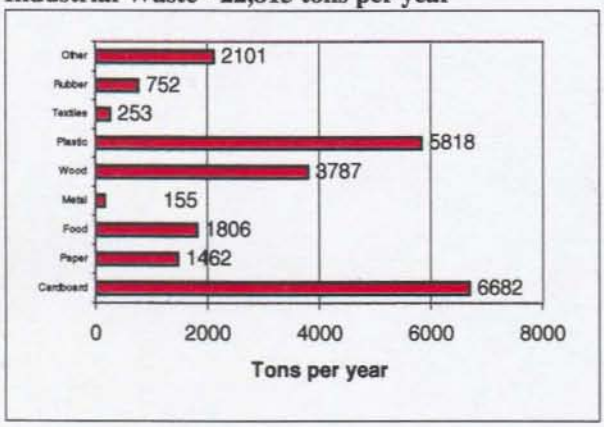
Total Waste Component -125,867 tons per year

Construction Waste -9,352 tons per year

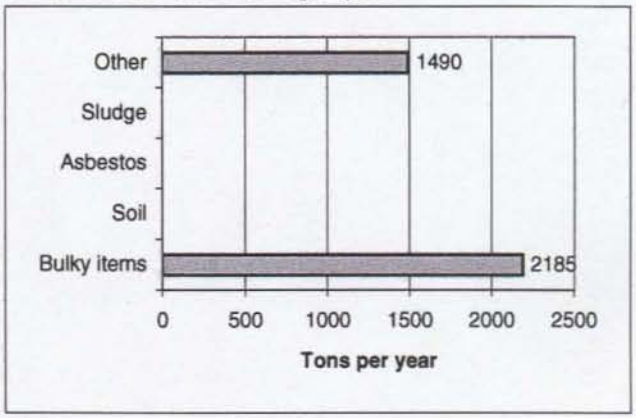


Demolition Waste - 17,285 tons per year

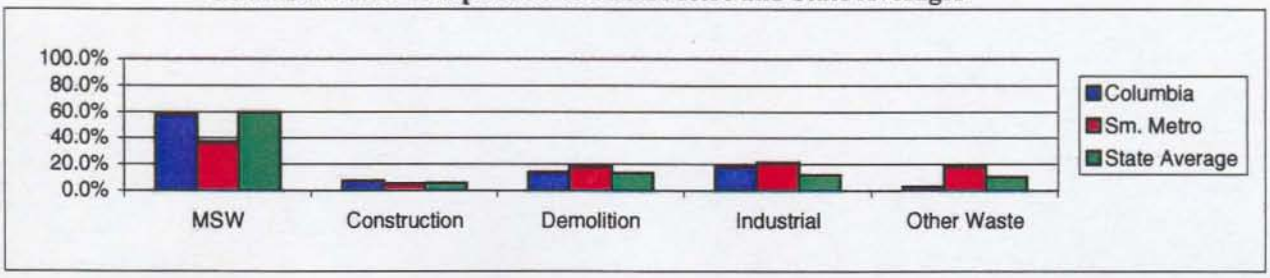
Industrial Waste - 22,815 tons per year



Other Waste - 3,675 tons per year



Columbia Waste Components vs Small Metro and State Averages



The City of St. Joseph Landfill

The City of St. Joseph Landfill is located in Buchanan County, MO., approximately 10 miles southeast of St. Joseph, MO. It is owned and operated by The City of St. Joseph. The disposal facility covers is permitted to accept all municipal solid waste (MSW) and some other wastes such as contaminated soils, asbestos, and wastewater treatment sludge. The City of St. Joseph also operates a yard waste composting operation at the same facility. The City of St. Joseph does not collect waste in the City. The residential and commercial waste collection service is contracted Deffenbaugh Industries and taken to their disposal facility in Kansas.

The City of St. Joseph Landfill accepted 98,940 tons in 1996, 99,285 tons in 1997 and 120,158 tons in 1998. The landfill operation was observed from Monday November 9^{h} through Friday November 13th. The weather was rainy and very windy during the first part of the week and fair the remainder of the week. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 667 trucks, delivered 2109 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was not typical of material received year round because of two large projects, which tended to skew the results of the demolition and other waste stream components. Therefore the results may not be as accurate as desired.

Each driver was asked where the load originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The City of St. Joseph Landfill accepts waste from Andrew, Buchanan, Clay, Clinton, DeKalb, counties. The nearest Missouri landfill are located in Maryville and Sugar Creek, Missouri. There are several landfills in Kansas, which accept waste from the area. There was a large amount of small self-haul traffic. There were no waste loads from transfer stations.

The Total Waste Stream - 2,084 tons

The total waste stream was very different than most comparable landfills. The Municipal Solid Waste (MSW) was very low because all of the St. Joseph MSW is contracted to Deffenbaugh Ind. And taken to their Kansas disposal facility. There were greater percentages of demolition, industrial and other waste than the rural areas. Total waste received during the observation period was 2,084 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
25%	4%	21%	23%	27%
523 tons	76tons	436 tons	478 tons	570 tons

Municipal Solid Waste - 523 tons

Municipal Solid Waste (MSW) accounted for only 25% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, three MSW sorts were conducted at the St. Joseph Landfill in 1996. During the three waste sorts 30 samples, weighing an average of 239 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 523 tons. The percentage of each major material category found in the 1996 sort was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
39.6%	6.4%	7.2%	12.7%	29.4%	4.1%
208 tons	34 tons	38 tons	67 tons	155 tons	22 tons

Construction Waste - 76 tons

About 4% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. This percentage was greater than most of the rural areas but less than urban landfills in the state. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was76 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardbrd	Other
40%	22%	29%	2%	1%	4%	1%
31 tons	17 tons	23 tons	2 tons	1 ton	3 tons	1 ton

Demolition Waste - 436 tons

About 21% of the total waste was from demolition sources. This was a very high percentage, which resulted from a large demolition project in Pattonsburg, Missouri. During the Observation period 25 trucks from the Pattonsburg project delivered 234 (51%) tons of demolition waste to the landfill. Therefore, this one time project doubled the normal demolition waste.

Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The wood was more weathered, there was very little if any

cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.
Total demolition waste received during the observation period was 436 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
53%	4%	18%	18%	1%	4%	1%
233 tons	19 tons	80 tons	79 tons	5 tons	17 tons	4 tons

Industrial Waste - 478 tons

St. Joseph has a large industrial base and therefore the industrial waste stream was significantly higher (23% of the total waste stream) than many other areas of the state. Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. There were 102 loads (15% of the total) that contained some industrial waste. These loads came from a variety of sources. The main industrial generators were Blueside, Ralston (Friskies), Johnson Control, Quaker Corp., Snorkel, and Silgan. Altec and Atchison Castings. The remaining industrial waste was from smaller generators.
Total industrial waste received during the observation period was 478 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
15%	9%	35%	4%	16%	6%	0%	0%	15%
72 tons	44 tons	168 tons	18 tons	75 tons	27 tons	0 tons	0 tons	73 tons

Other Waste - 570 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. The big surprise in other waste was the amount of dirt brought to the landfill. The dirt came from three main sources. The City of St. Joseph Street Department 142 tons, a highway project in Hopkins, MO. 315 tons, and a construction project in St. Joseph 74 tons.
Total other waste received during the observation period was 570 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

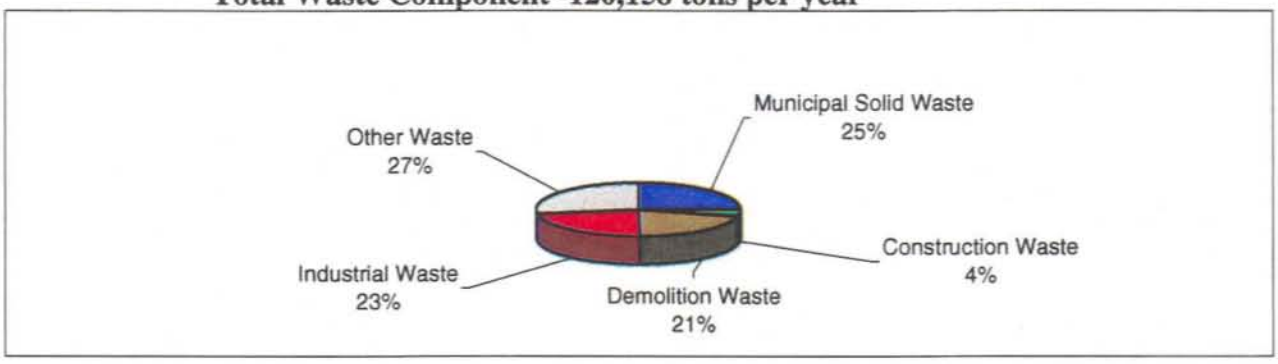
Bulky	Soil	Asbestos
5%	93%	2%
27 tons	531 tons	13 tons

CITY OF ST. JOSEPH LANDFILL 120,158 TONS IN 1998

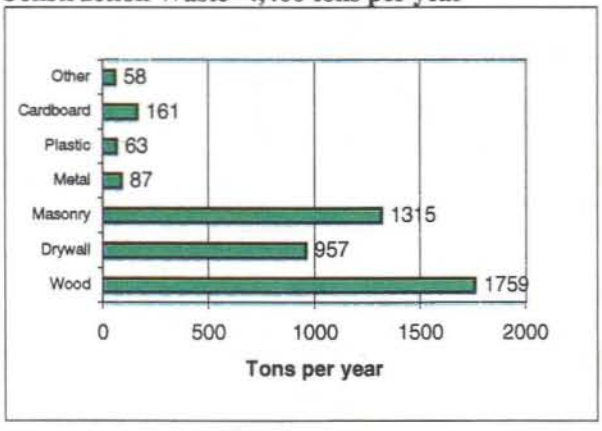
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	208 Tons	10.0%	11,995 Tons
Glass	34 Tons	1.6%	1,943 Tons
Metals	38 Tons	1.8%	2,186 Tons
Plastics	67 Tons	3.2%	3,852 Tons
Organics	155 Tons	7.4%	8,939 Tons
Inorganics	22 Tons	1.0%	1,246 Tons
TOTAL MSW	523 Tons	25.1%	30,161 Tons
Construction Waste			
Wood	31 Tons	1.5%	1,759 Tons
Dry Wall	17 Tons	0.8%	957 Tons
Masonry	23 Tons	1.1%	1,315 Tons
Metal	2 Tons	0.1%	87 Tons
Plastic	1 Tons	0.1%	63 Tons
Cardboard	3 Tons	0.1%	161 Tons
Other	1 Tons	0.0%	58 Tons
TOTAL CONSTRUCTION	76 Tons	3.7%	4,400 Tons
Demolition Waste			
Wood	233 Tons	11.2%	13,437 Tons
Dry Wall	19 Tons	0.9%	1,119 Tons
Roofing	80 Tons	3.8%	4,585 Tons
Masonry	79 Tons	3.8%	4,527 Tons
Metal	5 Tons	0.2%	294 Tons
Carpet	17 Tons	0.8%	963 Tons
Other	4 Tons	0.2%	242 Tons
TOTAL DEMOLITION	436 Tons	20.9%	25,167 Tons
Industrial Waste			
Cardboard	72 Tons	3.5%	4,169 Tons
Paper	44 Tons	2.1%	2,560 Tons
Food	168 Tons	8.1%	9,688 Tons
Metal	18 Tons	0.9%	1,044 Tons
Wood	75 Tons	3.6%	4,308 Tons
Plastic	27 Tons	1.3%	1,569 Tons
Textiles	0 Tons	0.0%	- Tons
Rubber	0 Tons	0.0%	- Tons
Other	73 Tons	3.5%	4,198 Tons
TOTAL INDUSTRIAL	478 Tons	22.9%	27,537 Tons
Other Waste			
Bulky Items	27 Tons	1.3%	1,569 Tons
Soil and Inert Materials	530 Tons	25.4%	30,564 Tons
Asbestos	13 Tons	0.6%	761 Tons
Other	0 Tons	0.0%	- Tons
TOTAL OTHER WASTE	570 Tons	27.4%	32,894 Tons
TOTAL WASTE STREAM	2084 Tons	100%	120,158 Tons

The City of St. Joseph Landfill

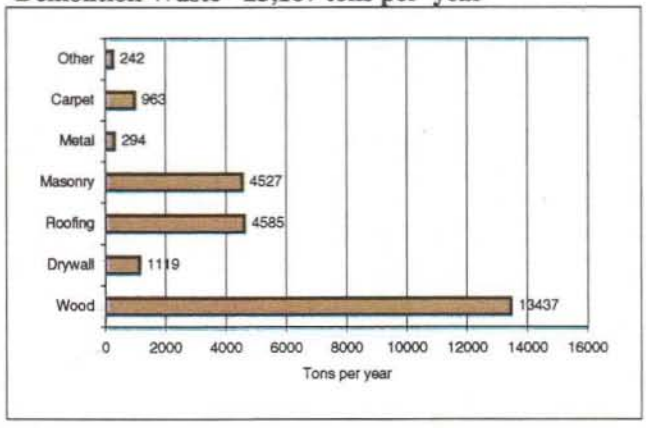
Total Waste Component -120,158 tons per year



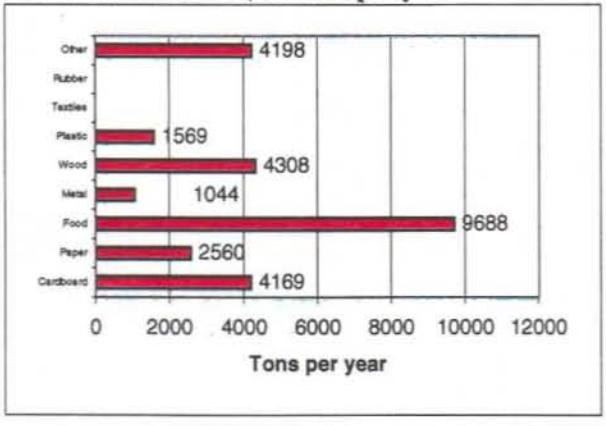
Construction Waste -4,400 tons per year



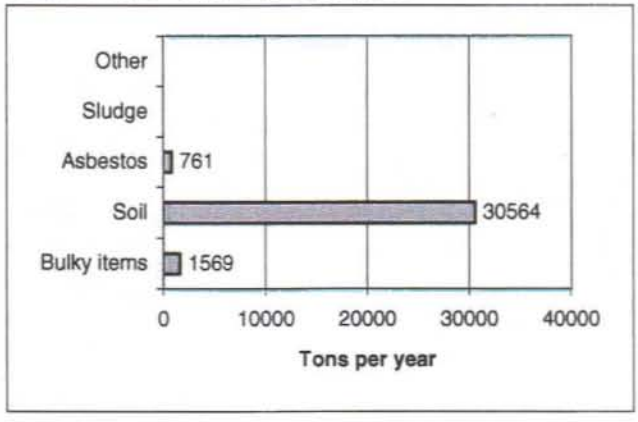
Demolition Waste - 25,167 tons per year



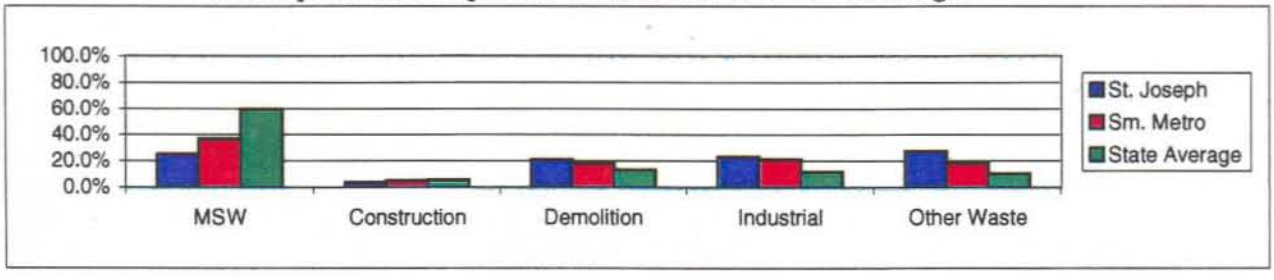
Industrial Waste - 27,537 tons per year



Other Waste - 32,894 tons per year



St. Joseph Waste Components vs Small Metro and State Averages



Courtney Ridge Landfill

The Courtney Ridge Landfill is located in Sugar Creek, MO., approximately 20 miles northwest of Kansas City, MO. It is owned and operated by Waste Management Inc. The disposal facility covers 134 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as asbestos, contaminated soils and waste water treatment sludge.

The Courtney Ridge Landfill accepted 59,332 tons in 1996, 315,951 tons in 1997 and 418,625 tons in 1998. The landfill operation was observed from Monday February 8th through Friday February 12th, 1999. The weather was fair for the first three days but rained and turned cold on Thursday and Friday. Observation took place from 7 AM till 5:00 PM on the above dates. The Courtney Ridge Landfill is open 24 hours a day and therefore not all trucks were observed. During the five-day period 733 trucks, delivered 4,350 tons of waste to the landfill were observed. The landfill staff felt the material received during the observation period was typical of material received year round.

Due to the heavy traffic and small dumping area drivers were not asked where the loads originated. However, all loads could be classified visually, without any driver data.

The Total Waste Stream - 4,350

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in local packer trucks.

Total waste received during the observation period was 4,350 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
59%	5%	7%	20%	9%
2571 tons	209 tons	304 tons	870 tons	397 tons

Municipal Solid Waste - 2571 tons

Municipal Solid Waste (MSW) accounted for 59% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and

volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 2571 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.8%	6.9%	14.4%	30.8%	4.8%
959 tons	149 tons	177 tons	370 tons	792 tons	123 tons

Construction Waste - 209 tons

About 5% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall).

Total construction waste received during the observation period was 209 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardboard	Other
52%	21%	6%	2%	8%	10%	0%
108 tons	44 tons	14 tons	4 tons	17 tons	22 tons	0 tons

Demolition Waste - 304 tons

About 7% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 304 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
35%	9%	23%	8%	9%	8%	8%
106 tons	28 tons	70 tons	26tons	27 tons	24 tons	24 tons

Industrial Waste -870 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. There were two main industrial generators. The materials in the "other" category listed below were primarily a sludge product from a manufacturer.

Total industrial waste received during the observation period was 870 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
22%	8%	34%	0%	22%	5%	0%	0%	9%
189 tons	71 tons	300 tons	2 tons	192 tons	41 tons	0 tons	0 tons	75 tons

Other Waste - 397 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received in open top roll-off containers.

Total Other waste received during the observation period was 397 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

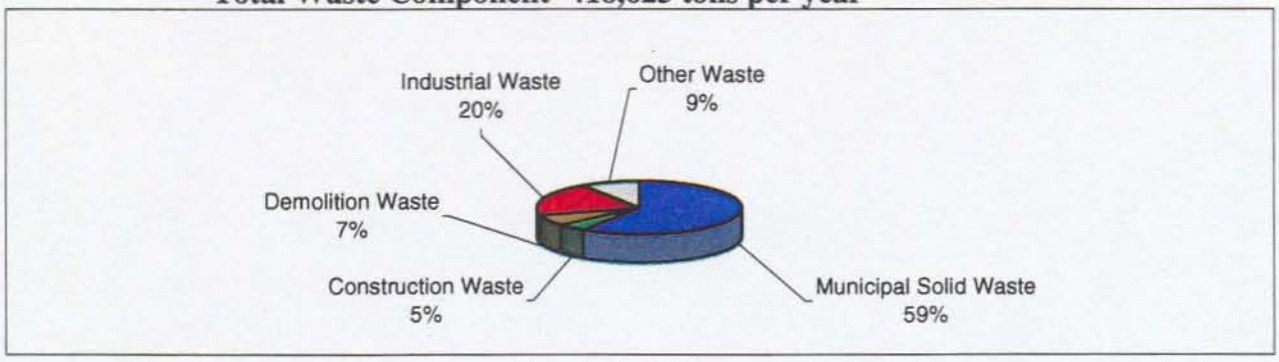
Bulky Items	Sewage Sludge	Soil	Ash
35%	37%	23%	4%
139 tons	148 tons	93 tons	17 tons

COURTNEY RIDGE LANDFILL 418,625 TONS IN 1998

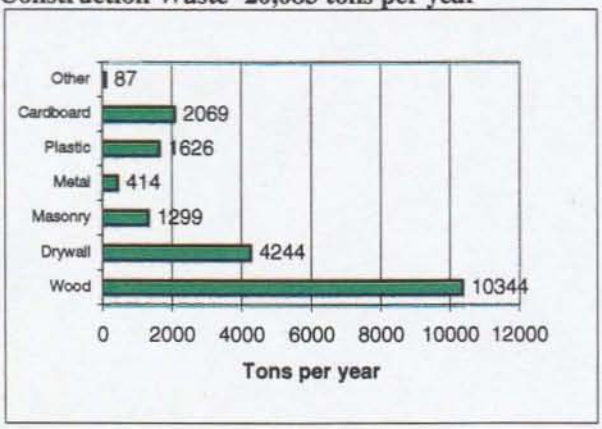
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	939 Tons	21.6%	90,357 Tons
Glass	149 Tons	3.4%	14,338 Tons
Metals	177 Tons	4.1%	17,032 Tons
Plastics	370 Tons	8.5%	35,604 Tons
Organics	792 Tons	18.2%	76,212 Tons
Inorganics	123 Tons	2.8%	11,836 Tons
TOTAL MSW	2571 Tons	59.1%	247,399 Tons
Construction Waste			
Wood	108 Tons	2.5%	10,344 Tons
Dry Wall	44 Tons	1.0%	4,244 Tons
Masonry	14 Tons	0.3%	1,299 Tons
Metal	4 Tons	0.1%	414 Tons
Plastic	17 Tons	0.4%	1,626 Tons
Cardboard	22 Tons	0.5%	2,069 Tons
Other	1 Tons	0.0%	87 Tons
TOTAL CONSTRUCTION	209 Tons	4.8%	20,083 Tons
Demolition Waste			
Wood	106 Tons	2.4%	10,162 Tons
Dry Wall	28 Tons	0.6%	2,665 Tons
Roofing	70 Tons	1.6%	6,697 Tons
Masonry	26 Tons	0.6%	2,483 Tons
Metal	27 Tons	0.6%	2,589 Tons
Carpet	24 Tons	0.5%	2,281 Tons
Other	24 Tons	0.6%	2,329 Tons
TOTAL DEMOLITION	304 Tons	7.0%	29,205 Tons
Industrial Waste			
Cardboard	189 Tons	4.3%	18,139 Tons
Paper	71 Tons	1.6%	6,813 Tons
Food	300 Tons	6.9%	28,849 Tons
Metal	2 Tons	0.0%	173 Tons
Wood	193 Tons	4.4%	18,533 Tons
Plastic	41 Tons	0.9%	3,955 Tons
Textiles	0 Tons	0.0%	
Rubber	0 Tons	0.0%	
Other	76 Tons	1.7%	7,284 Tons
TOTAL INDUSTRIAL	870 Tons	20.0%	83,746 Tons
Other Waste			
Bulky Items	139 Tons	3.2%	13,347 Tons
Soil and Inert Materials	93 Tons	2.1%	8,939 Tons
Sludge	148 Tons	3.4%	14,251 Tons
Other	17 Tons	0.4%	1,655 Tons
TOTAL OTHER WASTE	397 Tons	9.1%	38,192 Tons
TOTAL WASTE STREAM	4350 Tons	100%	418,625 Tons

The Courtney Ridge Landfill

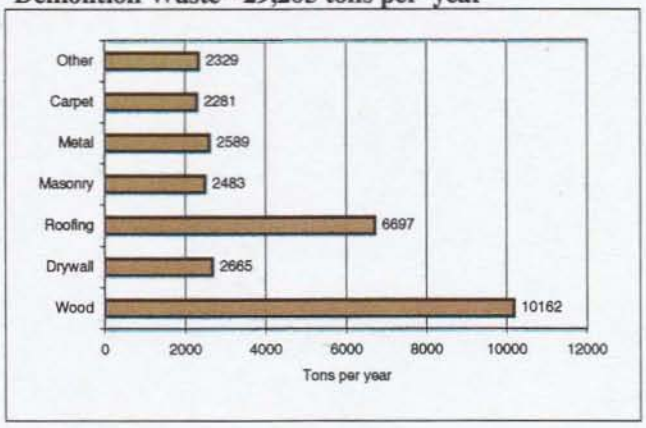
Total Waste Component -418,625 tons per year



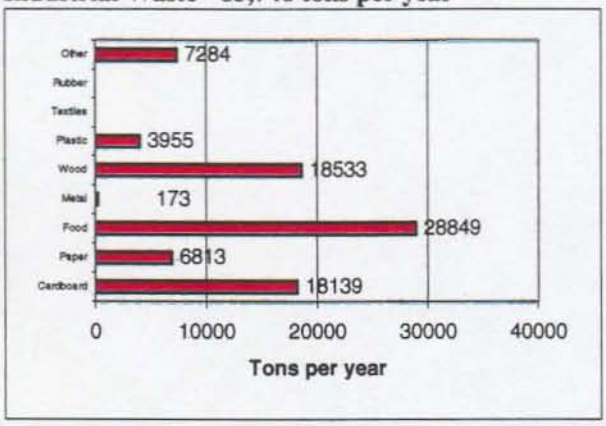
Construction Waste -20,083 tons per year



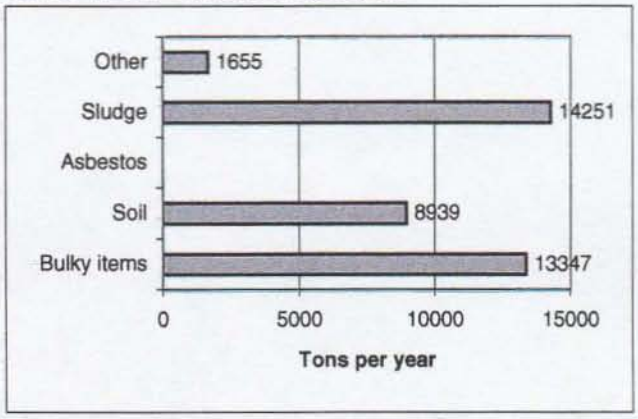
Demolition Waste - 29,205 tons per year



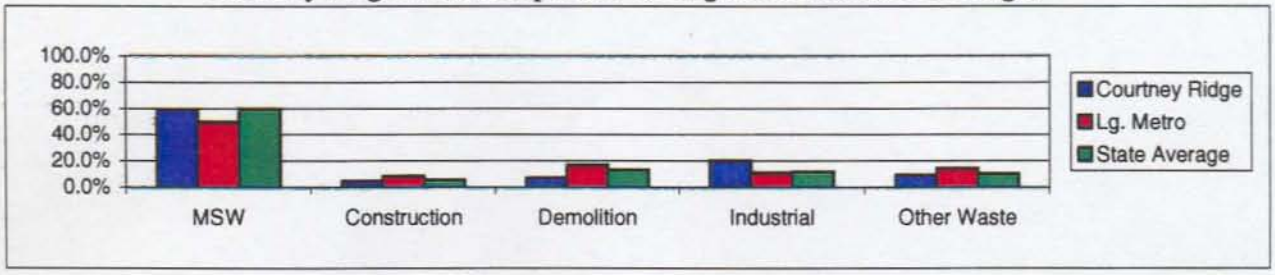
Industrial Waste - 83,746 tons per year



Other Waste - 38,192 tons per year



Courtney Ridge Waste Components vs Large Metro and State Averages



Fred Weber Inc. Landfill

The Fred Weber Landfill is located in St. Louis County approximately 15 miles west of the City of St. Louis, MO. It is owned and operated by Fred Weber Inc. The disposal facility covers 70 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes.

The Fred Weber Landfill accepted 59,332 tons in 1996, 315,951 tons in 1997 and 321,269 tons in 1998. The landfill operation was observed from Tuesday March 30th through Friday April 2nd, 1999. The weather was fair for the entire observation period. Observation took place from 7 AM till 4:30 PM on the above dates. During the four-day observation period 797 trucks, delivered 3,040 tons of waste to the landfill.

Because the weather was fair, and the observation period coincided with Easter week break, there may have been a slight increase in bulky items and brush. Other than that possibility the landfill staff felt the material received during the observation period was typical of material received year round.
Due to the heavy traffic and small dumping area drivers were not asked where the loads originated. However, all loads could be classified visually, without any driver data.

The Total Waste Stream - 3,040 tons

The composition of waste received at the Fred Weber Landfill has changed over the past year, and probably will continue to change during future months, due to consolidations, mergers, buy-outs and hauler-related ownership of the landfills in the St. Louis region. The Fred Weber Landfill is not owned by a waste hauling company. However, the remaining two sanitary landfills in the St. Louis region are owned by national waste hauling companies. Based on the waste received during the observation period the Fred Weber Landfill presently seems to attract construction and demolition haulers, small independents, and self haul vehicles. The MSW waste component was lower than most sanitary landfills throughout the state.
Total waste received during the observation period was 3,040 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
31%	16%	34%	7%	12%
948 tons	486 tons	1047 tons	206 tons	353 tons

Municipal Solid Waste - 948 tons

Municipal Solid Waste (MSW) accounted for 31% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally

contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste*.

The total MSW received during the observation period was 948 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.8%	6.9%	14.4%	30.8%	4.8%
354 tons	55 tons	65 tons	137 tons	292 tons	45 tons

Construction Waste - 486 Tons

About 16% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood or dry wall, etc.) than demolition loads.

Total construction waste received during the observation period was 486 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardboard	Other
48%	26%	8%	1%	4%	9%	4%
232 tons	125 tons	41 tons	6 tons	17 tons	43 tons	22 tons

Demolition Waste - 1047 Tons

About 34% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste. The "other" category was primarily roofing insulation board from commercial roofs.

Total demolition waste received during the observation period was 1047 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
26%	5%	23%	29%	5%	4%	7%
272 tons	55 tons	245 tons	303tons	55 tons	40 tons	77 tons

Industrial Waste - 206 Tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. The biggest industrial waste material was quartered tires from a tire chipping company. Much of the cardboard was from equipment installers and the wood component was primarily pallets.

Total industrial waste received during the observation period was 206 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
28%	10%	0%	0%	14%	8%	1%	39%	0%
58 tons	20 tons	0 tons	1 ton	28 tons	16 tons	2 tons	81 tons	0 tons

Other Waste - 353 Tons

Other waste is defined as waste which does not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received in open top roll-off containers from clean-up operations or delivered on small self-haul trucks and trailers. The brush was unloaded at the compost area if it was clean (no trash mixed with the yard waste) or put into the main fill area if there were stumps, dirt, or other items mixed with the brush.

Total other waste received during the observation period was 353 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

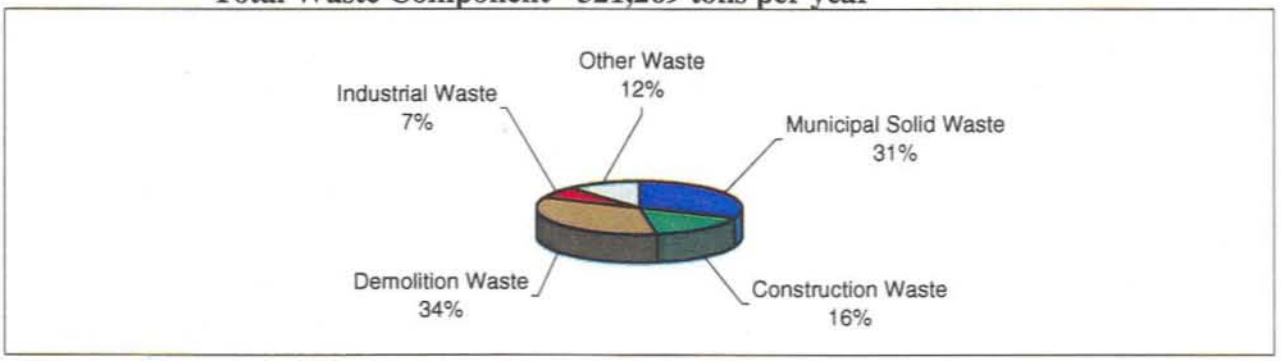
Bulky Items	Brush, Stumps, or Commercial Yard Waste
36%	64%
128 tons	225 tons

FRED WEBER LANDFILL 321,269 TONS IN 1998

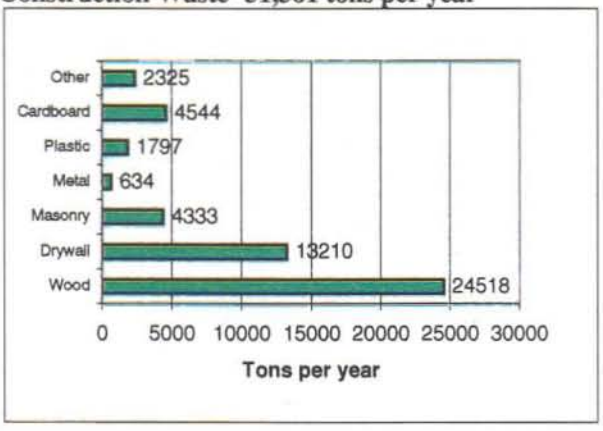
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	354 Tons	11.6%	37,411 Tons
Glass	55 Tons	1.8%	5,812 Tons
Metals	65 Tons	2.1%	6,869 Tons
Plastics	137 Tons	4.5%	14,478 Tons
Organics	292 Tons	9.6%	30,859 Tons
Inorganics	45 Tons	1.5%	4,756 Tons
TOTAL MSW	948 Tons	31.2%	100,185 Tons
Construction Waste			
Wood	232 Tons	7.6%	24,518 Tons
Dry Wall	125 Tons	4.1%	13,210 Tons
Masonry	41 Tons	1.3%	4,333 Tons
Metal	6 Tons	0.2%	634 Tons
Plastic	17 Tons	0.6%	1,797 Tons
Cardboard	43 Tons	1.4%	4,544 Tons
Other	22 Tons	0.7%	2,325 Tons
TOTAL CONSTRUCTION	486 Tons	16.0%	51,361 Tons
Demolition Waste			
Wood	272 Tons	8.9%	28,745 Tons
Dry Wall	55 Tons	1.8%	5,812 Tons
Roofing	245 Tons	8.1%	25,892 Tons
Masonry	303 Tons	10.0%	32,021 Tons
Metal	55 Tons	1.8%	5,812 Tons
Carpet	40 Tons	1.3%	4,227 Tons
Other	77 Tons	2.5%	8,137 Tons
TOTAL DEMOLITION	1047 Tons	34.4%	110,648 Tons
Industrial Waste			
Cardboard	58 Tons	1.9%	6,129 Tons
Paper	20 Tons	0.7%	2,114 Tons
Food	0 Tons	0.0%	- Tons
Metal	1 Tons	0.0%	106 Tons
Wood	28 Tons	0.9%	2,959 Tons
Plastic	16 Tons	0.5%	1,691 Tons
Textiles	2 Tons	0.1%	211 Tons
Rubber	81 Tons	2.7%	8,560 Tons
Other	0 Tons	0.0%	- Tons
TOTAL INDUSTRIAL	206 Tons	6.8%	21,770 Tons
Other Wastes			
Bulky Items	128 Tons	4.2%	13,527 Tons
Soil and Inert Materials	0 Tons	0.0%	- Tons
Asbestos	0 Tons	0.0%	- Tons
Commercial yard waste	225 Tons	7.4%	23,778 Tons
TOTAL OTHER WASTE	353 Tons	11.6%	37,305 Tons
TOTAL WASTE STREAM	3040 Tons	100%	321,269 Tons

The Fred Weber Landfill

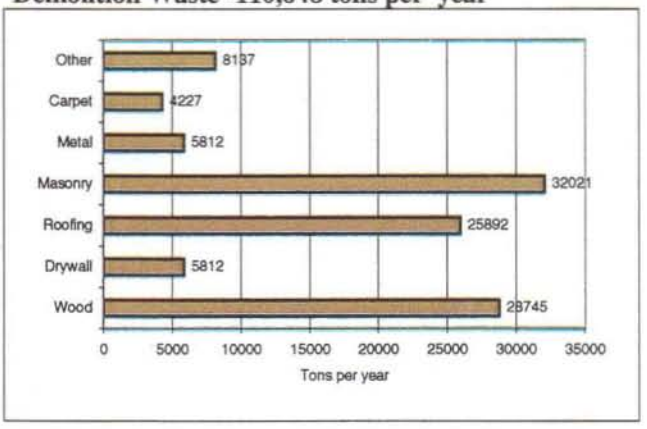
Total Waste Component - 321,269 tons per year



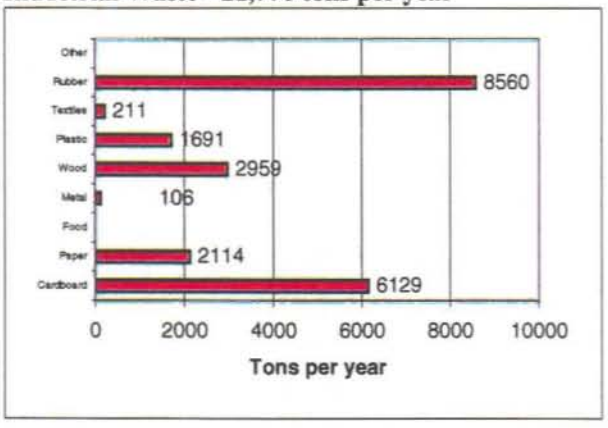
Construction Waste -51,361 tons per year



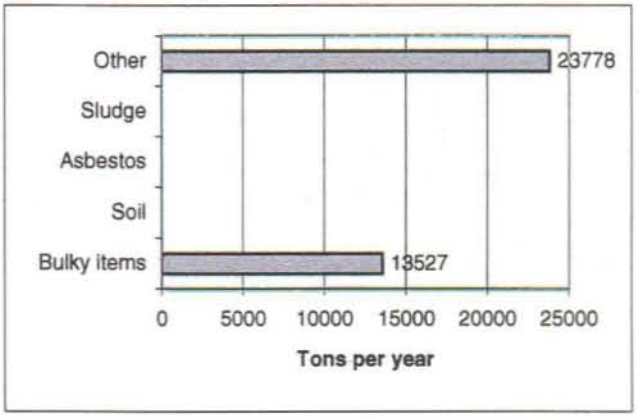
Demolition Waste -110,648 tons per year



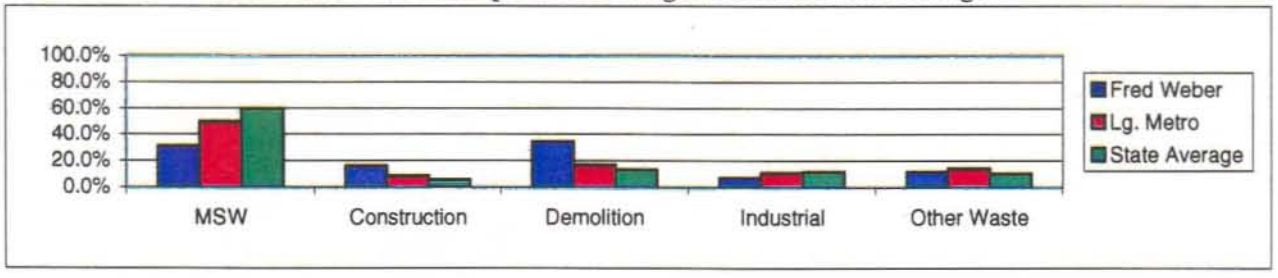
Industrial Waste - 21,770 tons per year



Other Waste - 37,305 tons per year



Fred Weber Waste Components vs Large Metro and State Averages



Lamar Landfill

The Lamar Landfill is located in Barton County, MO., approximately 5 miles north of Lamar, MO. It is owned and operated by Browning Ferris Industries Inc. The disposal facility is permitted to accept all municipal solid waste (MSW) and some Other wastes such as contaminated soils, asbestos, and wastewater treatment sludge.

The Lamar Landfill accepted 165,010 tons in 1996, 181,147 tons in 1997 and 168,591tons in 1998. The landfill operation was observed from Monday October 19^{h} through Friday October 23rd. The weather was sunny and fair the entire week.. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 197 trucks, delivered 2,769 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Each driver was asked where the load originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or Other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The Lamar Landfill accepts waste from a six county area. The nearest Missouri landfills are located in Springfield and Clinton. Two transfer stations shipped waste to the Lamar Landfill. These were the BFI Transfer Station in Springfield, and the Stockton Transfer Station. These sources accounted for 67% (1862 tons) of the total waste received during the observation period. There were some construction, demolition, and industrial materials observed and recorded in these transfer loads but the overwhelming majority of the transfer station waste was MSW.

The Total Waste Stream - 2,766 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in transfer trailers and local packer trucks. Total waste received during the observation period was 2,769 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
77%	1%	7%	8%	8%
2125 tons	19 tons	187 tons	227 tons	211 tons

Municipal Solid Waste - 2,122 tons

Municipal Solid Waste (MSW) accounted for 77% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally

contained within plastic bags. However, three MSW sorts were conducted at the Lamar landfill in 1996. During the three waste sorts 38 samples, weighing an average of 212 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 2125 tons. The percentage of each major material category found in the 1996 sort was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
35.1%	4.9%	7.1%	15.5%	33%	4.3%
746 tons	104 tons	151 tons	329 tons	701 tons	91 tons

Construction Waste - 19 tons

Only about 1% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The area served by the landfill is not a fast growing area and open burning is permitted in most municipalities and all counties. Both of these factors may have contributed to the low amount of construction waste. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 19 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardbrd	Other
51%	4%	0%	2%	0%	9%	26%
10 tons	1 tons	0 tons	2 tons	0 tons	2 tons	5 tons

Demolition Waste - 187 tons

About 7% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Over half (54%) of the of the demolition waste was roofing shingles. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 187 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed on the next page.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
25%	2%	54%	3%	4%	6%	6%
46 tons	4 tons	101 tons	5 tons	7 tons	11 tons	11 tons

Industrial Waste - 413 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. These loads came from a variety of sources. Sludge and foundry sand constituted the largest waste. During the observation period the Lamar Landfill received 178 tons of foundry sand. This sand was not hazardous and was normally dumped to the side and spread over the normal waste as time permitted. Approximately 8 tons of a black carbon char was received and was handled similar to the foundry sand. Aluminum sludge (65 tons) was transported from the BFI Transfer Station in Springfield and mixed with the MSW. The remaining industrial waste was from smaller generators.

Total industrial waste received during the observation period was 413 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Sludge
15%	2%	0%	4%	5%	5%	5%	2%	61%
62 tons	10 tons	0 tons	18 tons	20 tons	19 tons	22 tons	9 tons	253 tons

Other Waste - 26 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. About 12 tons of asbestos was received and disposed of properly during the observation period.

Total Other waste received during the observation period was 26 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

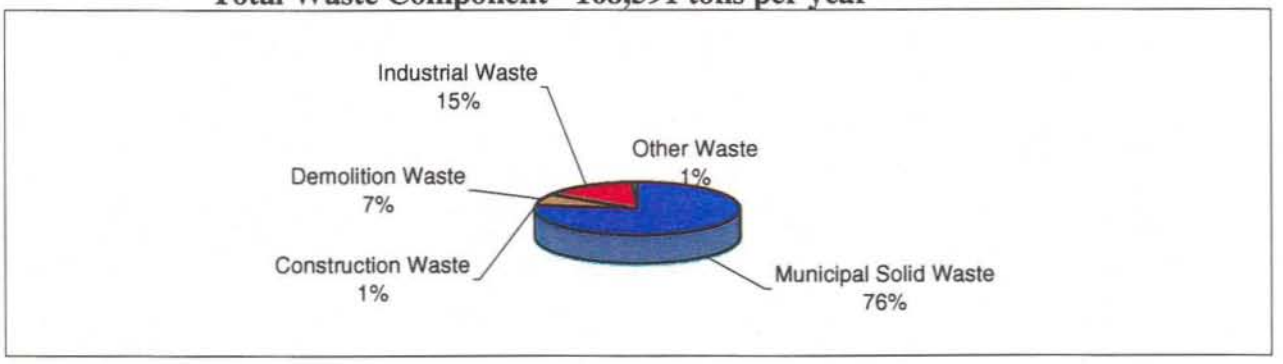
Bulky	Asbestos
54%	46%
14 tons	12 tons

LAMAR LANDFILL 168,591 TONS IN 1998

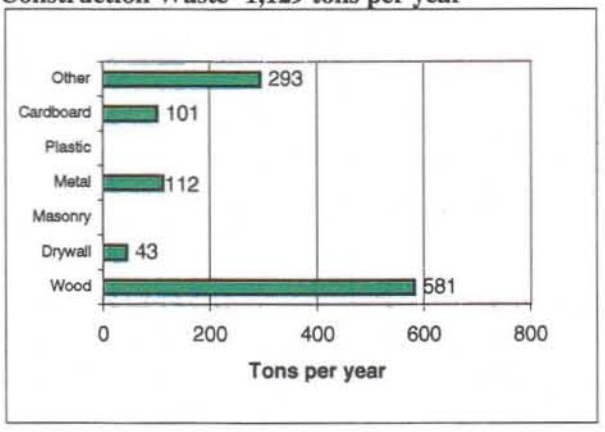
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	746 Tons	27.0%	45,467 Tons
Glass	104 Tons	3.8%	6,339 Tons
Metals	151 Tons	5.5%	9,203 Tons
Plastics	329 Tons	11.9%	20,052 Tons
Organics	701 Tons	25.3%	42,725 Tons
Inorganics	91 Tons	3.3%	5,565 Tons
TOTAL MSW	2122 Tons	76.7%	129,351 Tons
Construction Waste			
Wood	10 Tons	0.3%	581 Tons
Dry Wall	1 Tons	0.0%	43 Tons
Masonry	0 Tons	0.0%	- Tons
Metal	2 Tons	0.1%	112 Tons
Plastic	0 Tons	0.0%	- Tons
Cardboard	2 Tons	0.1%	101 Tons
Other	5 Tons	0.2%	293 Tons
TOTAL CONSTRUCTION	19 Tons	0.7%	1,129 Tons
Demolition Waste			
Wood	46 Tons	1.7%	2,798 Tons
Dry Wall	4 Tons	0.1%	222 Tons
Roofing	101 Tons	3.7%	6,156 Tons
Masonry	5 Tons	0.2%	282 Tons
Metal	7 Tons	0.2%	410 Tons
Carpet	15 Tons	0.5%	890 Tons
Other	11 Tons	0.4%	646 Tons
TOTAL DEMOLITION	187 Tons	6.8%	11,403 Tons
Industrial Waste			
Cardboard	62 Tons	2.3%	3,797 Tons
Paper	10 Tons	0.4%	616 Tons
Food	0 Tons	0.0%	- Tons
Metal	18 Tons	0.6%	1,085 Tons
Wood	20 Tons	0.7%	1,207 Tons
Plastic	19 Tons	0.7%	1,128 Tons
Textiles	22 Tons	0.8%	1,359 Tons
Rubber	9 Tons	0.3%	524 Tons
Other	253 Tons	9.2%	15,432 Tons
TOTAL INDUSTRIAL	413 Tons	14.9%	25,147 Tons
Other Waste			
Bulky Items	14 Tons	0.5%	823 Tons
Soil and Inert Materials	0 Tons	0.0%	- Tons
Asbestos	12 Tons	0.4%	737 Tons
Other	0 Tons	0.0%	- Tons
TOTAL OTHER WASTE	26 Tons	0.9%	1,560 Tons
TOTAL WASTE STREAM	2766 Tons	100%	168,591 Tons

The Lamar Landfill

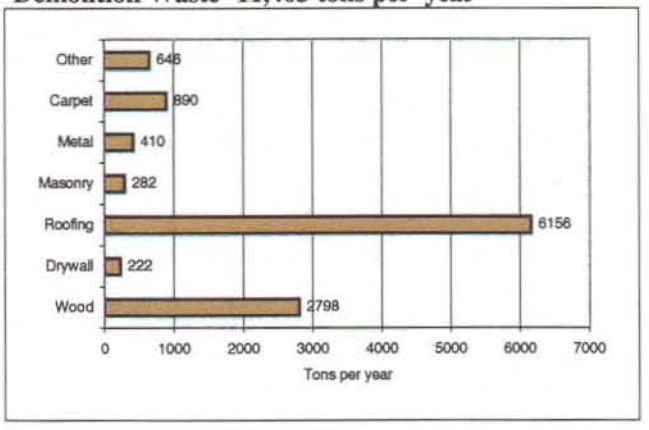
Total Waste Component - 168,591 tons per year



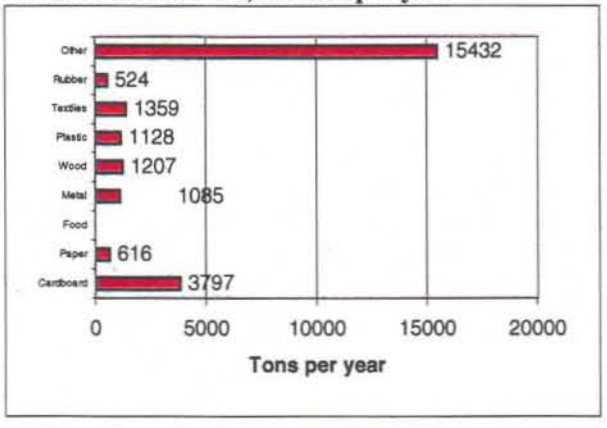
Construction Waste -1,129 tons per year



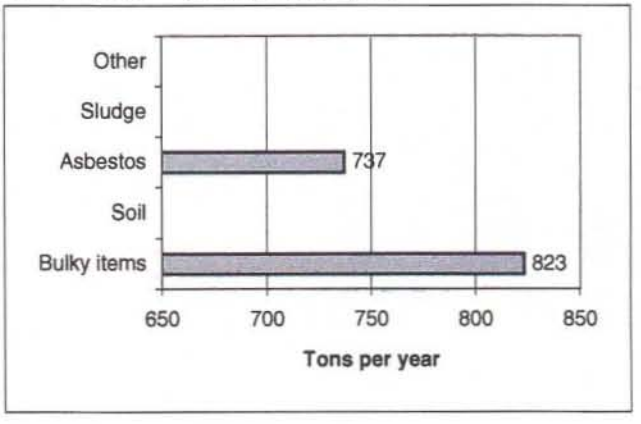
Demolition Waste -11,403 tons per year



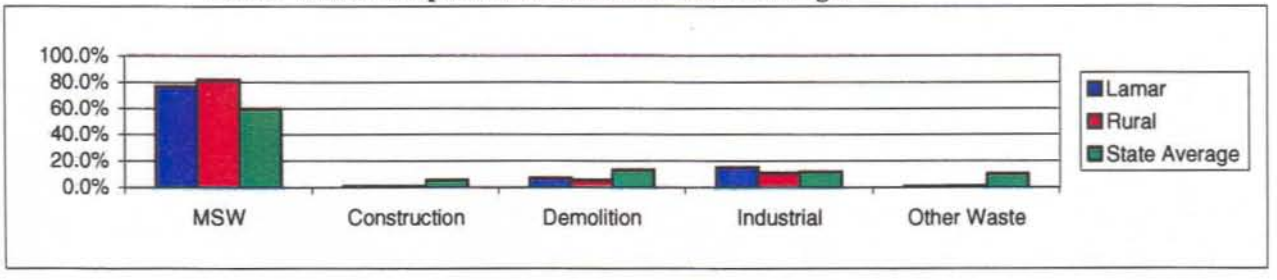
Industrial Waste - 25,147 tons per year



Other Waste - 1,560 tons per year



Lamar Waste Components vs Rural and State Averages



Lemons Landfill

The Lemons Landfill is located in Stoddard County, MO., approximately 3 miles north of Dexter. It is owned and operated by Allied Waste Industries Inc. The disposal facility covers 75 acres and is permitted to accept all municipal solid waste (MSW) and some Other wastes such as contaminated soils and waste water treatment sludge and paper waste dust.

The Lemons Landfill accepted 157,594 tons in 1996, 182,885 tons in 1997 196,092 tons in 1998. The landfill operation was observed from Monday January 25th through Friday January 29th, 1999. The weather was fair but cold the entire week. Observation took place from 7 AM till 4:00 PM on the above dates. During the observation period, 257 trucks, delivered 3,000 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Most drivers were asked where the loads originated. This was done to determine in what classification (MSW, construction, demolition, industrial, or other) the load should be recorded. However, most loads could be classified visually, without any driver data.

The Lemons Landfill accepts waste from three transfer stations. The Pemiscot County transfer station near Hayti, MO., the Jackson transfer station in Jackson MO., and the City of Cape Girardeau transfer station in Cape Girardeau, MO. These three sources represented 36% (93 trailers and roll-offs) of the traffic and 59% of the total waste. There were some demolition materials observed and recorded in these transfer loads but the overwhelming majority of the transfer station waste was MSW.

The Total Waste Stream - 3,000 tons

The total waste stream was predominately Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in transfer trailers and local packer trucks. Total waste received during the observation period was 3,000 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
71.1%	0.4%	7.3%	20.8%	0.5%
2132 tons	11 tons	220 tons	623 tons	15 tons

Municipal Solid Waste - 2,132 tons

Municipal Solid Waste (MSW) accounted for 71% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally

contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste*.

The total MSW received during the observation period was 2132 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.8%	6.9%	14.4%	30.8%	4.8%
795 tons	124 tons	147 tons	307 tons	657 tons	102 tons

Construction Waste - 11 tons

Only about 0.4% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The area served by the landfill is not a fast growing area and open burning is permitted in most municipalities and all counties. Both of these factors may have contributed to the low amount of construction waste. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall).

Total construction waste received during the observation period was 10.9 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardboard	Other
60%	40%	0%	0%	0%	0%	0%
6.5tons	4.4 tons	0 tons	0 tons	0 tons	0 tons	0 tons

Demolition Waste - 220 tons

About 7.3% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 220 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
40%	8%	28%	17%	2%	5%	0%
88 tons	17 tons	62 tons	36 tons	5 tons	11 tons	1 tons

Industrial Waste - 623 tons

Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. There were two main industrial generators. Proctor and Gamble had 134 tons (21.5% of the industrial component), mostly disposable diaper scraps, and Norranda Aluminum delivered 200 tons (32% of the industrial component) of aluminum ore dust from their smelting process. The paper materials were primarily from Proctor and Gamble, the food materials were from Tyson (dead birds), wood materials were mostly sawdust and small pieces of particle board, plastic materials were from Proctor and Gamble, and the materials in the "other" category listed below were primarily aluminum dust and a sludge product from a plastics manufacturer.

Total industrial waste received during the observation period was 623 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
6%	17%	4%	0%	11%	12%	4%	3%	42%
38 tons	109 tons	27 tons	2 tons	71 tons	73 tons	22 tons	18 tons	263 tons

Other Waste - 15 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc. Most of these bulky items were received from the transfer stations and estimated as a percent of those loads.

Total Other waste received during the observation period was 15 tons. The materials within the Other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

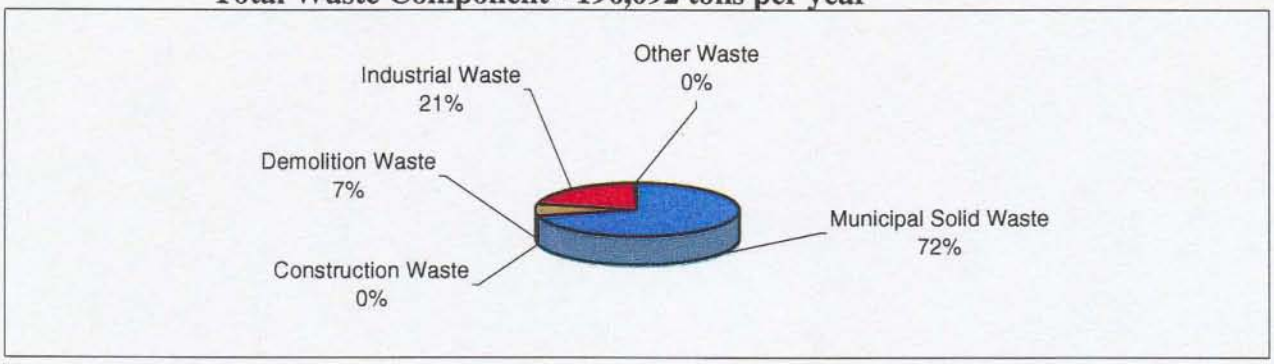
Bulky Items
100%
15 tons

LEMONS LANDFILL 196,092 TONS IN 1998

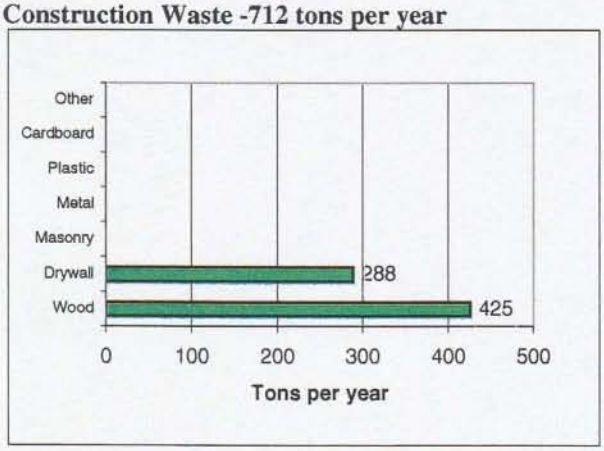
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	795 Tons	26.5%	51,961 Tons
Glass	124 Tons	4.1%	8,105 Tons
Metals	147 Tons	4.9%	9,608 Tons
Plastics	307 Tons	10.2%	20,065 Tons
Organics	657 Tons	21.9%	42,941 Tons
Inorganics	102 Tons	3.4%	6,667 Tons
TOTAL MSW	2132 Tons	71.1%	139,347 Tons
Construction Waste			
Wood	7 Tons	0.2%	425 Tons
Dry Wall	4 Tons	0.1%	288 Tons
Masonry	0 Tons	0.0%	- Tons
Metal	0 Tons	0.0%	- Tons
Plastic	0 Tons	0.0%	- Tons
Cardboard	0 Tons	0.0%	- Tons
Other	0 Tons	0.0%	- Tons
TOTAL CONSTRUCTION	11 Tons	0.4%	712 Tons
Demolition Waste			
Wood	88 Tons	2.9%	5,752 Tons
Dry Wall	17 Tons	0.6%	1,111 Tons
Roofing	62 Tons	2.1%	4,052 Tons
Masonry	36 Tons	1.2%	2,353 Tons
Metal	5 Tons	0.1%	294 Tons
Carpet	11 Tons	0.4%	719 Tons
Other	1 Tons	0.0%	65 Tons
TOTAL DEMOLITION	220 Tons	7.3%	14,346 Tons
Industrial Waste			
Cardboard	37 Tons	1.2%	2,418 Tons
Paper	109 Tons	3.6%	7,124 Tons
Food	27 Tons	0.9%	1,765 Tons
Metal	2 Tons	0.1%	131 Tons
Wood	71 Tons	2.4%	4,641 Tons
Plastic	73 Tons	2.4%	4,771 Tons
Textiles	22 Tons	0.7%	1,438 Tons
Rubber	18 Tons	0.6%	1,176 Tons
Other	264 Tons	8.8%	17,255 Tons
TOTAL INDUSTRIAL	623 Tons	20.8%	40,719 Tons
Other Waste			
Bulky Items	15 Tons	0.5%	967 Tons
Soil and Inert Materials	Tons	0.0%	- Tons
Asbestos	Tons	0.0%	- Tons
Other	Tons	0.0%	- Tons
TOTAL OTHER WASTE	15 Tons	0.5%	967 Tons
TOTAL WASTE STREAM	3000 Tons	100%	196,092 Tons

The Lemons Landfill

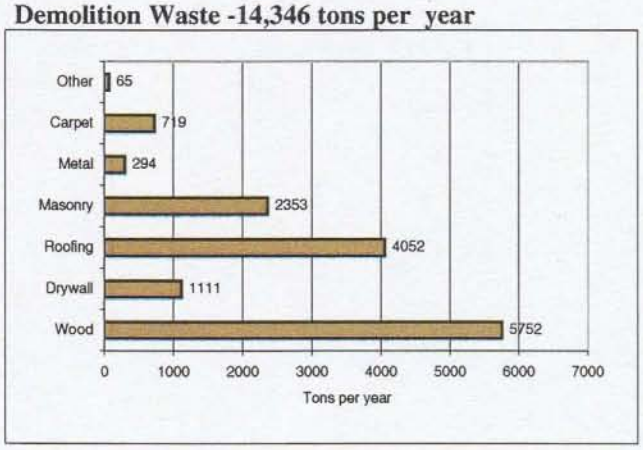
Total Waste Component - 196,092 tons per year



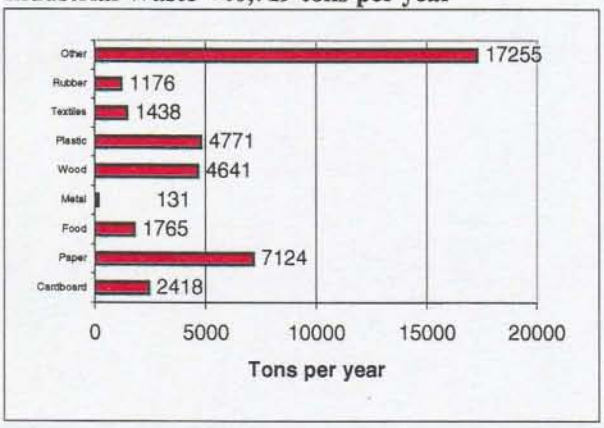
Construction Waste -712 tons per year



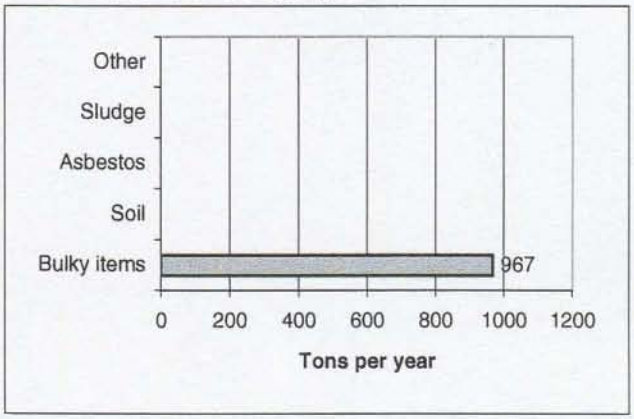
Demolition Waste -14,346 tons per year



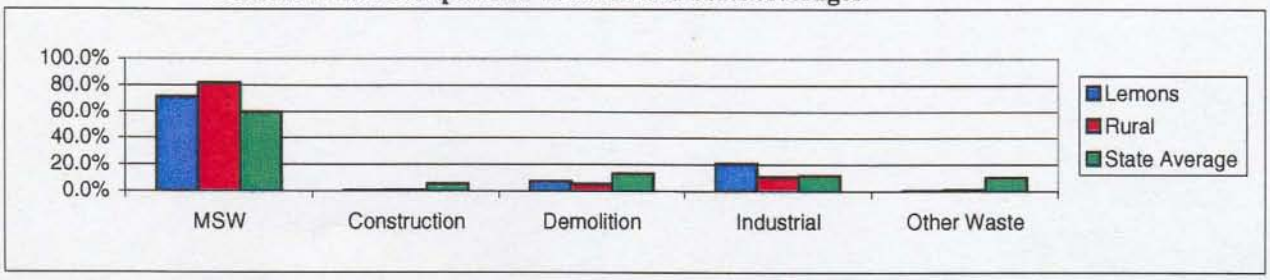
Industrial Waste - 40,719 tons per year



Other Waste - 967 tons per year



Lemons Waste Components vs Rural and State Averages



Maple Hill Landfill

The Maple Hill Landfill is located in Macon County, approximately 5 miles west of Macon, MO. It is owned and operated by Superior Waste Services Inc. The disposal facility is permitted to accept all municipal solid waste (MSW) and some Other wastes such as asbestos, contaminated soils and waste water treatment sludge.

The Maple Hill Landfill accepted 48,274 tons in 1996, 60,331 tons in 1997 and 114,982 tons in 1998. The landfill operation was observed from Monday April 26th through Thursday April 29th, 1999. The weather was cool and rainy for the first three days and was fair on Thursday. Observation took place from 7 AM till 4:30 PM on the above dates. The composition of the waste was predictable and therefore the observation period was shortened from five days down to four days . During the four-day observation period 221 trucks, delivered 1,757 tons of waste to the landfill. The landfill staff felt the material received during the observation period was typical of material received year round. They occasionally receive small quantities of asbestos and contaminated soil but those quantities are statistically nil and during sunnier weather there is usually more construction and demolition waste.

All loads could be classified visually, Drivers were asked about the generation point for industrial loads in order to better estimate material types.

The Total Waste Stream - 1,757 tons

The total waste stream was primarily Municipal Solid Waste (MSW). The source of the MSW portion is primarily residential, institutional, and light commercial waste. The MSW was delivered to the landfill in trailers from company owned transfer stations and local packer trucks. Total waste received during the observation period was 1,757 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
77.8%	0.8%	8.3%	10.8%	2.3%
1367 tons	14 tons	146 tons	189 tons	41 tons

Municipal Solid Waste - 1,367 Tons

Municipal Solid Waste (MSW) accounted for 78% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. The Maple Hill Landfill was one of those 19 sites. During the two waste sorts at this facility, 24 samples weighing an average of 241

pounds each were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 1,367 tons. The average percentage of each major material category found in the 1996-97 waste sorts at Maple Hill was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.2%	6.9%	15.1%	32.4%	3.1%
511 tons	71 tons	94 tons	206 tons	443 tons	42 tons

Construction Waste - 14 Tons

Only about 0.8% of the total waste received was from new construction sources. Construction waste loads are typically transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Only five roll-off trucks delivered construction waste during the observation period and they were all relatively light loads.

Total construction waste received during the observation period was 14 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardbrd	Other
44%	15%	10%	6%	13%	8%	5%
6 tons	2 tons	1 ton	1 ton	2 tons	1 ton	1 ton

Demolition Waste - 146 Tons

About 8% of the total waste was from demolition sources. Demolition waste loads are usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Four roofing waste loads were delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The other category was primarily wet insulation from the local power plant.

Total demolition waste received during the observation period was 146 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
51%	11%	18%	3%	6%	4%	7%
75 tons	16 tons	27 tons	4 tons	8 ton	6 tons	10 tons

Industrial Waste - 189 Tons

About 11% of the total waste was from industrial sources. Food and plastic wastes were significant. Food came from a processing plant in Tenton and the Con Agra plant in Macon. Plastics came from several small manufacturers in the area. Rubber was in the form of a fluffy type material and came from the tire processor in Macon. The "other" material was primarily a sludge type of material generated by a wire manufacturer.

Total industrial waste received during the observation period was 189 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
9%	2%	27%	5%	7%	27%	4%	10%	10%
16 tons	4 tons	50 tons	10 tons	13 tons	51 tons	7 tons	19 tons	19 tons

Other Waste - 41 Tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items accounted for a little over half of the other waste. Bulky items include furniture, mattresses, appliances, bicycles, etc. Most of these bulky items were received in transfer trailers. Organic matter (hay and manure) from a local meat processing plant accounted for the rest.

Total other waste received during the observation period was 41 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

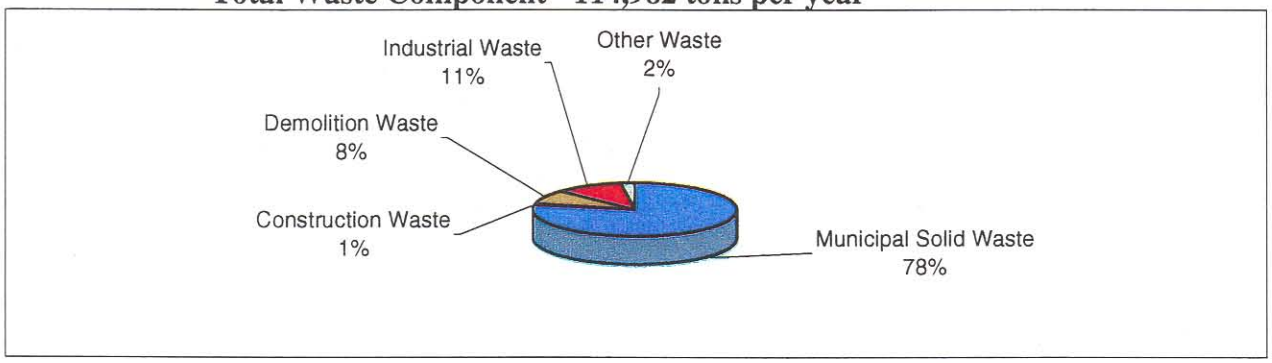
Bulky Items	Organic Material
52%	48%
21 tons	20 tons

MAPLE HILL LANDFILL 114,982 TONS IN 1998

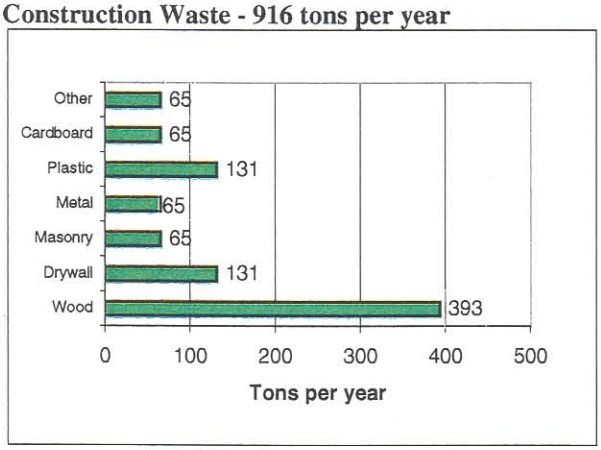
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	511 Tons	29.1%	33,441 Tons
Glass	71 Tons	4.0%	4,646 Tons
Metals	94 Tons	5.4%	6,152 Tons
Plastics	206 Tons	11.7%	13,481 Tons
Organics	443 Tons	25.2%	28,991 Tons
Inorganics	42 Tons	2.4%	2,749 Tons
TOTAL MSW	1367 Tons	77.8%	89,460 Tons
Construction Waste			
Wood	6 Tons	0.3%	393 Tons
Dry Wall	2 Tons	0.1%	131 Tons
Masonry	1 Tons	0.1%	65 Tons
Metal	1 Tons	0.1%	65 Tons
Plastic	2 Tons	0.1%	131 Tons
Cardboard	1 Tons	0.1%	65 Tons
Other	1 Tons	0.1%	65 Tons
TOTAL CONSTRUCTION	14 Tons	0.8%	916 Tons
Demolition Waste			
Wood	75 Tons	4.3%	4,908 Tons
Dry Wall	16 Tons	0.9%	1,047 Tons
Roofing	27 Tons	1.5%	1,767 Tons
Masonry	4 Tons	0.2%	262 Tons
Metal	8 Tons	0.5%	524 Tons
Carpet	6 Tons	0.3%	393 Tons
Other	10 Tons	0.6%	654 Tons
TOTAL DEMOLITION	146 Tons	8.3%	9,555 Tons
Industrial Waste			
Cardboard	16 Tons	0.9%	1,047 Tons
Paper	4 Tons	0.2%	262 Tons
Food	50 Tons	2.8%	3,272 Tons
Metal	10 Tons	0.6%	654 Tons
Wood	13 Tons	0.7%	851 Tons
Plastic	51 Tons	2.9%	3,338 Tons
Textiles	7 Tons	0.4%	458 Tons
Rubber	19 Tons	1.1%	1,243 Tons
Other	19 Tons	1.1%	1,243 Tons
TOTAL INDUSTRIAL	189 Tons	10.8%	12,369 Tons
Other Wastes			
Bulky Items	21 Tons	1.2%	1,374 Tons
Soil and Inert Materials	0 Tons	0.0%	- Tons
Asbestos	0 Tons	0.0%	- Tons
Organic material	20 Tons	1.1%	1,309 Tons
TOTAL OTHER WASTE	41 Tons	2.3%	2,683 Tons
TOTAL WASTE STREAM	1757 Tons	100%	114,982 Tons

The Maple Hill Landfill

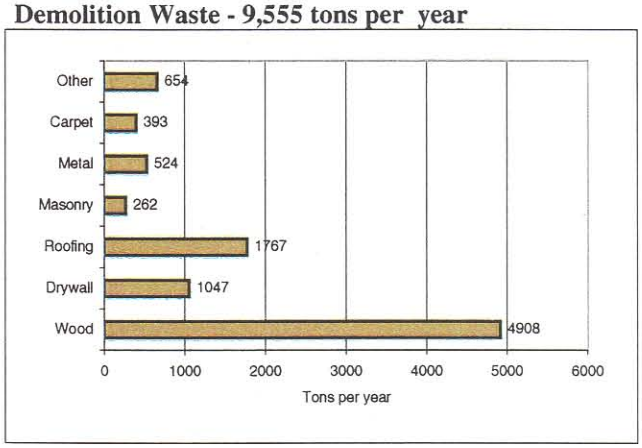
Total Waste Component - 114,982 tons per year



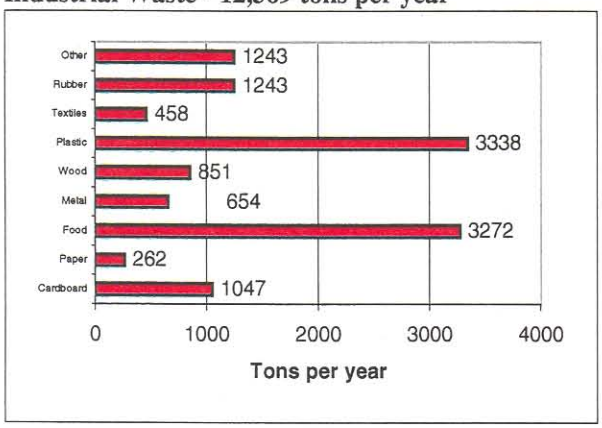
Construction Waste - 916 tons per year



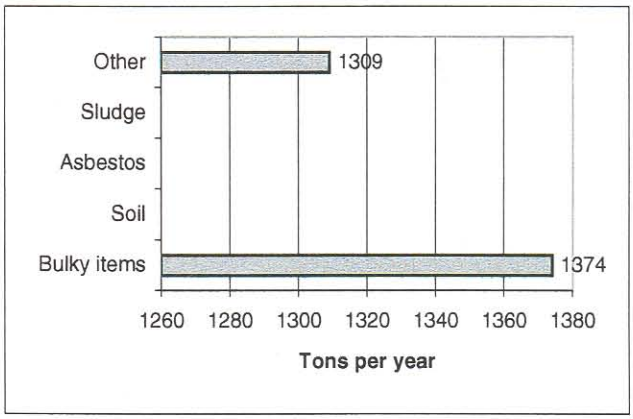
Demolition Waste - 9,555 tons per year



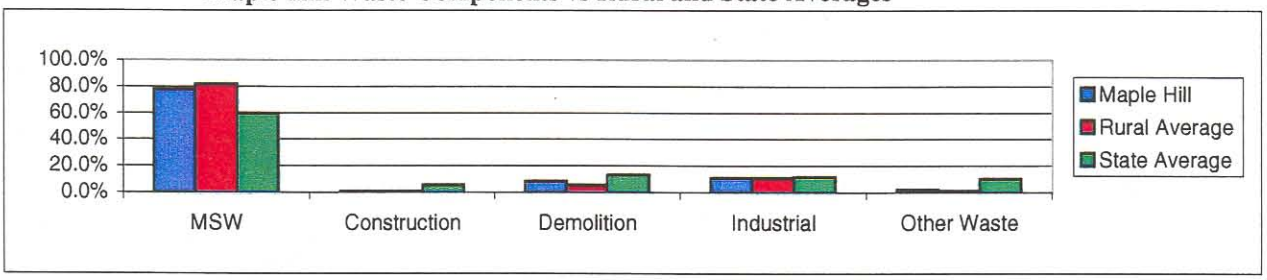
Industrial Waste - 12,369 tons per year



Other Waste - 2.683 tons per year



Maple Hill Waste Components vs Rural and State Averages



Oak Ridge Landfill

The Oak Ridge Landfill Inc. is located in West St. Louis County, MO., approximately 25 miles west of St. Louis, MO. It is owned and operated by Superior Waste Services Inc. An upscale residential community now surrounds the landfill, which originally was in a very sparsely populated portion of St. Louis County. The disposal facility is permitted to accept all municipal solid waste (MSW) and some other wastes such as contaminated soils, asbestos, and wastewater treatment sludge.

The Oak Ridge Landfill accepted 179,686 tons in 1996, 193,403 tons in 1997 and 262,365 tons in 1998. The landfill operation was observed from Monday November 16^{h} through Friday November 20th . The weather was sunny and fair during the entire week. Observation took place from 7 AM till 4:30 PM on the above dates. During the observation period, 720 trucks, delivered 6172 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Because the traffic was high, each driver was not asked where the load originated. This would have been helpful to determine where the load originated and how it should be recorded. Nevertheless, all loads could be classified visually, without any driver data.

The Superior Oak Hill Landfill accepts waste from St. Louis, St. Charles, and Jefferson counties. The nearest Missouri sanitary landfills are the Fred Weber Landfill and the Bridgeton Landfill, both in St. Louis County. The Peerless Construction and Demolition Landfill is within 5 miles. There were very few self-hauls. Most traffic was commercial. The City of St. Peters Transfer Station delivered their waste to the landfill.

The Total Waste Stream - 6152 tons

The total waste stream was predominantly Municipal Solid Waste (MSW). The source of the MSW was primarily residential, institutional, and light commercial waste. The amount of construction and demolition waste was almost identical. This is in contrast with many of the other landfills that receive two to five times more demolition than construction waste. The area around the landfill is growing rapidly and most construction is new rather than renovation or demolition. The industrial component was relatively low due to the lack of industrial activity in the West St. Louis County area. Other waste (contaminated soil) was surprisingly high.
Total waste received during the observation period was 6152 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
55%	6%	6%	8%	25%
3381 tons	358 tons	365 tons	515 tons	1533 tons

Municipal Solid Waste – 3381 Tons

Municipal Solid Waste (MSW) accounted for only 25% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 3381 tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.8%	6.9%	14.4%	30.8%	4.8%
1,261 tons	196 tons	233 tons	487 tons	1,042 tons	162 tons

Construction Waste - 358 tons

About 6% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 368 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardbrd	Other
36%	22%	31%	1%	2%	4%	4%
131 tons	80 tons	109 tons	3 tons	9 tons	13 tons	14 tons

Demolition Waste - 365 tons

About 6% of the total waste was from demolition sources. According to drivers, much of the heavier demolition waste such as roofing shingles are taken to the Peerless C&D landfill where the tipping fee is less and the loads are charged by volume instead of weight. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The wood was more weathered, there was very little if any cardboard, and there was

more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

Total demolition waste received during the observation period was 365 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
36%	2%	10%	36%	5%	6%	4%
132 tons	8 tons	38 tons	132 tons	19 tons	23 tons	13 tons

Industrial Waste - 515 tons

About 8% of the total waste stream was from industrial sources. Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. These loads came from a variety of sources. The other material was foundry sand.

Total industrial waste received during the observation period was 515 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
17%	15%	6%	1%	8%	14%	0%	1%	39%
88 tons	75 tons	33 tons	6 tons	41 tons	70 tons	0 tons	4 tons	199 tons

Other Waste - 1533 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. Most of the other waste was contaminated soil. The contaminated soil came from several remediation projects in St. Louis and Washington Counties. Both the Contaminated soil and the foundry sand was unloaded next to the landfill face and used for daily cover. No asbestos was received at the landfill during the observation period.

Total other waste received during the observation period was 571 tons. The materials within the other waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Other Waste Component

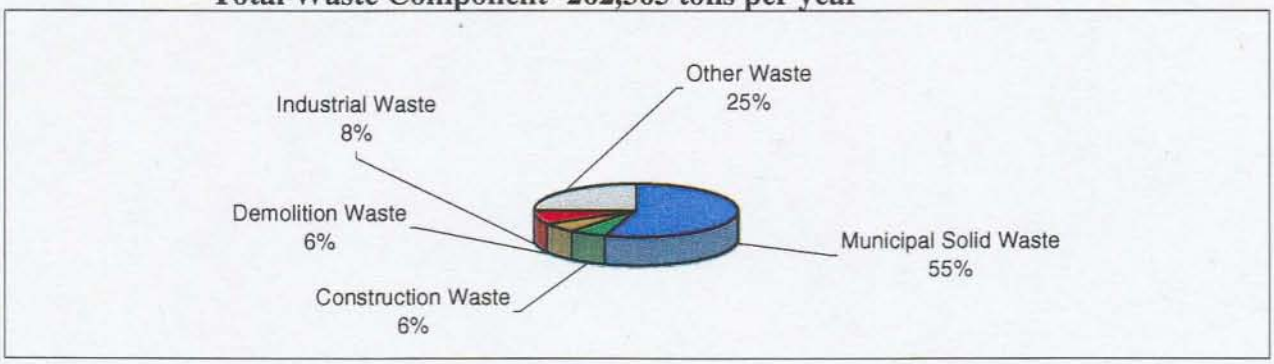
Bulky	Contaminated Soil
2%	88%
31 tons	1502 tons

OAK RIDGE LANDFILL 262,365 TONS IN 1998

MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	1261 Tons	20.5%	53,778 Tons
Glass	196 Tons	3.2%	8,359 Tons
Metals	233 Tons	3.8%	9,937 Tons
Plastics	487 Tons	7.9%	20,769 Tons
Organics	1042 Tons	16.9%	44,438 Tons
Inorganics	162 Tons	2.6%	6,909 Tons
TOTAL MSW	3381 Tons	55.0%	144,190 Tons
Construction Waste			
Wood	131 Tons	2.1%	5,587 Tons
Dry Wall	80 Tons	1.3%	3,390 Tons
Masonry	109 Tons	1.8%	4,649 Tons
Metal	3 Tons	0.0%	128 Tons
Plastic	9 Tons	0.1%	367 Tons
Cardboard	13 Tons	0.2%	567 Tons
Other	14 Tons	0.2%	580 Tons
TOTAL CONSTRUCTION	358 Tons	5.8%	15,268 Tons
Demolition Waste			
Wood	132 Tons	2.1%	5,629 Tons
Dry Wall	8 Tons	0.1%	337 Tons
Roofing	38 Tons	0.6%	1,608 Tons
Masonry	132 Tons	2.1%	5,629 Tons
Metal	19 Tons	0.3%	798 Tons
Carpet	23 Tons	0.4%	972 Tons
Other	13 Tons	0.2%	571 Tons
TOTAL DEMOLITION	365 Tons	5.9%	15,545 Tons
Industrial Waste			
Cardboard	88 Tons	1.4%	3,761 Tons
Paper	75 Tons	1.2%	3,190 Tons
Food	33 Tons	0.5%	1,395 Tons
Metal	6 Tons	0.1%	247 Tons
Wood	41 Tons	0.7%	1,753 Tons
Plastic	70 Tons	1.1%	2,981 Tons
Textiles	0 Tons	0.0%	- Tons
Rubber	4 Tons	0.1%	158 Tons
Other	199 Tons	3.2%	8,487 Tons
TOTAL INDUSTRIAL	515 Tons	8.4%	21,972 Tons
Other Waste			
Bulky Items	31 Tons	0.5%	1,335 Tons
Soil and Inert Materials	1502 Tons	24.4%	64,056 Tons
Asbestos	0 Tons	0.0%	- Tons
Other	0 Tons	0.0%	- Tons
TOTAL OTHER WASTE	1533 Tons	24.9%	65,391 Tons
TOTAL WASTE STREAM	6152 Tons	100%	262,365 Tons

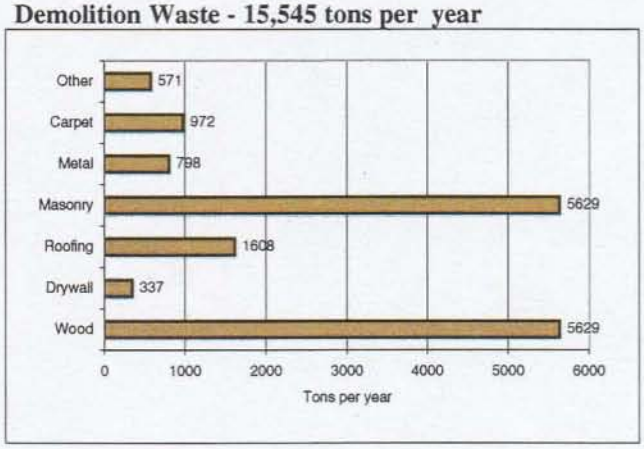
The Oak Ridge Landfill

Total Waste Component -262,365 tons per year

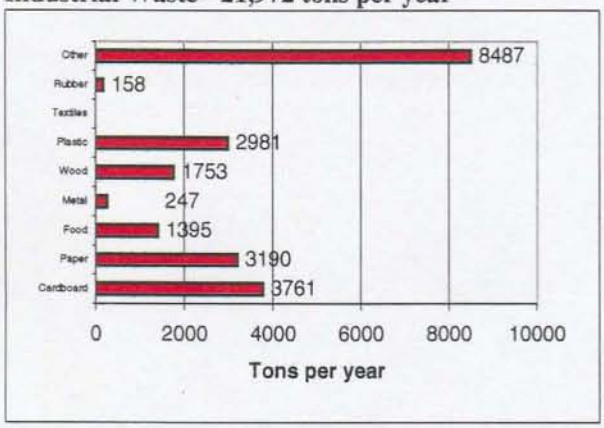


Construction Waste - 15,268 tons per year

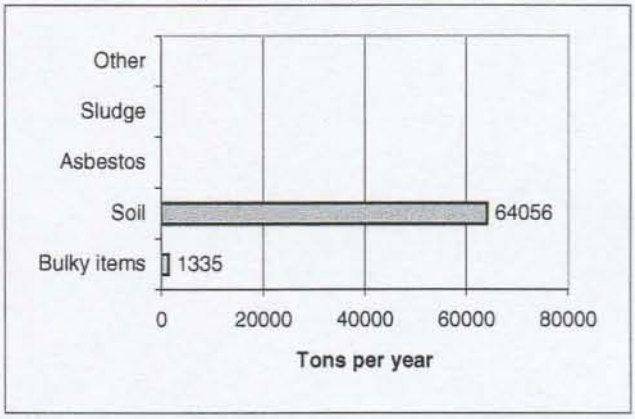
Demolition Waste - 15,545 tons per year



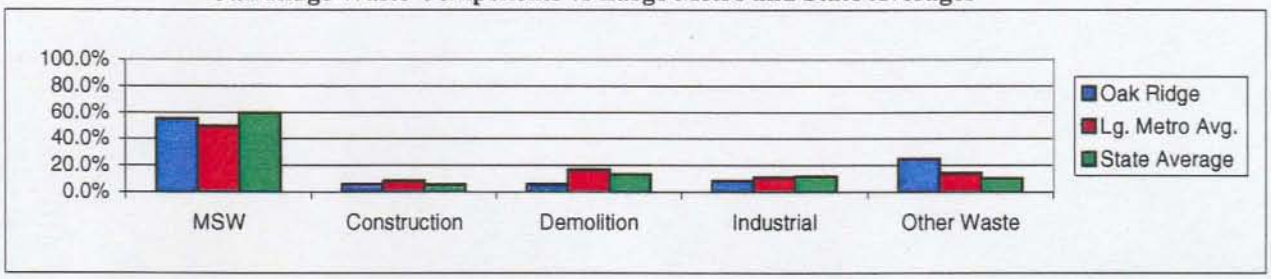
Industrial Waste - 21,972 tons per year



Other Waste -65,391 tons per year



Oak Ridge Waste Components vs Large Metro and State Averages



Peerless C&D Landfill

The Peerless C&D Landfill is located in Peerless Park , MO., which is part of the St. Louis metropolitan area. It is owned and operated by The George and Dale Behnen. The disposal facility is permitted to accept only construction, demolition, and inert industrial materials. The landfill is situated adjacent to Interstate 44 in an industrial area.

The Peerless Landfill accepted 146,660 tons in 1996, 149,426 tons in 1997 146,249 tons in 1998. The facility does not have a scale, therefore all incoming loads are estimated by volume and converted to tonnage using a 3:1 ratio of cubic yards to the ton.

The Peerless Landfill operation was the only landfill that was observed twice. Since there are only two large C&D landfills in the state, data was needed from both seasons in order to properly project annual composition. The first observation period was on Monday September 28th 1998 through Friday October 2nd 1998. Observation took place from 7 AM till 4:30 PM on the above dates. The second observation period was on Monday March 15th , 1999 through March 19th, 1999.
During the first observation period, 423 trucks, with loads approximating 8098 cubic yards, unloaded waste. Using a 3:1 volume to weight ratio, approximately 2700 tons of waste was observed. During the second observation period 354 trucks unloaded 7965 cubic yards of waste weighing approximately 2655 tons. A Total of 777 trucks were observed delivering about 5337 tons of waste to the Peerless Landfill

Virtually all of the trucks delivered waste in open top roll-off containers or dump trucks. Nearly one half of the trucks were from Behnen Container Services (BCS). Smaller hauling companies or independent contractors operated the remainder of the trucks.

During the first observation period each driver was asked where the load originated. This was done to determine in what classification (construction, demolition, or industrial) the load should be recorded. During the second observation period most loads could be classified without any driver data.

The Total Waste Stream - 5337 tons

The Peerless C&D Landfill is not permitted to accept Municipal Solid Waste (MSW), The construction, demolition and Industrial waste stream components were delivered to the landfill in dump trucks, roll-off containers, and small pick-ups and trailers.

Total waste received during the observation period was 5337 tons. The components of the waste stream were estimated as they were unloaded. The results of both observation periods are shown to illustrate the differences and similarities between fall and spring waste flows. These components are listed on the next page.

Waste Stream Components - 5,337 tons (16,030 Cubic yards)

Date	MSW	Const.	Demo	Industrial	Other
9/28 - 10/2	0%	32%	60%	8%	0%
Cu. yds.	0	2553	4828	664	0
Tons (3:1)	0	851	1609	221	0
3/15 - 3/19	0%	43%	53%	4%	0%
Cu. yds.	0	3424	4239	302	0
Tons (3:1)	0	1141	1413	101	0
Average %	**0%**	**37%**	**57%**	**6%**	**0%**
Total Cu. yds.	**0**	**5977**	**9067**	**966**	**0**
Tons (3:1)	**0**	**1922**	**3022**	**322**	**0**

Construction Waste - 1,991 tons (5,973 Cubic yards)

About 37% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall). Masonry was defined as inorganic materials (bricks, concrete, etc.) which was part of a load with other materials that were classified as coming from new construction. Other materials were primarily insulation.

Total construction waste received during the observation period was 1,991 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Date	Wood	Dry Wall	Masonry	Metal	Plas.	OCC	Other
9/28-10/2	41%	21%	10%	1%	2%	8%	17%
Cu. yds	1033	538	266	22	58	212	424
Tons (3:1)	344	179	88	7	19	71	141
3/15 - 3/19	41%	19%	17%	0%	5%	9%	10%
Cu. yds.	1374	640	582	12	158	315	344
Tons (3:1)	458	213	194	4	53	105	115
Average %	41%	20%	14%	1%	4%	9%	13%
Cu. yds.	2407	1177	847	33	216	527	768
Tons (3:1)	802	392	282	11	72	176	256

Demolition Waste - 3,023 tons (9,069 Cubic yards)

About 57% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials.

Total demolition waste received during the observation period was 3,023 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Date	Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
9/28-10/2	20%	5%	34%	23%	1%	2%	15%
Cu. yds.	976	234	1615	1121	71	117	694
Tons (3:1)	325	78	538	374	24	39	231
3/15 - 3/19	28%	7%	33%	19%	3%	3%	7%
Cu. yds.	1180	306	1383	814	124	146	287
Tons (3:1)	393	102	461	271	41	49	96
Average	24%	6%	33%	21%	2%	3%	11%
Cu. yds.	2156	540	2998	1935	195	263	981
Tons (3:1)	719	180	999	645	65	88	327

Industrial Waste - 323 tons (969 Cubic yards)

About 6% of the total waste was from industrial sources. Processed tire waste from Tire Shredders Unlimited in High Ridge Missouri represented over half of the industrial waste.

Total industrial waste received during the observation period was 325 tons. The materials within the industrial waste component were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

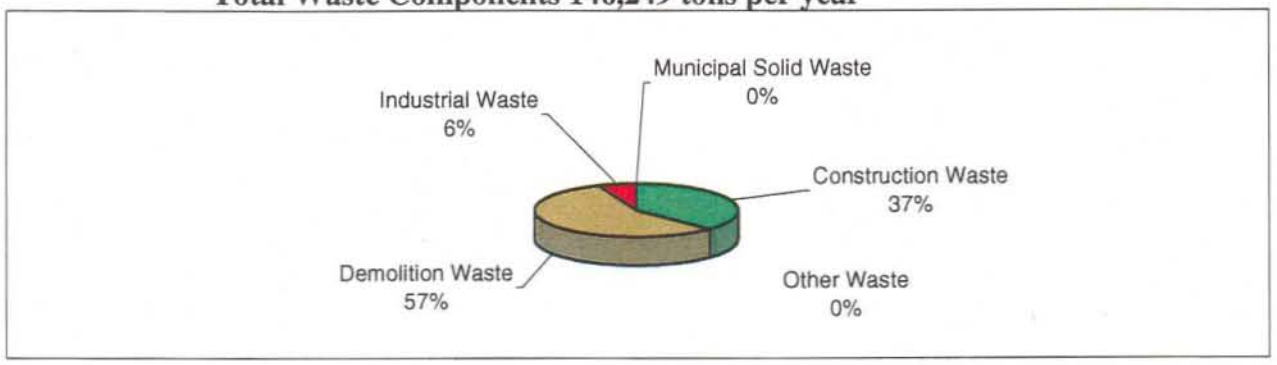
Date	Card	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
9/28-10/2	3%	7%	0%	3%	9%	16%	0%	53%	9%
Cu.yds.	18	44	0	217	61	104	0	354	62
Tons (3:1)	5.9	14.8	0	6.9	20.2	34.5	0	118	20.7
3/15 - 3/19	10%	10%	0%	11%	36%	10%	0%	13%	10%
Cu. yds.	29	30	0	33	110	30	0	40	30
Tons (3:1)	10	10	0	11	37	10	0	13	10
Average	5%	8%	0%	6%	18%	14%	0%	41%	10%
Cu. yds.	47	74	0	54	171	134	0%	394	92
Tons (3:1)	16	25	0	18	57	45	0	131	31

PEERLESS LANDFILL 146,249 TONS IN 1998

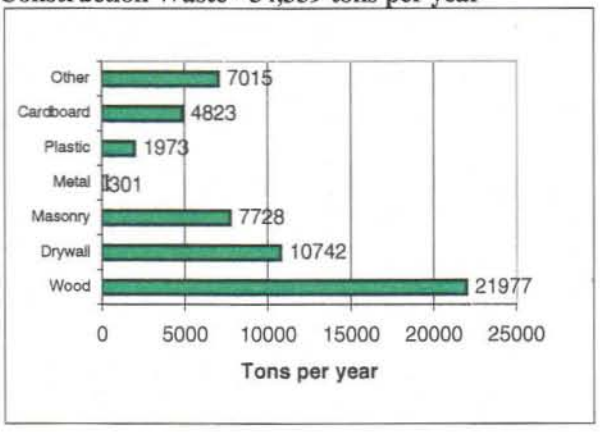
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	0 Tons	0.0%	- Tons
Glass	0 Tons	0.0%	- Tons
Metals	0 Tons	0.0%	- Tons
Plastics	0 Tons	0.0%	- Tons
Organics	0 Tons	0.0%	- Tons
Inorganics	0 Tons	0.0%	- Tons
TOTAL MSW	0 Tons	0.0%	- Tons
Construction Waste			
Wood	802 Tons	15.0%	21,977 Tons
Dry Wall	392 Tons	7.3%	10,742 Tons
Masonry	282 Tons	5.3%	7,728 Tons
Metal	11 Tons	0.2%	301 Tons
Plastic	72 Tons	1.3%	1,973 Tons
Cardboard	176 Tons	3.3%	4,823 Tons
Other	256 Tons	4.8%	7,015 Tons
TOTAL CONSTRUCTION	1991 Tons	37.3%	54,559 Tons
Demolition Waste			
Wood	719 Tons	13.5%	19,703 Tons
Dry Wall	180 Tons	3.4%	4,933 Tons
Roofing	999 Tons	18.7%	27,375 Tons
Masonry	645 Tons	12.1%	17,675 Tons
Metal	65 Tons	1.2%	1,781 Tons
Carpet	88 Tons	1.6%	2,411 Tons
Other	327 Tons	6.1%	8,961 Tons
TOTAL DEMOLITION	3023 Tons	56.6%	82,839 Tons
Industrial Waste			
Cardboard	16 Tons	0.3%	438 Tons
Paper	25 Tons	0.5%	685 Tons
Food	0 Tons	0.0%	- Tons
Metal	18 Tons	0.3%	493 Tons
Wood	57 Tons	1.1%	1,562 Tons
Plastic	45 Tons	0.8%	1,233 Tons
Textiles	0 Tons	0.0%	- Tons
Rubber	131 Tons	2.5%	3,590 Tons
Other	31 Tons	0.6%	849 Tons
TOTAL INDUSTRIAL	323 Tons	6.1%	8,851 Tons
Other Waste			
Bulky Items	0 Tons	0.0%	- Tons
Soil and Inert Materials	0 Tons	0.0%	- Tons
Asbestos	0 Tons	0.0%	- Tons
Other	0 Tons	0.0%	- Tons
TOTAL OTHER WASTE	0 Tons	0.0%	- Tons
TOTAL WASTE STREAM	5337 Tons	100%	146,249 Tons

The Peerless C&D Landfill

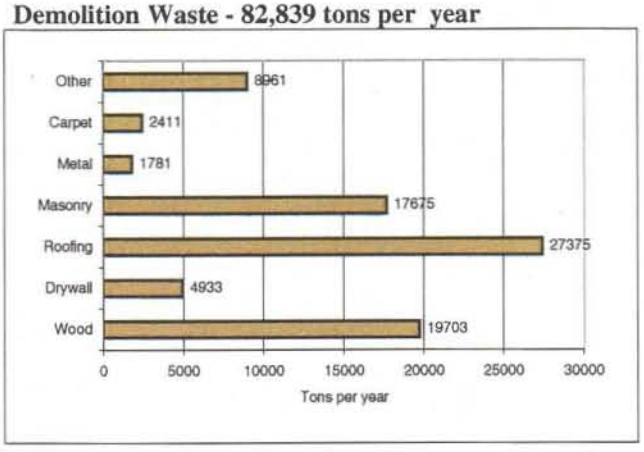
Total Waste Components 146,249 tons per year



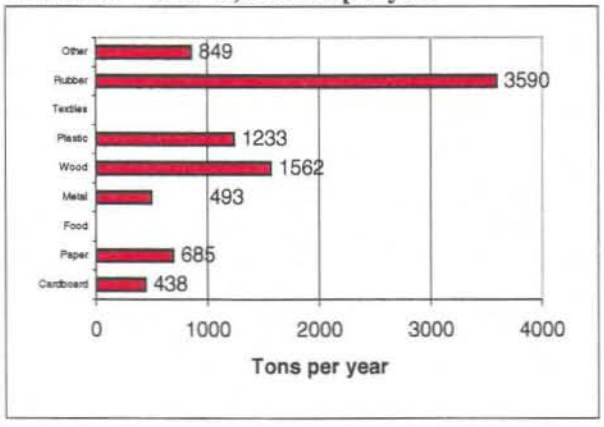
Construction Waste - 54,559 tons per year



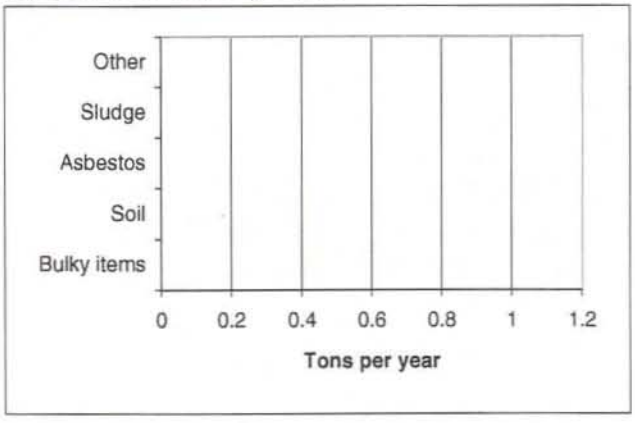
Demolition Waste - 82,839 tons per year



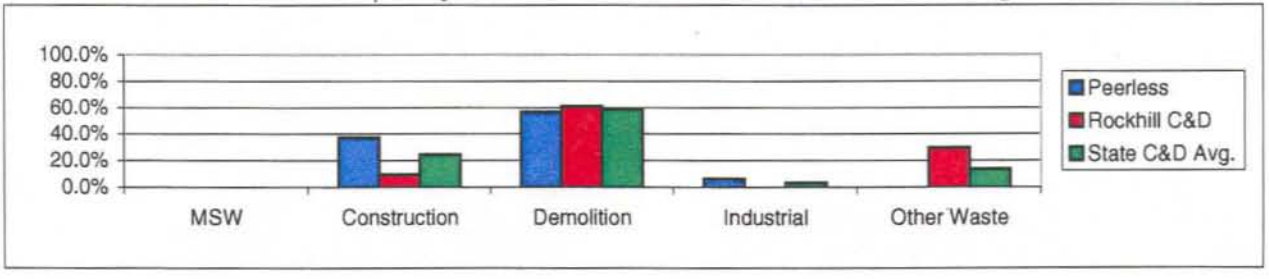
Industrial Waste - 8,851 tons per year



Other Waste - 0 tons per year



Peerless Waste Components vs RockHill C&D and State C&D Averages



Rock Hill C&D Landfill

The Rock Hill C&D Landfill is located in Rock Hill , MO., which is part of the St. Louis metropolitan area. It is owned and operated by The Rock Hills Quarry Company. The disposal facility is permitted to accept only construction and demolition materials. The landfill is situated in an old quarry and surrounded by residential neighborhoods. The landfill is operated in a very efficient manner and is certainly one of the cleanest landfills in the state.

The Rock Hill C&D Landfill accepted 315,630 cubic yards (105,210 tons) in 1996, 331,938 cubic yards (110,646) tons in 1997 and 371,547 cubic yards (123,849 tons) in 1998. The landfill operation was observed from Monday February 22nd through Thursday February 25th, 1999. The weather was snowy and cold on Tuesday but fair for the remainder of the week. Observation took place from 8 AM till 4 PM on the above dates. During the four-day period 420 trucks, delivering 5,093 cubic yards of waste to the landfill were observed. The Rock Hill C&D Landfill does not have a scale and therefore all waste was estimated in cubic yards. The landfill converts the yardage to tons using a 3:1 (yards to tons) ration when reporting tonnage figures to the Missouri Department of Natural Resources. The same 3:1 ration was used to convert cubic yards to tons in this report.

The landfill staff felt the material received during the observation period was typical of material received year round. All loads could be classified visually without interviewing drivers.

The Total Waste Stream - 1,697 tons (5,093 cubic yards)

The Rock Hill C&D Landfill is not permitted to accept Municipal Solid Waste (MSW), and by choice does not accept industrial waste. The construction, demolition and other waste stream components were delivered to the landfill in dump trucks, roll-off containers, and small pick-ups and trailers.

Total waste received during the observation period was 5,093 cubic yards (1,697 tons). The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

Construction	Demolition	Other
9.5%	61%	29.5%
482 cubic yards	3110 cubic yards	1501 cubic yards
161 tons	1036 tons	500 tons

Construction Waste - 161 tons (482 cubic yards)

About 9.5% of the total waste received was from new construction sources. Construction waste loads were transported to the landfill in open top roll-off containers, dump trucks, or open trailers.. The construction loads tended to be lighter, less weathered, and more homogeneous (all wood and dry wall). Masonry was defined as inorganic materials (bricks, concrete, etc.) which was part of a load with other materials that were classified as coming from new construction. Other materials were primarily insulation.

Total construction waste received during the observation period was 482 cubic yards (161 tons). The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardboard	Other
51%	24%	4%	0%	4%	12%	5%
245 yds.	115 yds.	20 yds.	0 yds.	18 yds.	58 yds.	26
82 tons	38 tons	7 tons	0 tons	6 tons	19 tons	9 tons

Demolition Waste - 1,036 tons (3,108 cubic yards)

About 61% of the total waste was from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. Roofing waste was typically delivered to the landfill by independent contractors and was not mixed with other materials. The remaining demolition loads contained more mixed materials. The wood was more weathered and broken up, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste.

The masonry materials were difficult to classify. Several trucks delivered dirt to the landfill during the observation period. Some of that dirt was unloaded away from the landfill face and used as daily cover. This dirt was classified as other waste and is listed in a separate area. Some trucks delivering contained dirt, asphalt, bricks, and rocks within their loads. These loads were dumped near the landfill face and mixed immediately with the other waste. The landfill personnel made the choices on where the dirt was unloaded.

Total demolition waste received during the observation period was 3,110 cubic yards (1036 tons). The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
40%	2%	13%	41%	3%	1%	0%
1239 yds.	68 yds.	411 yds.	1273 yds.	91 yds.	22 yds.	6 yds.
413 tons	23 tons	137 tons	424 tons	30 tons	7 tons	2 tons

Other Waste - 500 tons (1501 cubic yards)

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). The only materials which fit into this category was the clean dirt that was received and stockpiled for daily cover as explained earlier. The Rock Hill Landfill does not have an internal source for daily cover and therefore relies on clean soil received from contractors for that purpose. No contaminated soil was received.

Total Other waste received during the observation period was 1501 cubic yards (500 tons). The materials within the other waste stream were estimated, as they were unloaded. These estimated materials are listed below.

The Other Waste Component

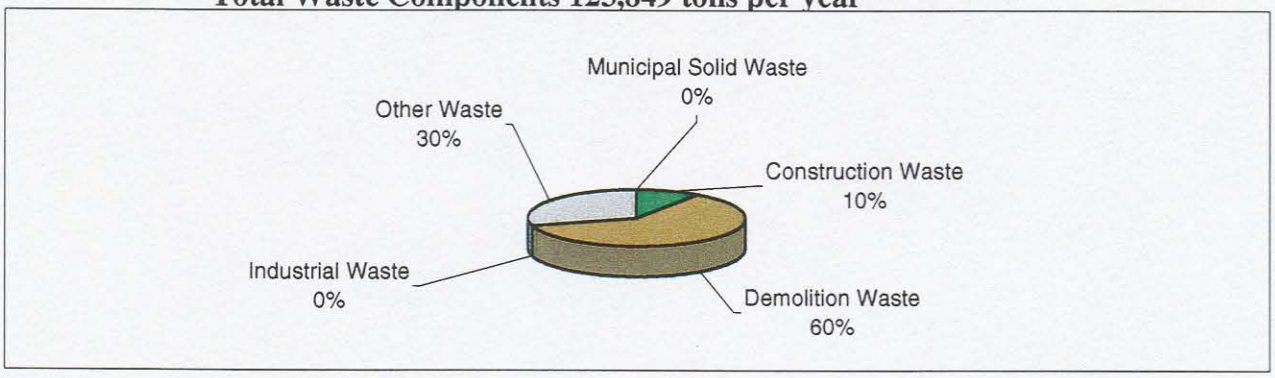
Soil used for daily cover
1501 cubic yards
500 tons

ROCKHILL LANDFILL 123,849 TONS IN 1998

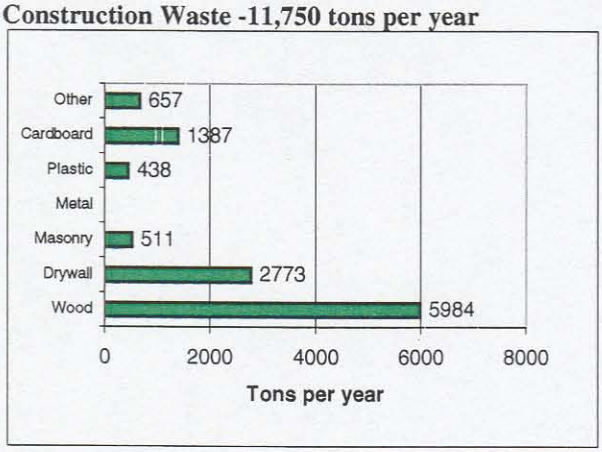
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation	
MSW Component				
Paper	0	0.0%	-	Tons
Glass	0	0.0%	-	Tons
Metals	0	0.0%	-	Tons
Plastics	0	0.0%	-	Tons
Organics	0	0.0%	-	Tons
Inorganics	0	0.0%	-	Tons
TOTAL MSW	0	0.0%	-	Tons
Construction Waste				
Wood	82	4.8%	5,984	Tons
Dry Wall	38	2.2%	2,773	Tons
Masonry	7	0.4%	511	Tons
Metal	0	0.0%	-	Tons
Plastic	6	0.4%	438	Tons
Cardboard	19	1.1%	1,387	Tons
Other	9	0.5%	657	Tons
TOTAL CONSTRUCTION	161	9.5%	11,750	Tons
Demolition Waste				
Wood	413	24.3%	30,141	Tons
Dry Wall	23	1.4%	1,679	Tons
Roofing	137	8.1%	9,998	Tons
Masonry	424	25.0%	30,944	Tons
Metal	30	1.8%	2,189	Tons
Carpet	7	0.4%	511	Tons
Other	2	0.1%	146	Tons
TOTAL DEMOLITION	1036	61.0%	75,608	Tons
			-	
Industrial Waste			-	
Cardboard	0	0.0%	-	Tons
Paper	0	0.0%	-	Tons
Food	0	0.0%	-	Tons
Metal	0	0.0%	-	Tons
Wood	0	0.0%	-	Tons
Plastic	0	0.0%	-	Tons
Textiles	0	0.0%	-	Tons
Rubber	0	0.0%	-	Tons
Other	0	0.0%	-	Tons
TOTAL INDUSTRIAL	0	0.0%	-	Tons
Other Waste				
Bulky Items		0.0%	-	Tons
Soil and inert materials	500	29.5%	36,491	Tons
Sludge		0.0%	-	Tons
Other		0.0%	-	Tons
TOTAL OTHER WASTE	500	29.5%	36,491	Tons
TOTAL WASTE STREAM	1697	100%	123,849	Tons

The Rockhill C&D Landfill

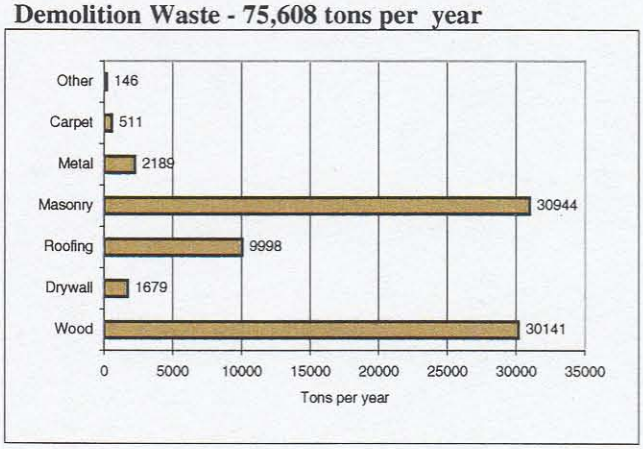
Total Waste Components 123,849 tons per year



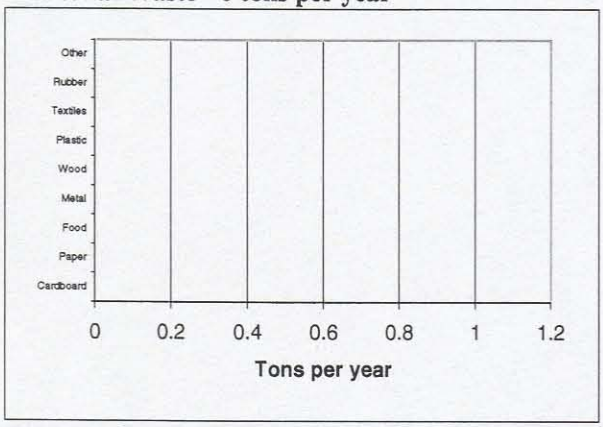
Construction Waste -11,750 tons per year



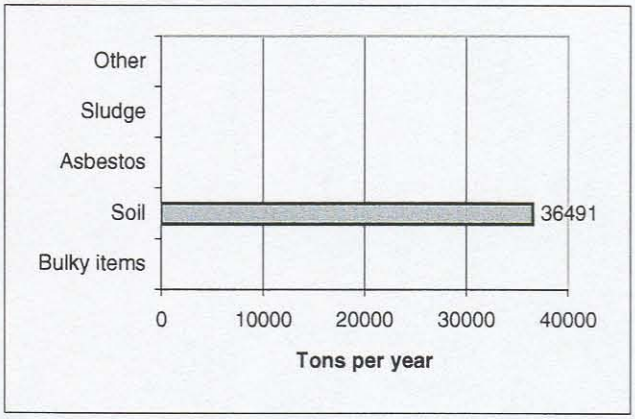
Demolition Waste - 75,608 tons per year



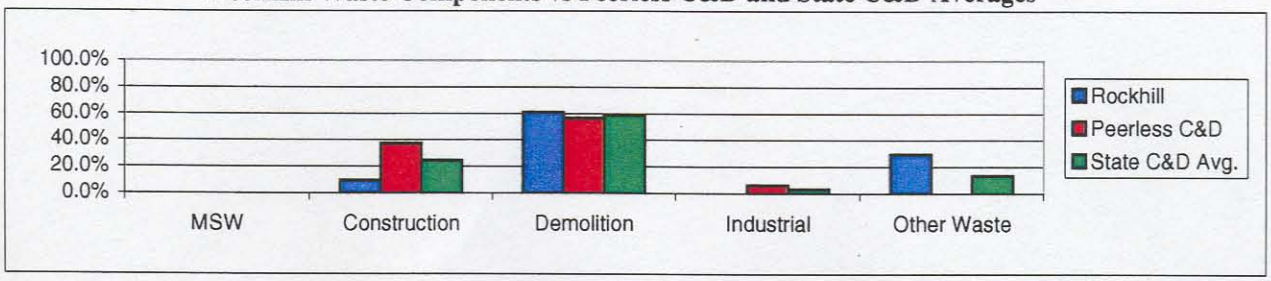
Industrial Waste - 0 tons per year



Other Waste - 36,491 tons per year



RockHill Waste Components vs Peerless C&D and State C&D Averages



The Southeast Sanitary Landfill

The Southeast Sanitary Landfill is located in Kansas City , MO. It is owned and operated by Allied Waste Systems Inc. The disposal facility covers 126 acres and is permitted to accept all municipal solid waste (MSW) and some other wastes such as contaminated soils, asbestos, and wastewater treatment sludge.

The Southeast Landfill accepted 341,328 tons in 1996, 306,569 tons in 1997 and 348,260 tons in 1998. The landfill operation was observed from Monday November 30^{h} through Thursday December 3rd . The weather was sunny and fair during the entire week. The Southeast Landfill is open 24 hours a day. However the observation took place from 8 AM till 4:30 PM on the above dates. During the observation period, 660 trucks, delivered 4485 tons of waste to the landfill. All loads were observed and recorded. The landfill staff felt the material received during the observation period was typical of material received year round.

Because the traffic was high, each driver was not asked where the load originated.. However, all loads could be classified visually, without any driver data.

The Southeast Landfill accepts waste from mainly from Jackson and Cass counties. The nearest Missouri sanitary landfills are the Courtney Ridge Landfill and the City of Lee's Summit Landfill, both in Jackson County. The There are no construction and demolition Landfills on the Missouri side of the State line. However there is a Construction and demolition landfill in Johnson County, Kansas. There were relatively few self-hauls. Most traffic was commercial. The Cass County Transfer Station delivered their waste to the landfill.

The Total Waste Stream - 4,482 tons

The total waste stream was mixed with a plurality being Municipal Solid Waste (MSW). The source of the MSW was primarily residential, institutional, and light commercial waste. The demolition waste was almost three times larger than the construction waste. Much of the area served by the landfill has older housing that tends to push demolition waste streams higher. The amount of industrial waste was about normal but the other waste component (contaminated soil) was surprisingly high.

Total waste received during the observation period was 4485 tons. The components of the waste stream were estimated as they were unloaded. These components are listed below.

Waste Stream Components

MSW	Const.	Demo	Industrial	Other
45%	6%	17%	10%	22%
2019 tons	272 tons	741tons	448 tons	1002 tons

Municipal Solid Waste - 2,019 tons

Municipal Solid Waste (MSW) accounted for about 45% of the total waste stream. MSW materials were not estimated during the observation period because the items are very small and normally contained within plastic bags. However, MSW was sorted and recorded at 19 landfills and transfer stations as part of this study in 1996 and 97. During the 56 sorts 632 samples, weighing an average of 222 pounds each, were examined. Each of these samples were hand sorted into six major categories and 26 sub categories. The sorted materials were recorded by weight and volume. Further details are available in the *Missouri Waste Composition Study: Municipal Solid Waste.*

The total MSW received during the observation period was 2,019tons. The average percentage of each major material category found in the 1996-97 waste sorts was applied to the tonnage received during the observation period and is displayed below.

Municipal Solid Waste Components

Paper	Glass	Metals	Plastics	Organics	Inorganics
37.3%	5.8%	6.9%	14.4%	30.8%	4.8%
753 tons	117 tons	139 tons	291 tons	622 tons	97 tons

Construction Waste - 272 tons

About 6% of the total waste received was from new construction sources. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads.

Total construction waste received during the observation period was 272 tons. The materials within the construction waste stream were estimated as they were unloaded. These estimated materials are listed below.

Construction Waste Components

Wood	Dry Wall	Masonry	Metal	Plas.	Cardbrd	Other
48%	15%	23%	4%	3%	5%	1%
130 tons	41 tons	63 tons	12 tons	9 tons	14 tons	4 tons

Demolition Waste – 741 Tons

About 17% of the total waste were from demolition sources. Demolition waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The wood was more weathered, there was very little if any cardboard, and there was more masonry materials (brick, concrete blocks, rock and dirt) in the demolition waste as compared to the construction waste. At most landfills, roofing shingles were delivered without many other

materials mixed within. However at Southeast most roofing loads were mixed with wood shakes.

Total demolition waste received during the observation period was 741 tons. The materials within the demolition waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Demolition Waste Component

Wood	Dry Wall	Roof	Masonry	Metal	Carpet	Other
34%	7%	25%	27%	2%	2%	1%
254 tons	55 tons	190 tons	204 tons	15 tons	16 tons	11 tons

Industrial Waste - 448 tons

About 10% of the total waste stream was from industrial sources. Industrial waste loads were usually transported to the landfill in open top roll-off containers or compactor units. They were normally homogeneous, containing a single waste products from a manufacturing process. These loads came from a variety of sources.

Total industrial waste received during the observation period was 448 tons. The materials within the industrial waste stream were estimated as they were unloaded. These estimated materials are listed below.

The Industrial Waste Component

Cardbrd	Paper	Food	Metal	Wood	Plas.	Tex.	Rbr.	Other
34%	8%	11%	1%	24%	13%	0%	0%	8%
153 tons	37 tons	50 tons	4 tons	107 tons	59 tons	0 tons	0 tons	38 tons

Other Waste - 1002 tons

Other wastes were defined as waste which did not fit into one of the above categories or was handled differently at the landfill (i.e. soil-like materials used for daily cover, asbestos, etc.). Bulky items include furniture, mattresses, appliances, etc.. Most of the other waste was contaminated soil. The contaminated soil came from two sources. The City of Kansas City Street Department delivered 534 tons of dirt, rock and asphalt. A remediation project in Kansas City brought in 321 tons of contaminated soil. Both the Contaminated soil and the dirt from the street dept. was unloaded next to the landfill face and used for daily cover. About 81 tons of asbestos was received and disposed of properly at the landfill during the observation period.

Total other waste received during the observation period was 1002 tons. The materials within the other waste stream were estimated, as they were unloaded. These estimated materials are listed below.

The Other Waste Component

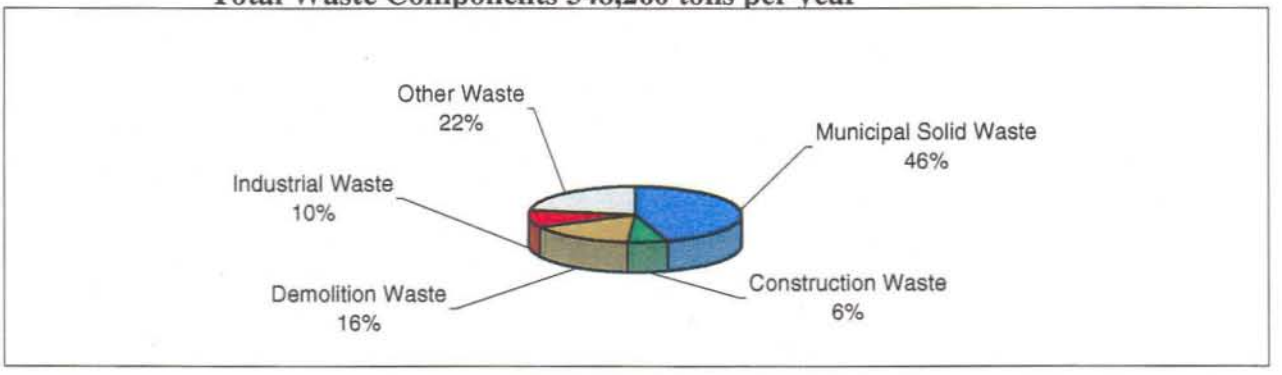
Bulky	Contaminated Soil	Asbestos
7%	85%	8%
66 tons	855 tons	81 tons

SOUTHEAST (KC) LANDFILL 348,260 TONS IN 1998

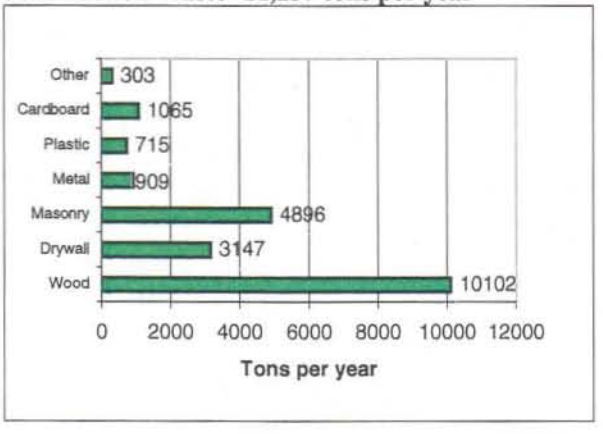
MATERIAL	Tons received during observation period	Percent of each material received	Estimated tonnage received in 1998 based on observation
MSW Component			
Paper	753 Tons	16.8%	58,515 Tons
Glass	117 Tons	2.6%	9,092 Tons
Metals	139 Tons	3.1%	10,802 Tons
Plastics	291 Tons	6.5%	22,613 Tons
Organics	622 Tons	13.9%	48,335 Tons
Inorganics	97 Tons	2.2%	7,538 Tons
TOTAL MSW	2019 Tons	45.1%	156,894 Tons
Construction Waste			
Wood	130 Tons	2.9%	10,102 Tons
Dry Wall	41 Tons	0.9%	3,147 Tons
Masonry	63 Tons	1.4%	4,896 Tons
Metal	12 Tons	0.3%	909 Tons
Plastic	9 Tons	0.2%	715 Tons
Cardboard	14 Tons	0.3%	1,065 Tons
Other	4 Tons	0.1%	303 Tons
TOTAL CONSTRUCTION	272 Tons	6.1%	21,137 Tons
Demolition Waste			
Wood	253 Tons	5.6%	19,660 Tons
Dry Wall	55 Tons	1.2%	4,305 Tons
Roofing	188 Tons	4.2%	14,609 Tons
Masonry	203 Tons	4.5%	15,775 Tons
Metal	15 Tons	0.3%	1,197 Tons
Carpet	16 Tons	0.3%	1,204 Tons
Other	11 Tons	0.2%	824 Tons
TOTAL DEMOLITION	741 Tons	16.5%	57,574 Tons
Industrial Waste			
Cardboard	153 Tons	3.4%	11,889 Tons
Paper	37 Tons	0.8%	2,860 Tons
Food	50 Tons	1.1%	3,862 Tons
Metal	4 Tons	0.1%	295 Tons
Wood	107 Tons	2.4%	8,315 Tons
Plastic	59 Tons	1.3%	4,616 Tons
Textiles	0 Tons	0.0%	- Tons
Rubber	0 Tons	0.0%	- Tons
Other	38 Tons	0.8%	2,937 Tons
TOTAL INDUSTRIAL	448 Tons	10.0%	34,775 Tons
Other Waste			
Bulky Items	66 Tons	1.5%	5,113 Tons
Soil and Inert Materials	855 Tons	19.1%	66,441 Tons
Asbestos	81 Tons	1.8%	6,326 Tons
Other	0 Tons	0.0%	- Tons
TOTAL OTHER WASTE	1002 Tons	22.4%	77,880 Tons
TOTAL WASTE STREAM	4482 Tons	100%	348,260 Tons

Southeast Landfill

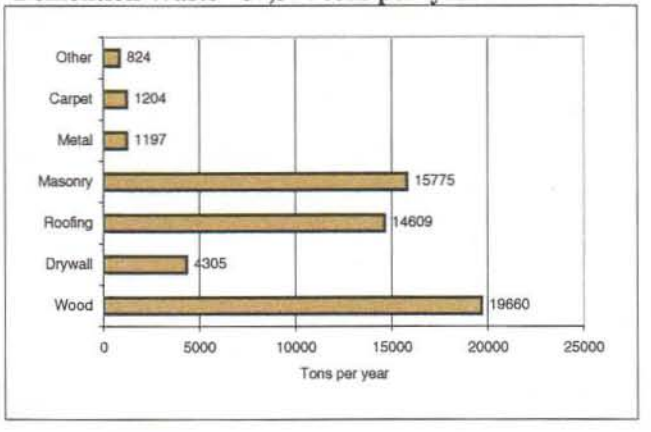
Total Waste Components 348,260 tons per year



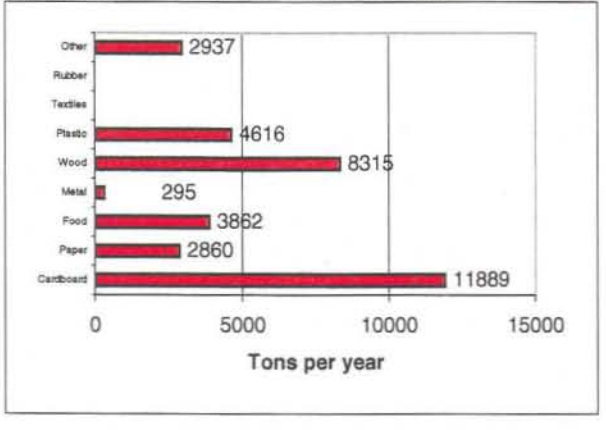
Construction Waste -21,137 tons per year



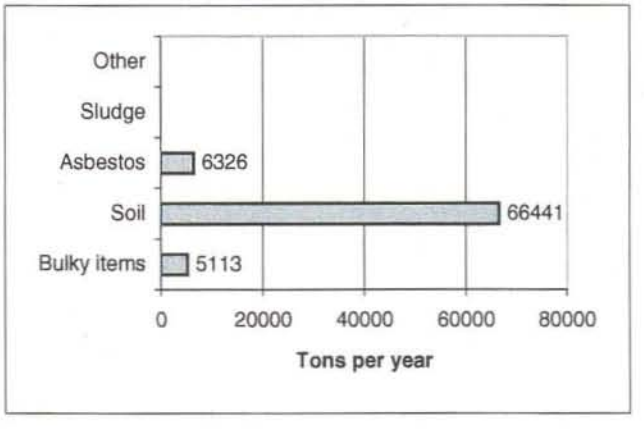
Demolition Waste - 57,574 tons per year



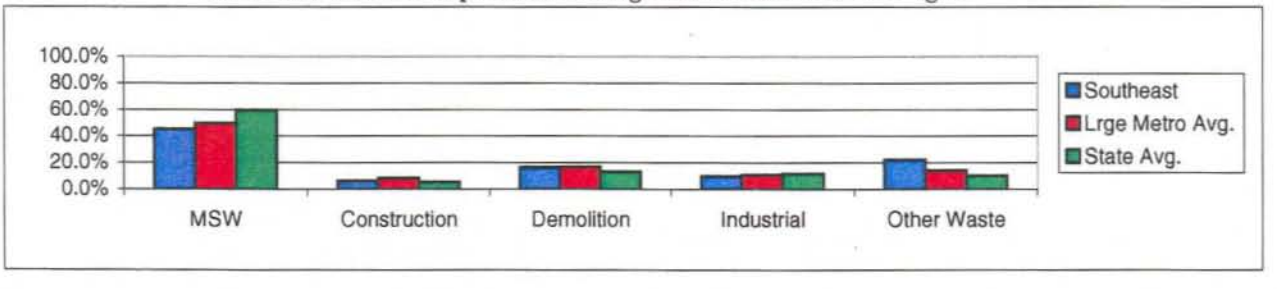
Industrial Waste - 34,775 tons per year



Other Waste - 77,880 tons per year



Southeast Waste Components vs Large Metro and State Averages



MUNICIPAL SOLID WASTE

Introduction

For the purposes of this study municipal solid waste (MSW) is defined as residential, institutional, or commercial waste which is disposed in small containers or plastic bags. This is a somewhat simplistic definition but is inclusive enough to cover most of the materials found in the MSW component. MSW is normally collected in packer trucks that collect from residential, institutional, and commercial generators. In many cases the same truck will collect MSW from all three generators in the same load. MSW is generally delivered to the landfill in packer trucks or transfer trailers. Some rural landfills still receive MSW in open top trucks or trailers.

Methodology

The materials within the MSW component are difficult to characterize because the items are small, and in most cases they are concealed within plastic trash bags. Therefore MSW must be hand sorted into material categories in order to gain accurate data. The results of that characterization (the percentage of all materials that make up the MSW component) were applied to MSW loads observed at the landfills. The methodology used to characterize the materials in the MSW component is described below.

Sampling

Samples of MSW were taken from commercial waste haulers at a landfill or transfer station in each of the 19 solid waste management districts throughout Missouri. Three seasonal sorts were conducted at each facility. A map of the solid waste management districts is on page 95 and a map of sort locations is on page 96. Samples were selected at random and analyzed during three seasonal waste sorts conducted over a two-year period at each location. The randomly selected waste haulers served only residential, institutional, and commercial accounts. No construction and demolition wastes, sewage sludge, bulky items, combustion ash, industrial process waste, or "other waste" was sampled.

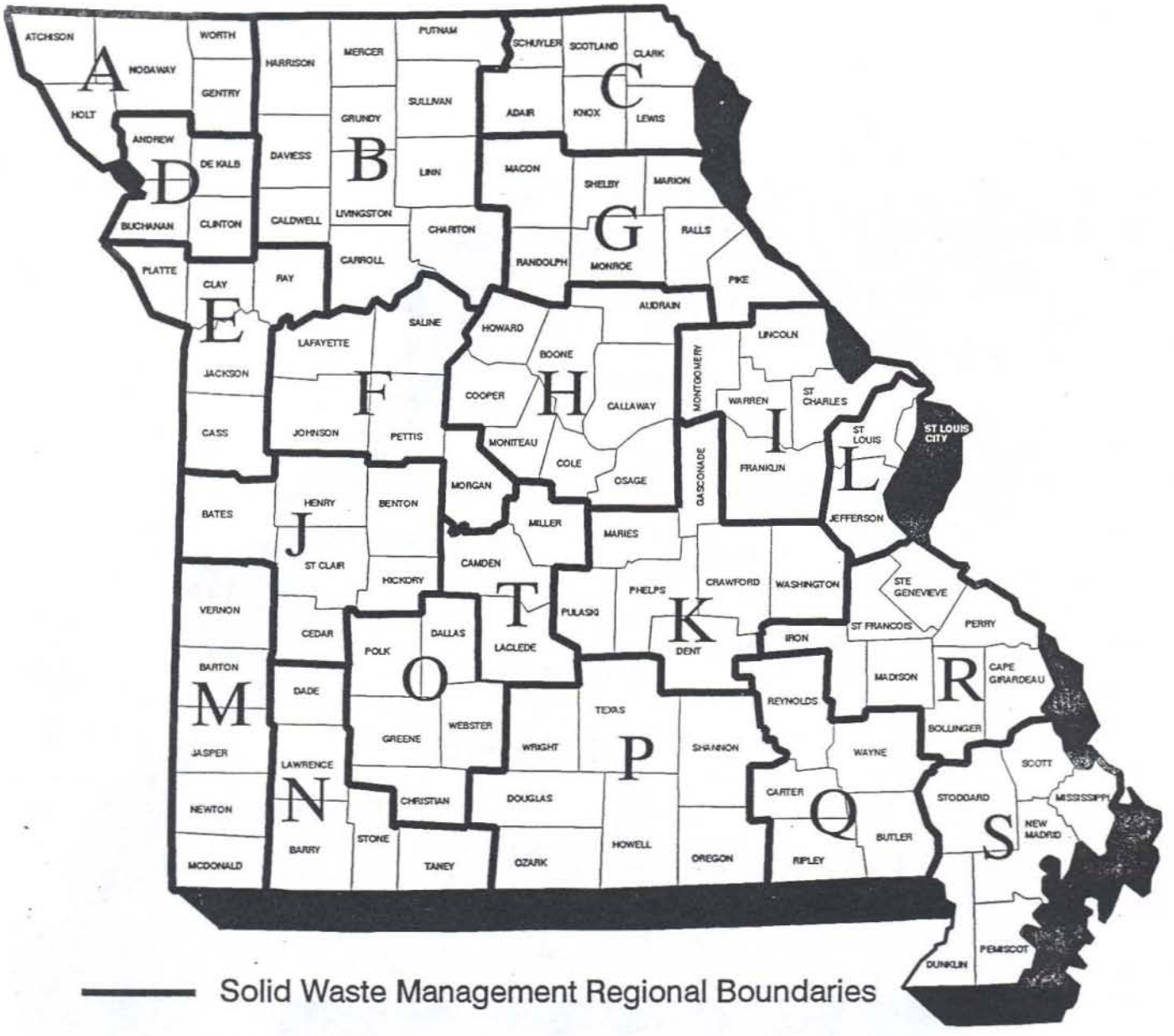
Each sample consisted of 25 bags of waste chosen at random. Bagged waste was selected for two reasons. First, the equipment needed to select scoop loads of waste, and buildings that such equipment could enter and deposit the waste, was non existent at virtually all of the sort locations. Second, and more important, bagged waste provided a more representative sample of the MSW component.

Between February 1996 and October 1997, 632 samples of waste were sorted into 26 material categories and 16 "other waste" categories. The categories are listed on page 97. The bags of MSW were taken to a sorting area where they were opened and the materials sorted into identical 20-gallon containers. After all materials were sorted from a sample the 20-gallon containers were weighed, volumes estimated, and the data recorded. The chart on the following page depicts the summary of all samples. All weights are in pounds, all volumes in cubic feet, and the composition was estimated by the waste hauler. For further information on the MSW sorts see *The Missouri Waste Composition Study: MSW Phase I.*

MSW Sample Summary

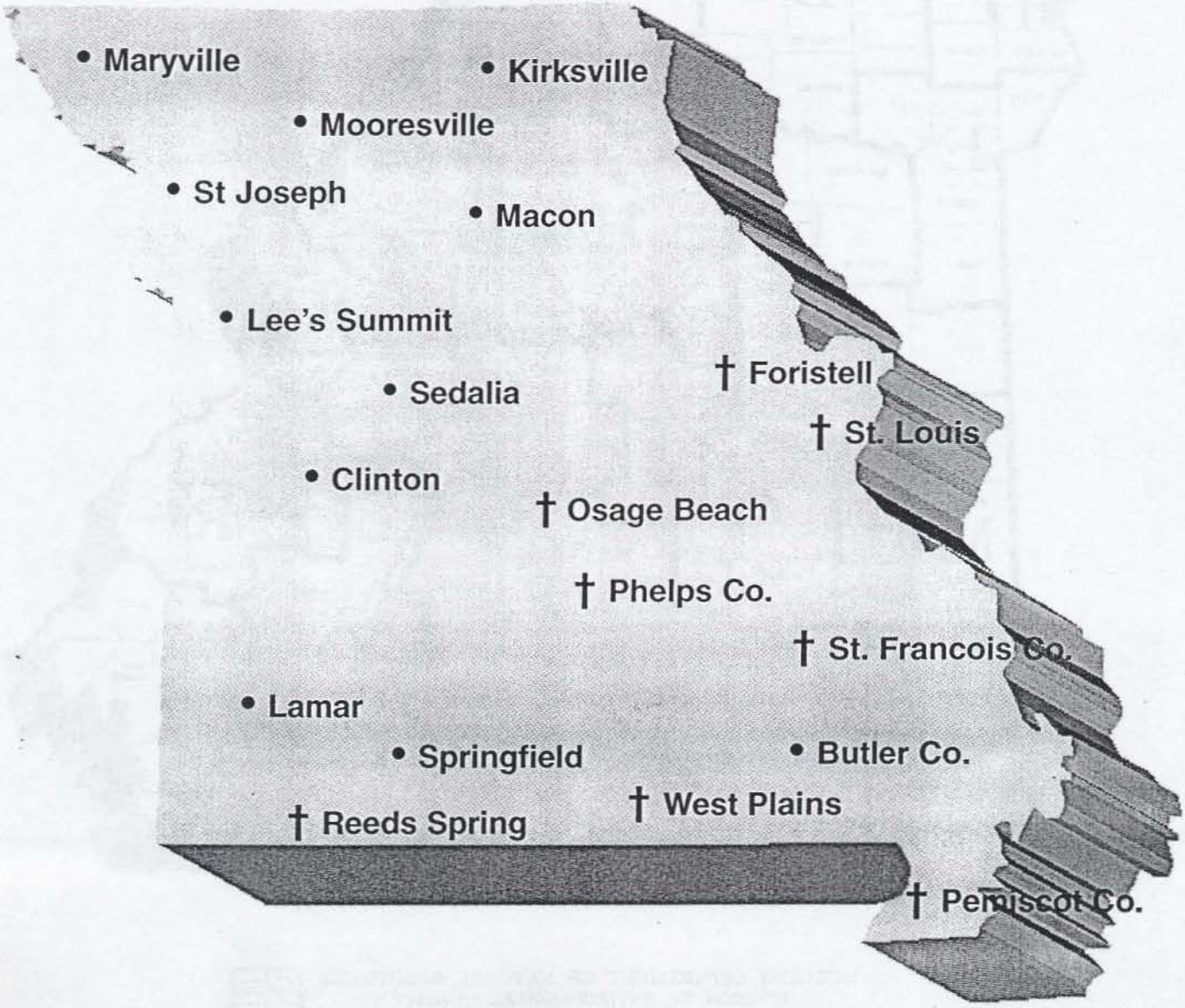
Location	Number of Samples	Total of all Samples Weight	Volume	Composition Res.	Comm.
Dist. A: Maryville	34	7,368	1,854	98%	2%
Dist. B: Mooresville	32	8,179	1,535	55%	45%
Dist. C: Kirksville	24	5,539	1,150	66%	34%
Dist. D: St. Joseph	30	7,162	1,613	87%	13%
Dist. E: Lee's Summit	35	8,486	1,640	86%	14%
Dist. F: Sedalia	29	6,186	1,296	70%	30%
Dist. G: Macon	24	5,786	1,199	70%	30%
Dist H: Columbia	Conducted by the University of Missouri. Results on page 113				
Dist. I: Foristell	36	7,849	1,760	86%	14%
Dist. J: Clinton	28	6,342	1,331	71%	29%
Dist. K: Phelps Co.	33	6,590	1,491	87%	13%
Dist. L: St. Louis	40	7,149	1,642	100%	0%
Dist. M: Lamar	38	8,064	1,774	53%	47%
Dist. N: Reeds Spring	40	9,282	2,032	43%	57%
Dist. O: Springfield	32	7,078	1,547	90%	10%
Dist. P: West Plains	34	7,384	1,623	60%	40%
Dist. Q: Butler Co.	32	8,145	1,685	84%	16%
Dist. R: St. Francois Co.	39	8,854	1,877	87%	13%
Dist. S: Pemiscot Co.	40	8,342	1,831	81%	19%
Dist. T: Osage Beach	32	6,797	1,517	77%	23%
TOTAL	**632**	**140,581**	**30,399**	**78%**	**22%**

SOLID WASTE MANAGEMENT REGIONS OF MISSOURI



MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
SOLID WASTE MANAGEMENT PROGRAM

Missouri Waste Composition Study
Sort Locations



† Transfer Stations • Landfills

Sort Categories

The following categories, and sub categories were used during the waste sorts at all locations. The "Other Waste" category was separated into the sub categories listed and recorded separately.

Paper

Cardboard and Kraft Paper- Non waxed corrugated cardboard (OCC), box board, and Kraft paper.
Newsprint-. Printed groundwood paper.
Magazines- Periodicals, or bound printed material including glossy and plain paper stocks.
High Grade Paper- Paper that is recyclable and consistently has a positive market value
Mixed Paper- All paper that does not fit into the categories specified above

Glass

Clear Glass Containers- Clear glass that originally contained food or beverage.
Brown Glass Containers- Brown glass which originally contained food or beverages.
Green and Blue Glass Containers- Green or blue cast glass which originally contained food or beverage.
Other Glass- Glass that was not originally a food or beverage container and glass broken beyond recognition.

Metals

Aluminum Cans- All aluminum beverage containers.
Other Aluminum- All aluminum except beverage containers.
Ferrous Food Cans- Any steel food containers, including pet food cans and aerosol cans.
Other Ferrous- Ferrous and alloyed ferrous scrap to which a magnet attracted.
Other Non-Ferrous- All nonmagnetic metals that are not recognizable as aluminum.
Oil Filters- Used and new oil filters for automobiles.

Plastics

PET (#1)- Beverage bottles composed of polyethylene terephthalate. Other containers clearly labeled PET (#1).
HDPE (#2)- High-density polyethylene containers..
Plastic Film- Includes all flexible plastic film regardless of resin content.
Other Plastic- Includes: PVC (#3), LDPE (#4), PP (#5), PS (#6), other plastics or mixed resins (#7), and unidentifiable plastics.

Organics

Food Waste- Putrescibles. Material capable of being decomposed by microorganisms with sufficient rapidity as to cause nuisances from odors and gases.
Wood Waste- Includes small wooden furniture, wooden tool handles, boards, plywood and particleboard.
Textiles- All woven fabric, natural or synthetic, either in bulk or made into usable items.
Disposable Diapers- Adult or infant disposable diapers, clean or soiled.
Other Organics- Those items which do not fall into any other category and which are composed of carbon-based material.

Inorganics

Fines- All matter not sorted into specific categories that are too small or mixed to be categorized.
Other Inorganics- Those items which do not fall into any other category and are composed of inert materials.

Other Potentially Hazardous MSW Waste

Items that are potentially hazardous to solid waste handlers or ecosystems: These items include over-the-counter medicine (OTC), prescription medication (Rx), beauty/hygiene products, beauty/hygiene aerosol products, household cleaning products, household cleaning aerosol products, aerosol cans, sharps/blades, syringes and needles, hardware/shop products, gardening/yard products, disposable razors, alkaline batteries, miscellaneous hazardous or toxic items. Definition of each of these items is on page 121.

Results

Three seasonal waste sorts were scheduled at each of the sort locations. A tent was erected at each site and all waste was transported to the tent where it was sorted into material categories. Weather was a factor at several of the waste sorts. High winds, heavy rains, snow and ice caused some sort activities to be shortened, but only one sort (round one at District G) was cancelled due to weather. The sorting dates are listed in the table below:

Location	First Round Sorting dates	Second Round Sorting dates	Third Round Sorting dates
Dist. A: Maryville	3/18-3/20/96	6/24-6/26/96	10/21-10/23/96
Dist. B: Mooresville	3/17-3/18/97	6/11-6/12/97	9/15-9/17/97
Dist. C: Kirksville	3/24-3/25/97	6/16-6/17/97	9/8-9/10/97
Dist. D: St. Joseph	3/10-3/11/97	6/9-6/10/97	9/18/9/20/97
Dist. E: Lee's Summit	3/25-3/2796	7/1-7/3/96	10/28-10/30/96
Dist. F: Sedalia	3/6-3/7/97	5/21-5/22/97	9/22-9/24/97
Dist. G: Macon	Cancelled	6/10-6/12/96	10/7-10/9/96
Dist H: Columbia	Conducted by the University of Missouri.		Results on page 113
Dist. I: Foristell	3/31-4/1/97	6/23-6/24/97	9/2/9/4/97
Dist. J: Clinton	4/1/-4/3/96	7/8-7/10/96	11/4-11/6/96
Dist. K: Phelps Co.	4/7-4/8/97	5/15-5/16/97	9/29-10/1/97
Dist. L: St. Louis	3/11-3/13/96	6/17-6/19/96	9/30-10/2/96
Dist. M: Lamar	4/8-4/10/96	7/15-7/17/96	11/11-11/13/96
Dist. N: Reeds Spring	2/12-2/14/96	5/20-5/22/96	9/9-9/11/96
Dist. O: Springfield	2/5-2/7/96	5/13-5/15/96	9/3/-9/5/96
Dist. P: West Plains	2/10-2/11/97	5/5-5/6/97	10/6-10/8/97
Dist. Q: Butler Co.	2/3-2/4/97	4/28-4/29/97	10/13-10/15/97
Dist. R: St. Francois Co.	2/26-2/28/96	6/3-6/5/96	9/23-9/25/96
Dist. S: Pemiscot Co.	2/19-2/21/96	5/28-5/30/96	9/16-9/18/96
Dist. T: Osage Beach	2/24-2/25/97	5/19-5/20/97	9/25-9/27/97

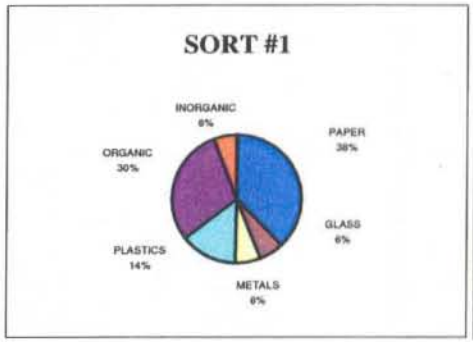
Seasonal Changes in the Waste Component

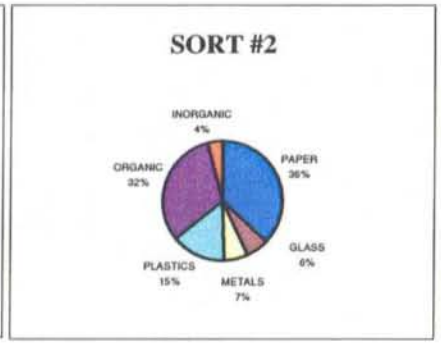
The table on page 99 reflects the percentage of materials found in the MSW (by weight) component during the three seasonal sorts. The seasonal sort average is based on the total weight of that material, divided by the total weight sorted during that round. The average of all sorts is the total weight of each material, divided by the total weight of all materials sorted during the entire study. The pie charts on page 101 compares the percentages in each major category found during each of the seasonal sorts and the bar graph illustrates the average percentage of each material found during the sorting process.

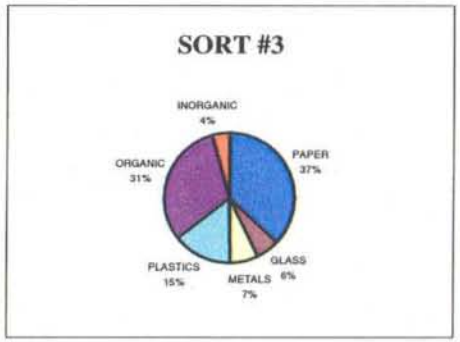
Seasonal Results by Weight

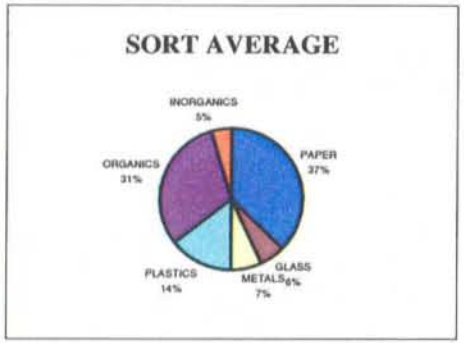
CATEGORY	SORT # 1 WT.	SORT # 2 WT.	SORT #3 WT.	AVERAGE WT.
Cardboard	6.6%	6.8%	6.6%	6.7%
Newsprint	7.4%	8.0%	8.3%	7.9%
Magazines	3.5%	3.4%	4.3%	3.7%
High Grade	3.2%	3.8%	3.6%	3.6%
Mixed	17.1%	15.1%	14.2%	15.5%
PAPER TOTALS	**37.8%**	**37.1%**	**36.9%**	**37.3%**
Clear	3.2%	3.2%	3.1%	3.2%
Brown	1.5%	1.7%	1.5%	1.5%
Green	0.5%	0.4%	0.4%	0.4%
Other	0.5%	0.6%	0.6%	0.6%
GLASS TOTALS	**5.7%**	**5.9%**	**5.7%**	**5.8%**
Alum. Cans	1.4%	1.6%	1.6%	1.5%
Other Alum	0.7%	0.8%	0.8%	0.8%
Non ferrous	0.2%	0.3%	0.2%	0.2%
Food Cans	3.4%	2.7%	3.3%	3.1%
Ferrous	1.0%	1.1%	1.3%	1.1%
Oil Filters	0.2%	0.1%	0.1%	0.1%
METAL TOTALS	**6.9%**	**6.6%**	**7.2%**	**6.9%**
PET # 1	1.7%	1.6%	1.7%	1.7%
HDPE # 2	1.9%	2.0%	2.4%	2.1%
Film	4.0%	3.7%	3.5%	3.7%
Other Plastic	6.6%	7.2%	6.9%	6.9%
PLASTIC TOTALS	**14.1%**	**14.7%**	**14.5%**	**14.4%**
Food Waste	18.0%	18.9%	19.2%	18.7%
Wood Waste	0.8%	0.7%	0.9%	0.8%
Textiles	3.6%	4.4%	3.9%	4.0%
Diapers	4.7%	3.9%	3.9%	4.2%
Other Organics	2.5%	3.8%	3.3%	3.2%
ORGANIC TOTALS	**29.6%**	**31.7%**	**31.2%**	**30.8%**
Fines	4.4%	2.5%	2.9%	3.3%
Other Inorganics	1.5%	1.6%	1.4%	1.5%
INORGANIC TOTALS	**5.9%**	**4.1%**	**4.4%**	**4.8%**
SORT TOTALS	**100%**	**100%**	**100%**	**100%**

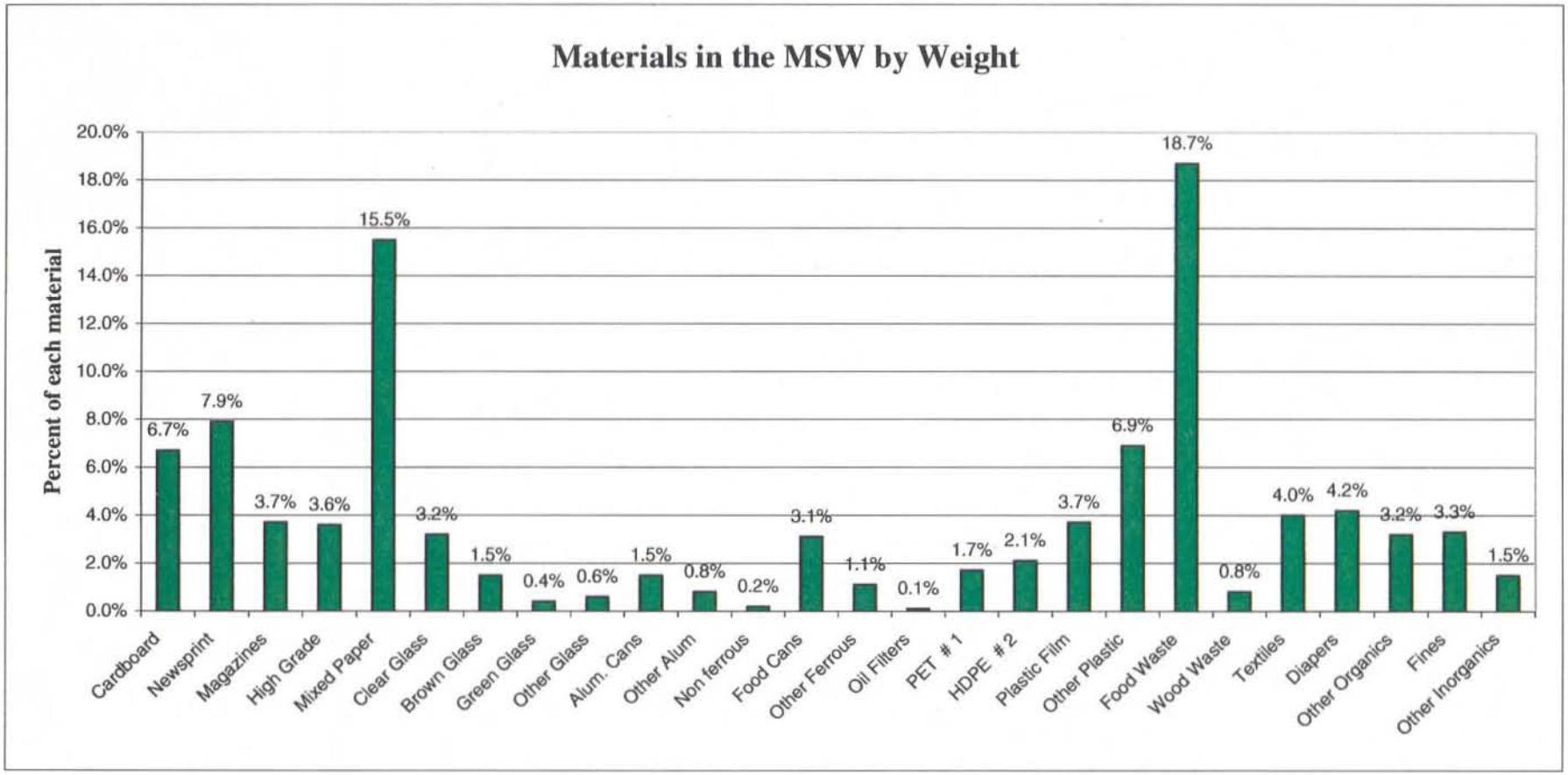
Municipal Solid Waste Composition By Weight











Chronological Changes in the Waste Component

Just as society changes over time, the waste component also changes. In 1987 The Missouri Environmental Improvement and Energy Resources Authority (EIERA) conducted the *Statewide Resource Recovery Feasibility and Planning Study*. Part of that study involved conducting two seasonal waste sorts for MSW at four Missouri landfills. The four landfills were the City of Springfield, the City of Lee's Summit, the City of Columbia, and the City of Willow Springs. Many communities and solid waste management districts have used the results of those 1987 waste sorts. However several changes have taken place in the solid waste environment since 1987.

As part of the *Missouri Waste Composition Study,* waste sorts were conducted at the City of Springfield, and the City of Lee's Summit landfill's in 1996. The University of Missouri conducted an independent waste characterization study at the City of Columbia's landfill in 1996 (results on page 113), and the City of Willow Spring's landfill is closed.

One result of the 1987 EIERA study was the passage of Senate Bill 530 in 1990. This bill contained legislation pertaining to landfill permitting requirements, set state-wide goals for solid waste recovery and reduction, banned certain items from Missouri landfills, set up a solid waste management fund, and provided for the development of Solid Waste Management Districts.

Many of the items, which were in the MSW component in 1987, are not present today. Major appliances (white goods), waste oil, whole tires, lead acid batteries, and yard waste or clippings have been banned from Missouri landfills and transfer stations. Programs have since been implemented to dispose of these items in a more responsible manner. In 1987 yard waste comprised 8.3% of the waste component (this actually varied from 1% at a rural location to 17% in the suburbs). For comparative purposes the 1987 yard waste percentages were added to the "other organics" sub category. In 1987 white goods were counted as other ferrous, lead acid batteries were counted as other waste, and tires were counted as other organics.

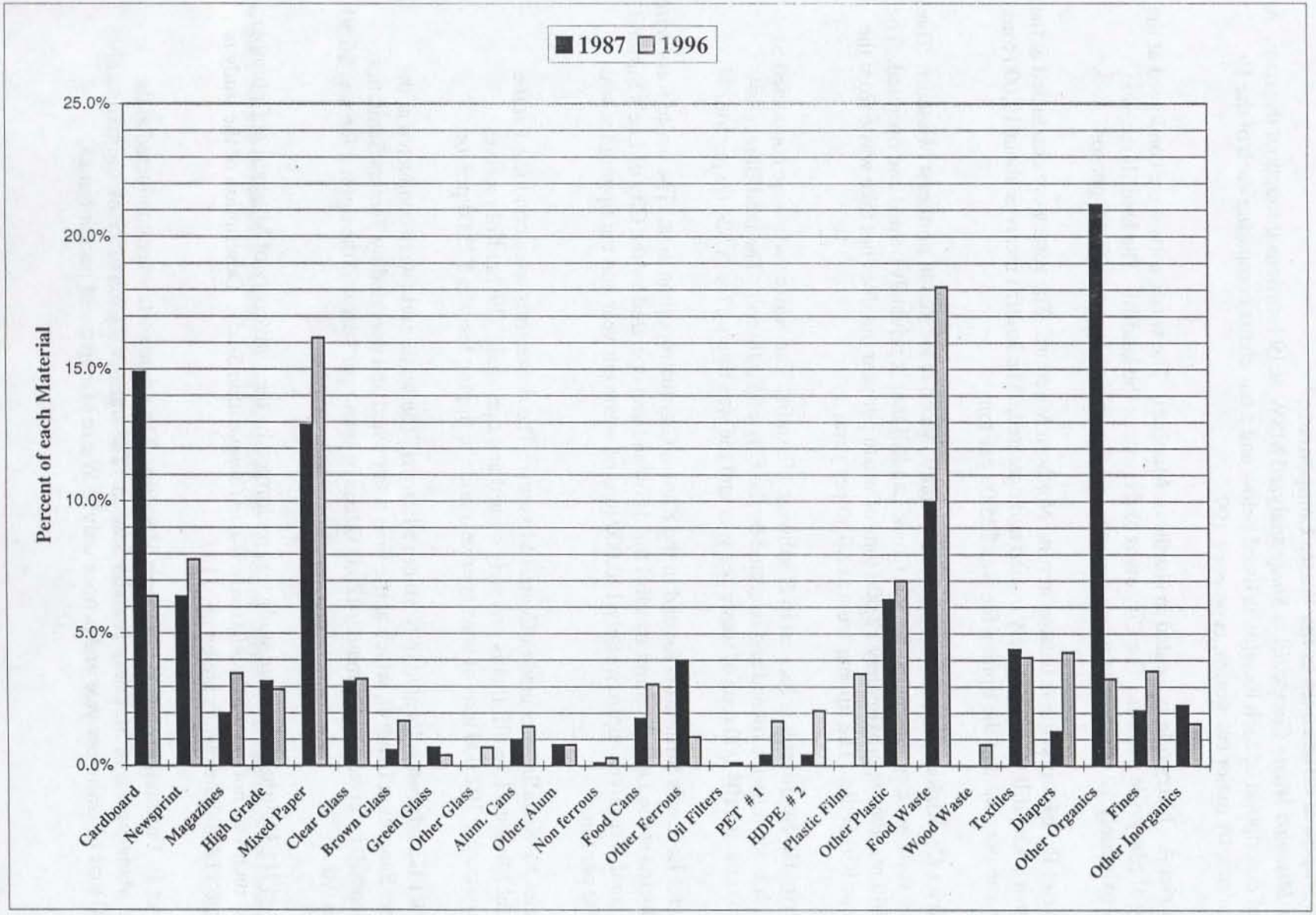
Changes in technology, products, and packaging also change over time and the waste component reflects these changes. The Table on page 104 and the chart on page 105 illustrate the changes in the waste stream between 1987 and 1996.

- Cardboard is about one half of what it was in 1987. This is probably a result of increased cardboard recycling and a difference in sampling procedures between the two studies.
- All plastic resins have increased. PET and HDPE have increased 500% during the past 10 years. Other plastics (plastic film included) have increased by 50%.
- The increase in food waste (120%) is probably a result in different sampling procedures between the two studies. The 1987 study put food-contaminated paper into the other organics category rather than the food waste category. The growth of fast food restaurants may also have some affect on this increase.
- The increase in disposable diapers (188%) is probably a result of society's preference of disposable baby diapers over cloth, and the increased usage of adult diapers among the elderly.
- The decrease in the 1987 "other organics" category reflects the ban on yard waste and tires, and a separate category to measure wood waste.

Changes in the Waste Stream Over Time

CATEGORY	1987 EIERA % wt.	1996-97 Missouri % wt.
Cardboard	15.1%	6.7%
Newsprint	6.6%	7.9%
Magazines	1.7%	3.7%
High Grade	3.2%	3.6%
Mixed	12.7%	15.5%
PAPER TOTALS	**39.4%**	**37.3%**
Clear	3.0%	3.2%
Brown	0.8%	1.5%
Green	0.7%	0.4%
Other	N/A	0.6%
GLASS TOTALS	**4.5%**	**5.8%**
Alum. Cans	1.0%	1.5%
Other Alum	0.5%	0.8%
Non ferrous	0.1%	0.2%
Food Cans	2.0%	3.1%
Ferrous	3.5%	1.1%
Oil Filters	N/A	0.1%
METAL TOTALS	**7.0%**	**6.9%**
PET # 1	0.4%	1.7%
HDPE # 2	0.3%	2.1%
Film	N/A	3.7%
Other Plastic	7.1%	6.9%
PLASTIC TOTALS	**7.7%**	**14.4%**
Food Waste	8.3%	18.7%
Wood Waste	N/A	0.8%
Textiles	3.9%	4.0%
Diapers	1.5%	4.2%
Other Organics	21.6%	3.2%
ORGANIC TOTALS	**35.3%**	**30.8%**
Fines	2.9%	3.3%
Other Inorganics	2.9%	1.5%
INORGANIC TOTALS	**5.8%**	**4.8%**
TOTAL	**99.6%**	**100.0%**

Changes in MSW Composition 1987-1997



Geographical differences in the Waste Component

The *Missouri Waste Composition Study* analyzed MSW at 19 locations throughout the state. A brief description of each location is listed below and a bar charts comparing each of the 19 locations, by major categories, is on page 109

District A: **Maryville** is located in Northeast Missouri. The waste sorts were conducted at the City of Maryville landfill. The City owns and operates the landfill. The landfill receives approximately 12,000 tons of waste per year and the tipping fee was $60.00 per ton.

District B: Mooresville is located in rural Northern Missouri. The sorts were conducted at the Farmer's Landfill that is privately owned and operated. The landfill receives about 19,000 tons of waste per year and the tipping fee was $25.00 per ton.

District C: Kirksville is located in Adair County, which is located in northeast Missouri. The waste sorts were conducted at the Rye Creek Landfill that is privately owned and operated. The landfill receives approximately 12,000 tons of waste per year but does not take waste from the City of Kirksville. The tipping fee was $6.50 per yard.

District D: St. Joseph is located in Northwest Missouri. The waste sorts were conducted St. Joseph landfill that is owned and operated by the City of St. Joseph. The landfill receives approximately 104,000 tons of waste per year and the was tipping fee is $24.00 per ton.

District E: Lee's Summit is located in the Kansas City metropolitan area. The waste sorts were conducted at the Lee's Summit Landfill that is owned and operated by the City of Lee's Summit. The landfill receives approximately 110,000 tons of waste per year and the tipping fee was $23.00 per ton.

District F: Sedalia is located in Central Missouri. The waste sorts were conducted at the Central Missouri Landfill that is privately owned and operated. The landfill receives approximately 102,000 tons of waste per year and the tipping fee was $25.00 per ton.

District G: Macon is located in Northern Missouri. The waste sorts were conducted at the Teeters Sanitation Landfill, which at the time was owned and operated by Teeters Sanitation. The landfill receives approximately 120,000 tons of waste per year and the tipping fee was $6.50 per cu. yd.

District H: Columbia's waste study was performed by the University of Missouri at Columbia and as such was not part of the *Missouri Waste Composition Study*. Description of the study is on page 112 and the results are on pg. 113.

District I: Foristell is located in Eastern Missouri. The waste sorts were conducted at the Waste Management of St. Louis Transfer Station. The transfer station receives approximately 57,000 tons of waste per year and is open only to Waste Management packer trucks.

District J: Clinton is located in West Central Missouri. The waste sorts were conducted at the Ellis Scott landfill that was owned and operated by USA Waste Inc. The landfill receives approximately 55,000 tons of waste per year and the tipping fee was $23.25 per ton.

District K: Phelps County is located in Central Missouri. The waste sorts were conducted at the Phelps County Transfer Station that is owned by the County. The transfer station receives approximately 50,000 tons of waste per year and the tipping fee was $43.81 per ton.

District L: St. Louis is located in Eastern Missouri. The waste sorts were conducted at the South St. Louis Transfer Station that is owned by the City but operated by Allied Waste. The transfer station receives approximately 177,000 tons of waste and fees are assessed internally.

District M: Lamar is located in Southwest Missouri. The waste sorts were conducted at the Lamar Landfill that is owned and operated by BFI Inc. The landfill receives approximately 170,000 tons of waste per year and the tipping fee was $22.75 per ton.

District N: Reeds Spring is located in Southwest Missouri. The waste sorts were conducted at the Reed's Spring Transfer station that is operated by American Disposal. The transfer station receives approximately 66,000 tons of waste per year and the tipping fee was $44.00 per ton.

District O: Springfield is located in Southwest Missouri. The waste sorts were conducted at the City of Springfield landfill that is owned and operated by the City. The landfill receives approximately 100,000 tons of waste per year and the tipping fee was $27.50 per ton.

District P: West Plains is located in South Central Missouri. The waste sorts were conducted at the West Plains Transfer Station. The transfer station is owned and operated by the City. It receives approximately 12,000 tons of waste per year and the tipping fee was $40.00 per ton.

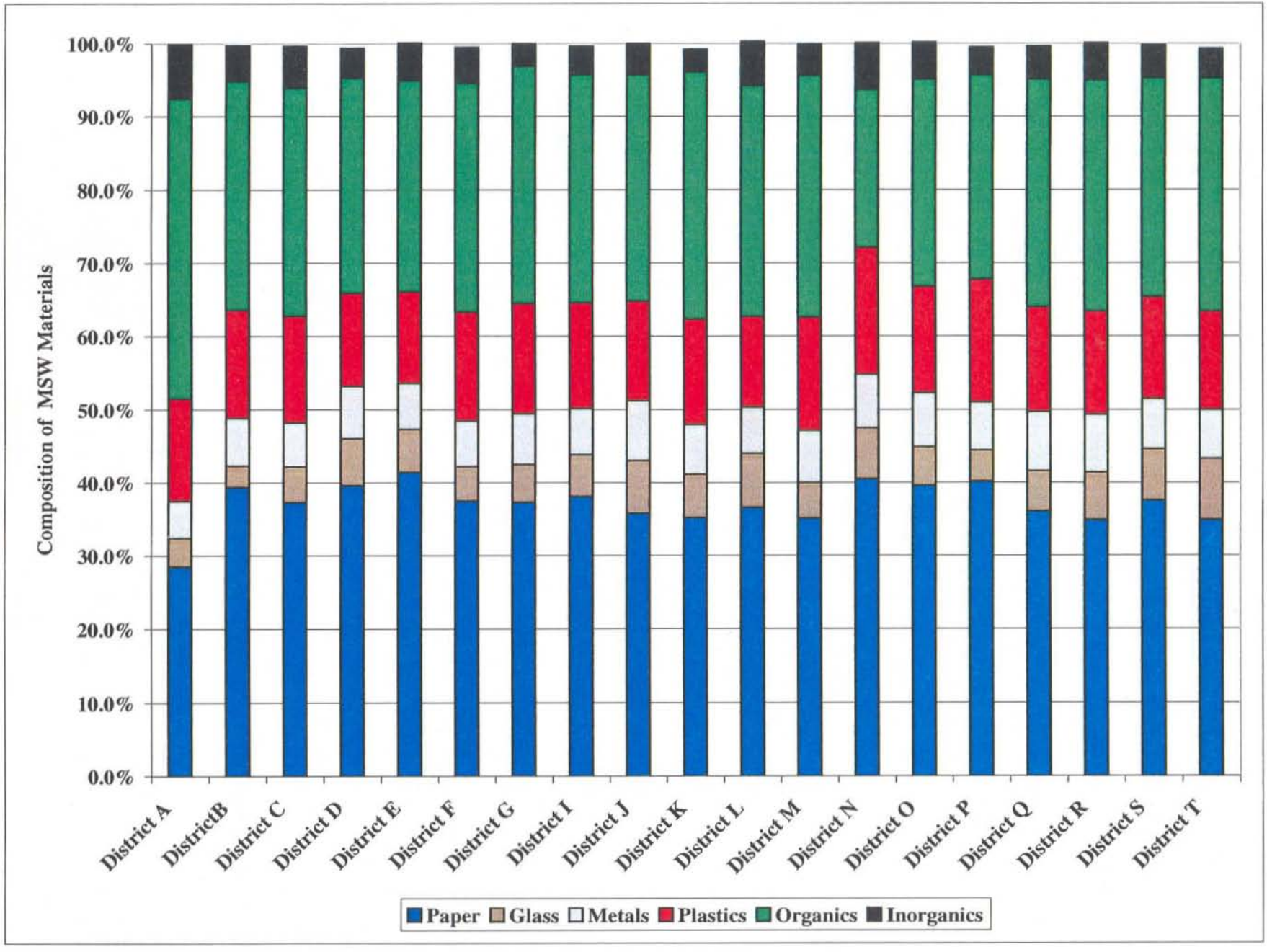
District Q: Butler County is located in the Southeastern Missouri. The waste sorts were conducted at the Butler County Landfill that is operated by Allied Waste. The landfill receives approximately 120,000 tons of waste per year and the tipping fee was $32.00 per ton.

District R: St. Francois County is located in Eastern Missouri. The waste sorts were conducted at the St. Francois Co. Transfer Station that is owned and operated by the County. The transfer station receives approximately 20,000 tons of waste per year and the tipping fee was $42.00 per ton.

District S: Pemiscot County is located in Southeast Missouri. The waste sorts were conducted at the Pemiscot County Transfer Station that is owned and operated by the County. The transfer station receives approximately 15,000 tons of waste per year and the tipping fee was $32.50 per ton.

District T: Osage Beach is located at the Lake of the Ozarks in Central Missouri. The waste sorts were conducted at the Modern Sanitation Transfer Station. The transfer station receives approximately 20,000 tons of waste per year and the tipping fee was $44.00 per ton.

Composition of MSW Within Each Solid Waste Management District



Differences between *The Missouri Waste Composition Study* and other state waste composition studies

Several waste composition studies have been conducted during the past ten years. Virtually all waste composition studies use different methodology. Therefore comparing results is difficult and not entirely reliable. Differences in methodology depend on a number of variables. The *Missouri Waste Composition Study* chose a limited scope and sampled bagged waste in order to characterize the largest (MSW) portion of the waste component. Most waste composition studies use a "random scoop" method and hope to characterize the entire waste component (MSW, industrial, C&D, bulky items, etc.). Both approaches are appropriate but care must be taken to understand the underlying methodology of each study, especcially the sampling methodology, before arguing too intently over waste percentages.

Another problem in comparing waste composition studies is that most studies chose different waste categories or defined their categories differently. The differences in categories makes comparisons somewhat difficult but not impossible. For purposes of comparison and standardization, the major waste categories used in the *Missouri Waste Composition Study* (page 97) are used in the chart on page 113.

The Missouri Statewide Resource Recovery Feasibility and Planning Study: EIERA 1987

This was the first statewide waste composition study done in Missouri. Two seasonal sorts were conducted at four landfills throughout the state. The four landfills were the City of Springfield, the City of Lee's Summit, the City of Columbia, and the City of Willow Springs. The waste sorts were performed before yard waste was banned in Missouri, therefore yard waste is included in the "other organics" sub category. This comparison indicates how the Missouri waste component has changed over the past ten years. The chart on page 11 also displays the changes in the waste component between 1987 and 1997

Oregon Solid Waste Characterization and Composition 1992-93

The study was conducted by the Matrix Management Group and consisted of four seasonal sorts of residential and commercial waste. A total of 823 samples weighing 200 to 300 pounds each were collected at disposal sites in 10 counties during all four quarters of the year. The waste was sorted into 83 categories, so many of those categories were combined for comparison purposes. Oregon had an extensive waste reduction and recycling program in place before, and during, the waste sorts. Yard waste was not banned from landfills and is included as "other organics".

The Minnesota Solid Waste Composition Study 1990-1992

The Minnesota study was conducted by the Minnesota Pollution Control Agency. It consisted of four seasonal waste sorts conducted over a two-year period. The results found on page 20 are the average of sorts conducted throughout 1991 and 1992. Samples were taken from residential and commercial waste haulers. During the year, 1,119 samples weighing 343,007 pounds were sorted. The methodology for this study was used in planning the *Missouri Waste Composition Study.*

Waste Characterization Study for the City of Columbia Sanitary Landfill 1996
This study was designed and conducted by the University of Missouri at Columbia in cooperation with the City of Columbia. Waste sorts were conducted during each of the four quarters (or seasons) of 1996 at the City of Columbia Sanitary Landfill. Weight fractions of 32 waste components were quantified from the surrounding area. To accomplish this, 127 to 151 samples, with an average weight of 306 pounds were collected each quarter. The number of samples was determined using ASTM Standard D5231-92 to achieve 80% confidence that the true weight-fraction mean would lie within 10% of the measured mean. Standard errors and percent errors were reported at the 80% and 90% confidence levels. The results on page 114 are from the residential waste component in the City of Columbia, which is the only community in the State of Missouri with a deposit law (bottle bill) in effect.

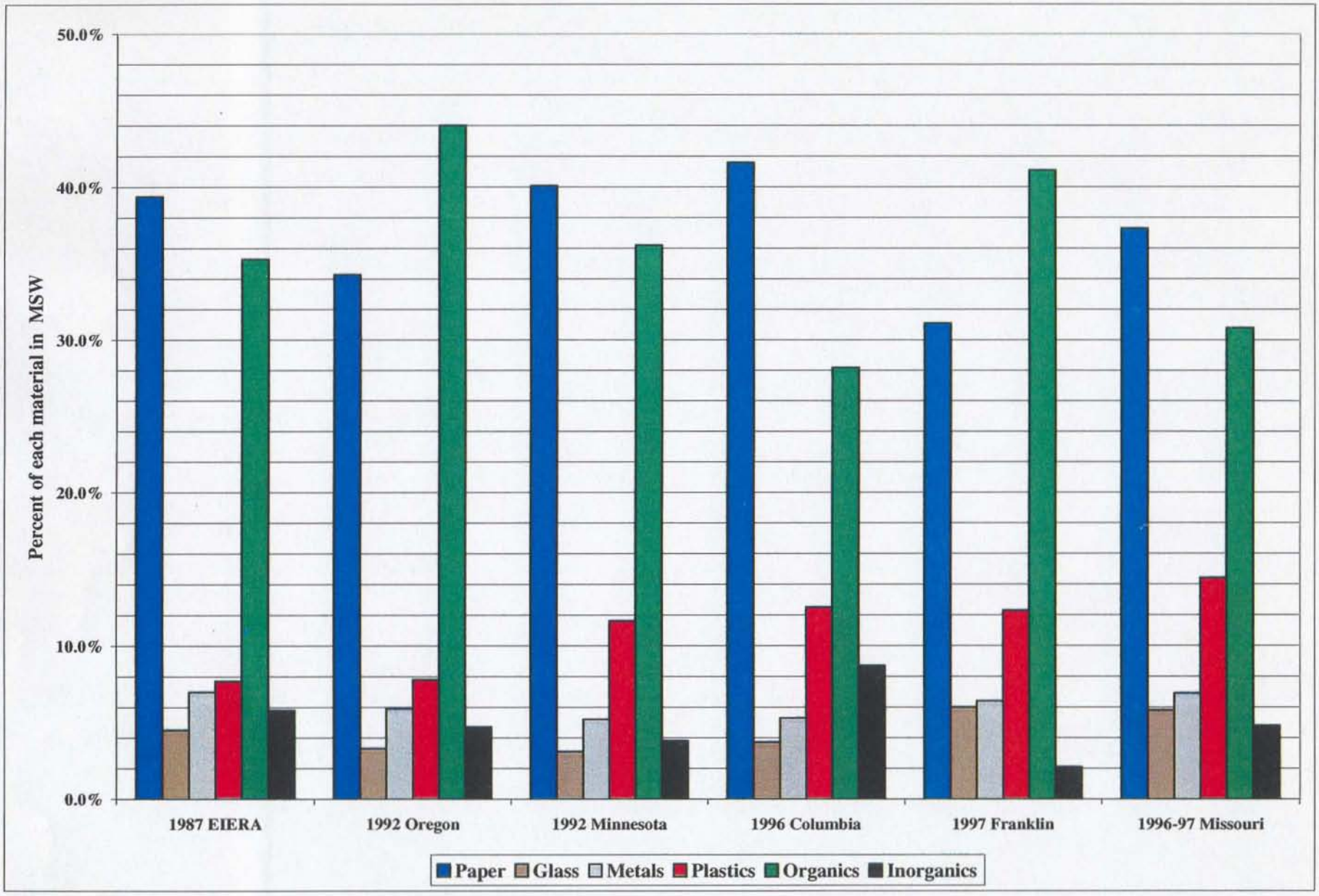
Characterization of Municipal Solid Waste in the United States: 1996 update
This study was funded, and distributed by the Environmental Protection Agency. It is better known in solid waste circles as the "Franklin Study". The authors of the study, Franklin and Associates use the "material flows methodology " to determine the composition of solid waste. This methodology is based on production data (by weight) for the materials and products in the waste component, with adjustments for imports, exports, and product lifetimes. The Franklin study defined categories differently than other waste composition studies. Main divisions include durable goods, Non-durable goods, containers and packaging, and other wastes. Materials can be listed in one or more of these major divisions. Every effort was made to maintain accuracy and still fit the "Franklin categories" into the categories used for comparisons.

Possible reasons for the differences between the waste composition studies
Comparisons between the different waste composition data is interesting. If we assume that the methodology used to conduct the study has provided accurate results, there seem to be two main components that effect the data. These two are banned items and recycling. The items that are banned from disposal in Missouri landfills are:

- Major appliances (white goods)
- Waste oil
- Lead-acid batteries
- Yard waste or clippings
- Whole Tires
- Small quantities of hazardous waste (large quantities were already banned)

The ban on yard waste seems to have a remarkable effect on reducing the amount of organic materials in the waste component. The organic component in the Missouri waste component is considerably lower than the organic materials in the other studies. The most plausible explanation seems to be the lack of yard waste.
Recycling also seems to have an effect on the composition of the waste component. Oregon, and Minnesota had strong recycling programs in effect during their waste sorts. The only Missouri location that has a similar recycling program is the City of Maryville. The percentage of "recyclable material" in the Maryville waste component seems to be comparable to the percentage of "recyclable material" within the Oregon and Minnesota waste component.

Comparable MSW Composition Studies



The Volume of the Waste Component

Most solid waste composition studies are recorded by weight. However, in many instances volume of the material may be more significant. Some examples are: calculations for landfill capacities, vehicle and storage space for recyclable materials, and compaction rates for waste haulers. This study attempted to quantify the volume of waste as well as the weight of that waste. During the sorting procedure all materials were placed into identical containers which were three cubic feet in volume. As the container was weighed, the volume of the material within that container was estimated. Both the weight and the volume were recorded on the sample data sheet.

The relationship between weight and volume found during the MSW waste sorts are listed below. **These volumes are for uncompacted waste.**

Category	Pounds per cubic foot	Cubic yards per ton
Cardboard	2.49	29.7
Newsprint	6.42	11.5
Magazines	8.51	8.7
High Grade Paper	5.20	14.2
Mixed Paper	4.07	18.2
Clear Glass	9.97	7.4
Brown Glass	9.39	7.9
Green Glass	8.25	9.0
Other Glass	9.61	7.9
Aluminum Cans	2.61	28.4
Other Aluminum	3.61	20.5
Non Ferrous Metals	6.50	11.4
Ferrous Food Cans	5.27	14.1
Other ferrous Metals	7.65	9.7
Oil Filters	12.60	5.9
PET #1 Plastic	1.95	38.0
HDPE #2 Plastic	1.88	39.4
Plastic Film	1.94	38.2
Other Plastics	2.46	30.1
Food Waste	11.25	6.6
Wood Waste	7.43	10
Textiles	5.28	14
Diapers	8.67	8.5
Other Organics	5.82	8.7
Fines	8.54	8.7
Other Inorganics	10.66	6.9

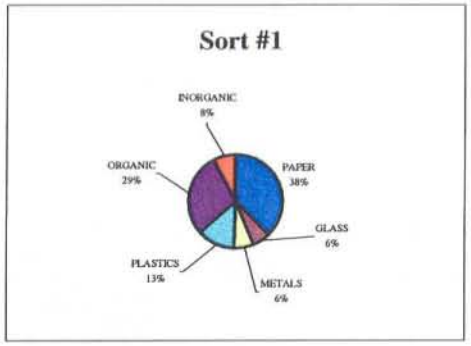
Seasonal Changes in the Waste Component

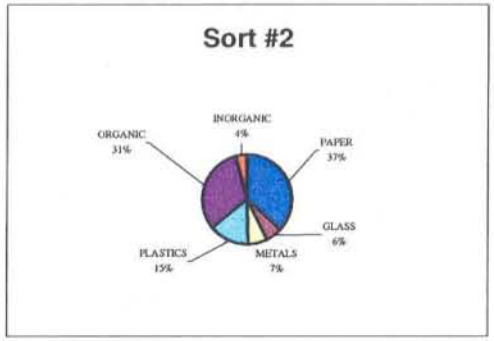
The table on page 116 reflects the percentage of each material found in the MSW (by volume) component during the three seasonal sorts. The seasonal sort average is based on the total volume of that material, divided by the total volume sorted during that round. The pie charts on page 117 compares the percentages in each major category found during each of the seasonal sorts and the bar graph illustrates the average percentage of each material found during the sorting process. The chart on page 119 compares weight percentages to volume percentages.

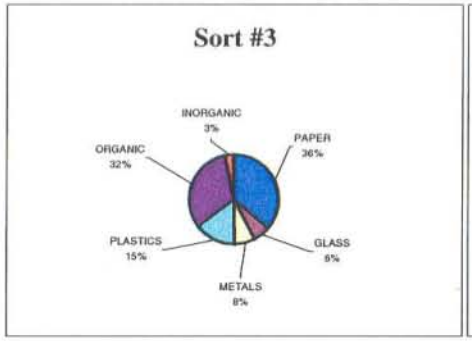
Seasonal Results by Volume

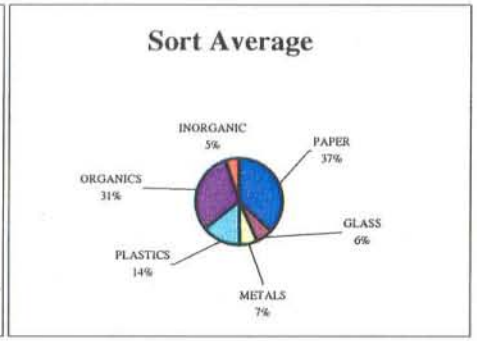
CATEGORY	SORT # 1 VOL.	SORT # 2 VOL.	SORT #3 VOL.	AVERAGE VOL.
Cardboard	11.8%	11.6%	11.5%	11.6%
Newsprint	5.5%	5.6%	5.7%	5.6%
Magazines	1.9%	1.8%	1.9%	1.9%
High Grade	3.2%	3.4%	3.4%	3.3%
Mixed	18.5%	17.5%	16.9%	17.7%
PAPER TOTALS	**40.9%**	**39.9%**	**39.3%**	**40.1%**
Clear	1.5%	1.3%	1.2%	1.3%
Brown	0.8%	0.8%	0.7%	0.7%
Green	0.2%	0.2%	0.2%	0.2%
Other	0.3%	0.3%	0.3%	0.3%
GLASS TOTALS	**2.8%**	**2.5%**	**2.4%**	**2.6%**
Alum. Cans	2.3%	2.8%	3.1%	2.8%
Other Alum	1.2%	0.9%	1.1%	1.1%
Non ferrous	0.2%	0.2%	0.1%	0.2%
Food Cans	3.1%	2.5%	2.9%	2.8%
Ferrous	0.7%	0.6%	0.7%	0.7%
Oil Filters	0.0%	0.0%	0.0%	0.0%
METAL TOTALS	**7.6%**	**7.1%**	**8.0%**	**7.5%**
PET # 1	4.1%	3.6%	3.9%	3.9%
HDPE # 2	4.8%	4.9%	5.8%	5.1%
Film	9.2%	8.5%	8.5%	8.8%
Other Plastic	12.4%	13.8%	13.6%	13.3%
PLASTIC TOTALS	**30.6%**	**30.8%**	**31.8%**	**31.0%**
Food Waste	6.9%	8.4%	8.0%	7.8%
Wood Waste	0.5%	0.5%	0.6%	0.5%
Textiles	3.5%	3.6%	3.3%	3.5%
Diapers	2.4%	2.0%	2.0%	2.1%
Other Organics	2.0%	2.9%	2.4%	2.4%
ORGANIC TOTALS	**15.4%**	**17.3%**	**16.2%**	**16.3%**
Fines	2.1%	1.7%	1.6%	1.8%
Other Inorganics	0.7%	0.7%	0.6%	0.7%
INORGANIC TOTALS	**2.8%**	**2.4%**	**2.2%**	**2.5%**
SORT TOTALS	**100%**	**100%**	**100%**	**100%**

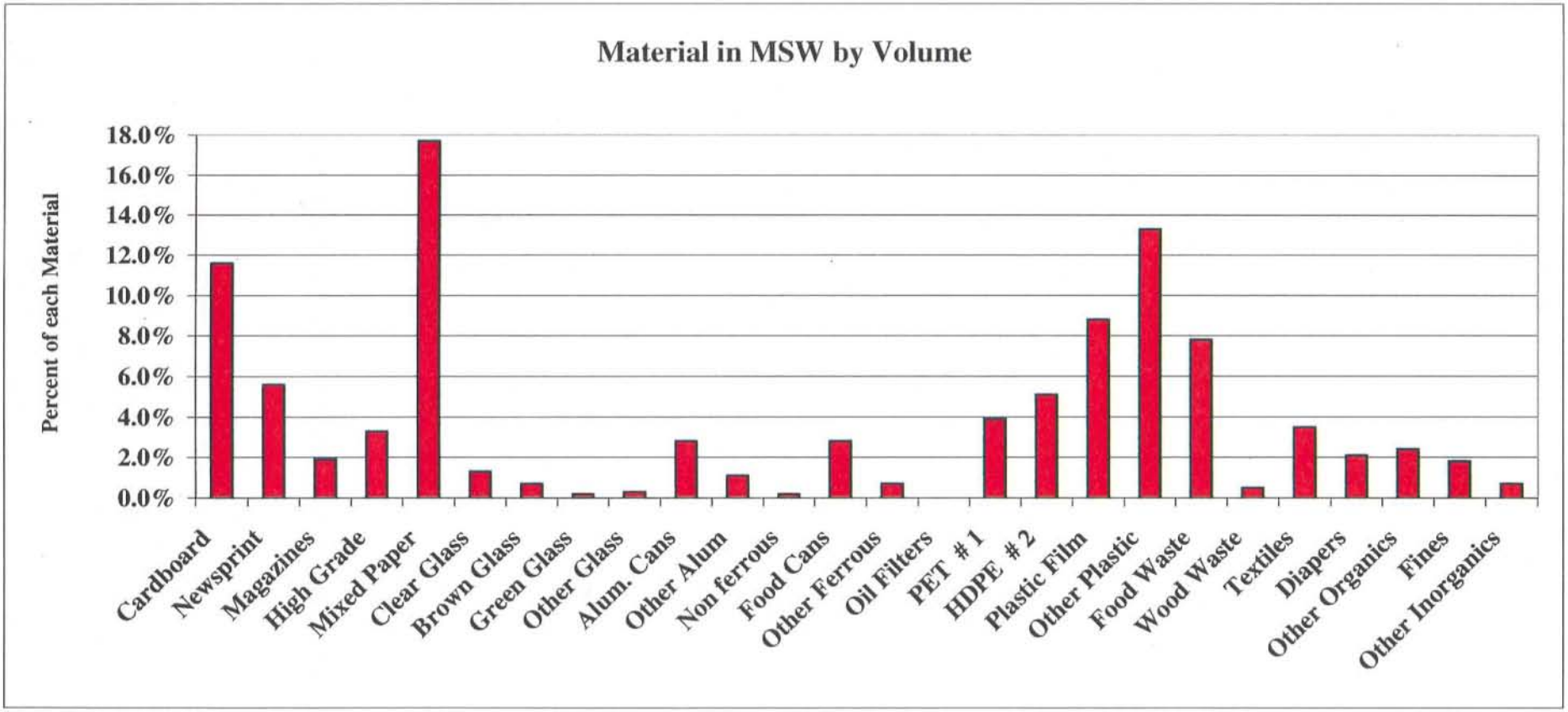
Municipal Solid Waste Composition by Volume



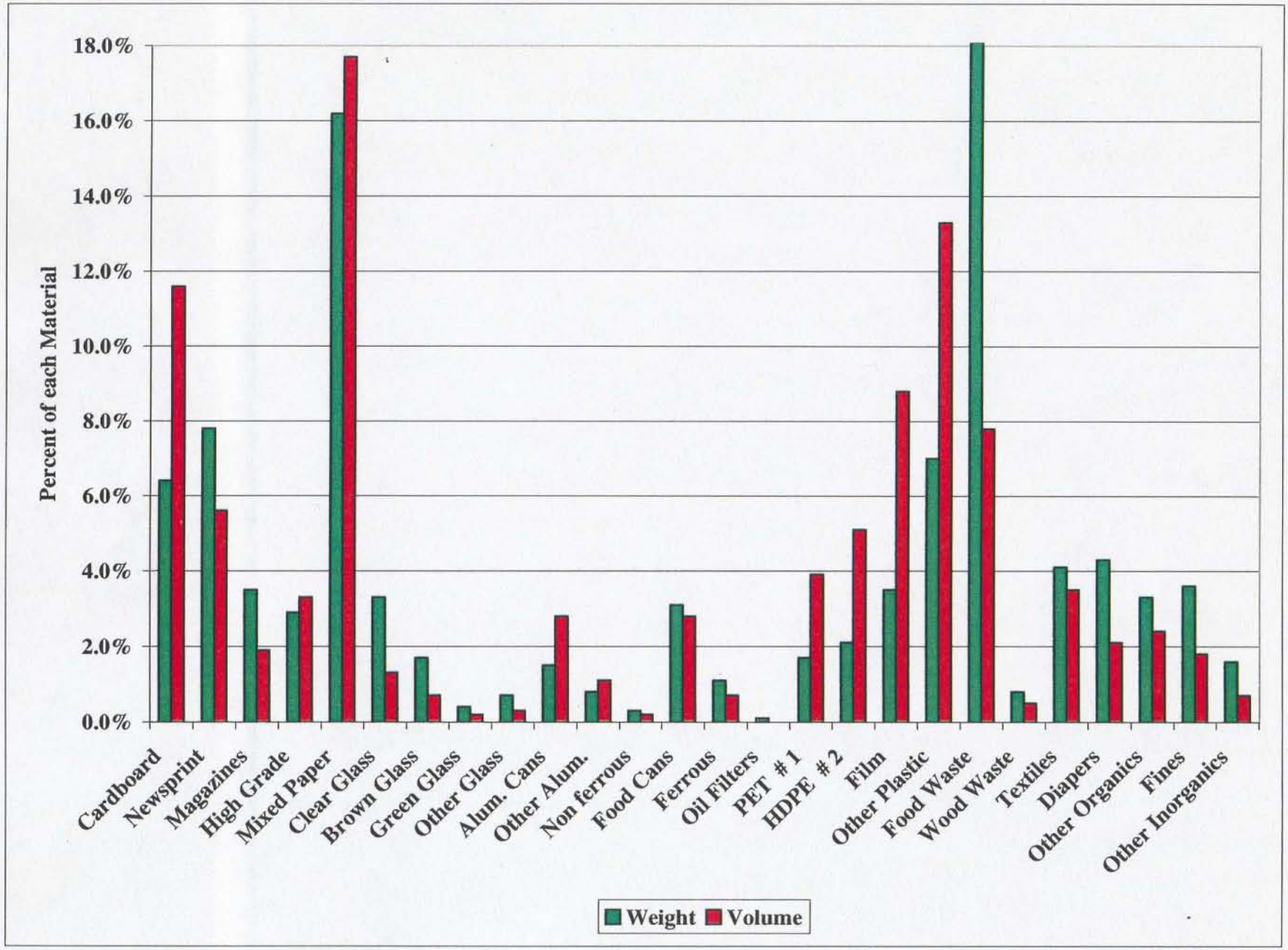








RELATIONSHIP BETWEEN WEIGHT AND VOLUME



Other Potentially Hazardous MSW Waste

One of the objectives of the *Missouri Waste Composition Study* was to measure the percentage of household hazardous wastes (HHW) in the municipal solid waste component. Household hazardous waste was not separated in the 1987 EIERA study but has been estimated at about 1% of the MSW component.

During the planning of the *Missouri Waste Composition Study* a category was established for Household Hazardous Waste. At the initial waste sort it became apparent that the definition of household hazardous waste was too vague to be of any significant value in the sorting process. Therefore a new category titled "other waste" was set up for any item or material which could possibly cause harm to the environment, ground water supplies, landfill liners, or solid waste handlers. The following is a list of the sub categories used to separate "other waste".

Over-the-Counter Medicine (OTC)- Medication bought over the counter. Examples: vitamins, antacid, aspirin, and cold medicine.

Prescription Medication (Rx)- Medication requiring a prescription. Examples: oral contraceptives, prescription inhalants, perspiration ointments, and vaccinations (human or animal).

Beauty/hygiene products- Items used for cosmetic or hygiene purposes. Examples: soap, shampoo, cosmetics, hair gel, deodorant, toothpaste, mouthwash, perfume/cologne, etc.

Beauty/hygiene aerosol products- Items in an aerosol can used for hygiene purposes. Examples: shaving cream, hair spray, deodorant.

Household cleaning products- Products used for cleaning items in a household. Examples: silver cleaner, floor wax, furniture oil, all-purpose chemical cleaners, bleach, dishwashing detergent, etc.

Household cleaning aerosol products- Products used for household cleaning in aerosol containers. Examples: furniture polish, oven cleaner, some glass cleaners, etc.

Aerosol Cans- Aerosol cans containing product. Examples: spray paint, some glues, and air fresheners.

Sharps/Blades- Items with sharp edges that could cause harm. Examples: knives, utility blades, saws.

Syringes and Needles

Automotive Products- Items used for car care and maintenance. Waxes, oils,

Hardware/Shop products- Items used for home improvement projects. Examples: rubber cement, caulking, wood stain, paint thinner, glue.

Gardening/Yard products- Items used for garden and lawn care and maintenance. Example: pesticides, plant food, garden chemicals, water treatment chemicals.

Pet Grooming Products- Items used to care for pets. Examples: pet medicines, shampoos.

Disposable razors

Alkaline batteries

Miscellaneous items- Unusual items which could be harmful but do not belong in any of the above.

These items were separated and listed by sub category. The results are on the chart on page 122. **The totals listed for each category are individual items and the container or package**. The percentage of "other waste" in the waste component was difficult to quantify because in many cases the container weighed more than the potentially hazardous contents.

POTENTIALLY HAZARDOUS ITEMS FOUND DURING WASTE SORTS

Solid Waste Management Districts

CATEGORY	A	B	C	D	E	F	G	I	J	K	L	M	N	O	P	Q	R	S	T	TOTAL
OTC Medicine	23	14	24	3	9	5	3	7	2	3	12	31	7	7	1	15	3	17	8	**194**
Prescription Medication	37	1	1	8	8	8	8	19	2	13	10	12	10	6	10	18	31	41	3	**246**
Beauty/Hygiene	45	10	18	23	40	14	16	17	5	9	76	21	10	16	25	21	21	24	21	**432**
Beauty/Hygiene Aerosols	10	2	5	2	1	2	2	5	3	2	6	4	7	9	2	2	0	8	1	**73**
Household Cleaning	5	3	1	3	6	3	3	3	2	5	4	9	4	11	0	3	2	6	1	**74**
Household Cleaning Aerosols	2	2	1	7	1	1	0	0	1	0	6	1	5	4	0	2	0	2	2	**37**
Other Aerosol Cans	4	0	2	12	4	8	14	4	3	2	4	11	4	1	3	6	1	9	5	**97**
Automotive products	7	0	0	0	7	1	2	0	1	0	3	6	0	3	1	1	3	1	0	**36**
Hardware/Shop Products	4	3	5	3	9	1	3	15	4	3	7	33	6	15	2	1	5	6	11	**136**
Gardening/Yard Products	1	2	0	0	4	2	1	3	1	0	2	1	2	7	0	0	3	3	2	**34**
Pet Grooming Products	2	0	0	0	3	2	0	1	0	0	1	0	0	1	1	0	0	1	0	**12**
Sharps/Blades	6	0	8	3	4	23	1	0	5	3	6	4	0	2	2	4	6	6	3	**86**
Syringes and Needles	196	47	20	23	10	6	33	31	50	40	11	5	26	31	39	40	70	20	22	**720**
Disposable Razors	52	28	18	29	31	11	27	18	11	23	27	56	20	5	35	59	53	39	17	**559**
Alkaline Batteries	106	45	44	69	53	30	28	42	25	37	31	61	40	30	28	68	47	74	62	**920**
Miscellaneous Items	24	11	2	10	7	9	12	16	7	4	3	10	7	5	10	19	8	7	5	**176**
Total Items Found	**524**	**168**	**149**	**195**	**197**	**126**	**153**	**181**	**122**	**144**	**209**	**265**	**148**	**153**	**159**	**259**	**253**	**264**	**163**	**3,832**

CONSTRUCTION WASTE

Construction waste is normally combined with demolition waste and described as "construction and demolition" (C&D). There are many definitions for C&D. Virtually every state has a slightly different definition for C&D waste. The EPA's *Characterization of Building-Related construction and Demolition Debris in the United States* (EPA530-R-98-010) contains a partial list of these varied state definitions. For the purpose of this study, C&D waste is defined as the waste resulting from new construction, remodeling, or the demolition of a structure.

However there are some differences between construction and demolition waste. Construction waste loads were usually transported to the landfill in open top roll-off containers, dump trucks, or open trailers. The construction loads tended to be lighter, less weathered, more homogeneous (all wood, dry wall, etc), and contained more cardboard boxes (usually from fixtures) than the demolition waste loads. In most cases it was relatively easy to visually differentiate between the construction and demolition loads. The most difficult loads to identify were from remodeling projects. These loads contained some new material and some demolition materials. In those cases, the load was analyzed and the waste components assigned percentages. For instance a remodeling load might be estimated to be 60% construction and 40% demolition. The materials within each of these components were then estimated.

Although most loads could be easily identified visually, drivers were interviewed when possible to determine where the load originated. If a load was identified as construction waste, the percentage of each material within the load was visually estimated. Visual estimates were made during and after the load was dumped. After each load was dumped the project manager walked around the waste to identify waste materials and assign material percentages. Typically, the percentage of the predominate material was estimated first (for instance wood might be estimated at 60% of the load) and secondary materials followed, (dry wall material might be 30%, and the remaining 10% might be cardboard). Materials were estimated until 100% of the load was assigned. Obviously this was a non-scientific analysis because all data was subjective. However, materials were relatively easy to differentiate and the same person did all the estimates in order to maintain consistency. The following materials were observed and estimated as part of the construction waste component:

Wood: Waste materials that are predominately *new* wood from new construction. This may include plywood, chipwood, dimensional lumber (2x4's, etc.) shavings and sawdust.

Drywall: Gypsum wallboard that is a waste product from *new* construction.

Masonry: Inert materials such as brick, concrete, rock, and dirt that originated at a construction site. This masonry material was "cleaner" and "newer" than the demolition masonry materials.

Metal: Metallic materials that were a waste product of *new* construction. This material consisted of new metal studs and metal beams and pipes

Plastic: Plastic waste materials used in *new* construction. This included PVC plumbing pipe, PVC siding, Styrofoam insulation, and plastic sheet.

Cardboard: Cardboard boxes, box board, and cardboard packing material.

Other: Any waste materials originating from *new* construction which do not fit into the one of the categories above. These materials include fiberglass insulation, electrical wiring, paper, and MSW from job sites

The Construction Waste Component

About 5.5 percent of the solid waste in Missouri landfills is construction waste. However this percentage varies greatly from metropolitan to rural areas. The percentage of each construction waste material (wood, drywall, etc.) within each of the population groups is very similar but the amount of construction waste in large metropolitan areas is much higher than the rural areas.

The large metropolitan areas (St. Louis and Kansas City) account for about 58% of Missouri's total waste but 88% of the state's construction waste. Likewise, the rural areas account for 34% of the total waste but only 5% of the construction waste. There seems to be several reasons for this difference.

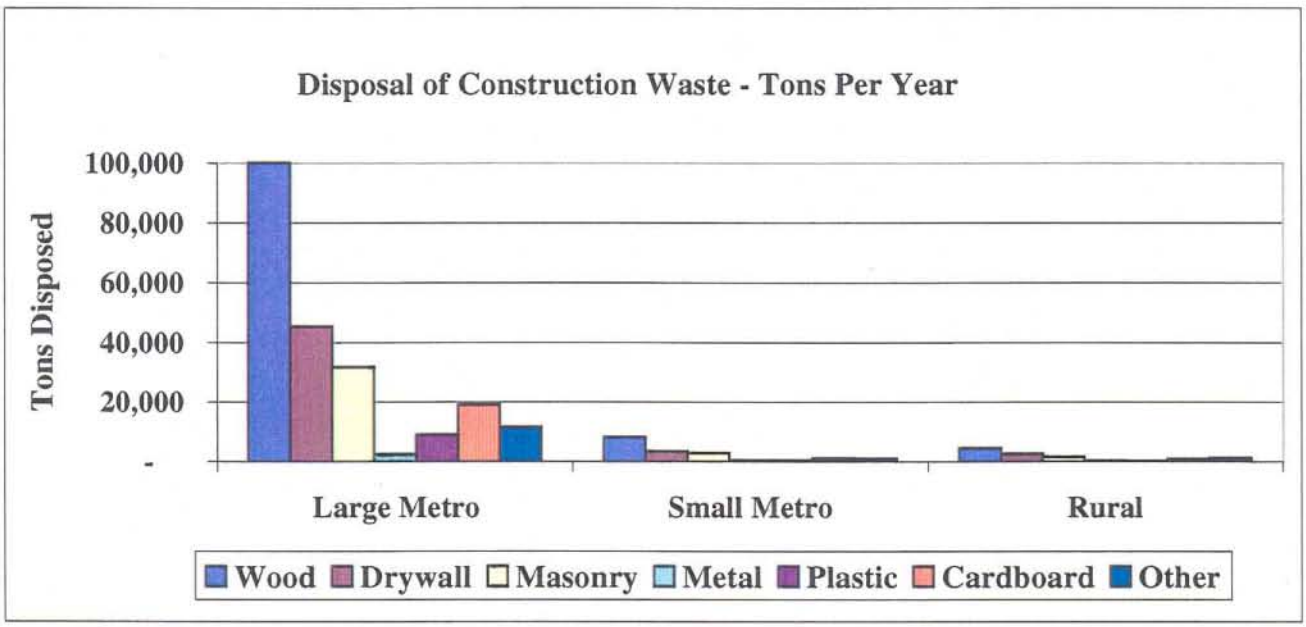
1. There is more construction in the metropolitan areas than the rural areas.
2. The metropolitan areas have more regulations concerning waste disposal and enforcement of illegal dumping activities.
3. Many rural areas allow open burning and therefore much of the carbon-based waste is burned and not disposed in landfills.
4. Many urban construction contracts require proper disposal in landfills, whereas many rural construction contracts leave disposal options unstated.

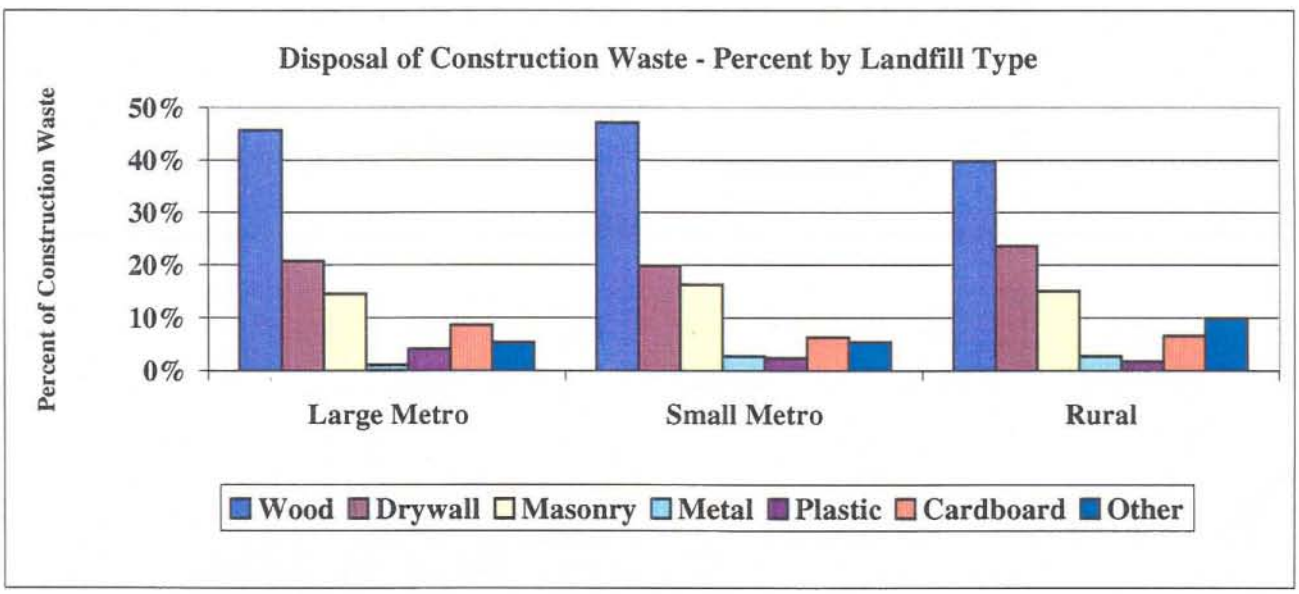
Recovery of some construction waste may be possible in the larger metropolitan areas where there are large construction waste volumes. However recovery in rural areas, where volumes are very low, seems to be impractical.

The table and charts on page 125 illustrate the composition of construction waste materials in large metropolitan, small metropolitan, and rural landfills. The construction waste for each of the observed landfills can be found in the landfill chapters.

Construction Waste Components

	Large Metro		Small Metro		Rural		State Average	
Materials	**%**	**Tons**	**%**	**Tons**	**%**	**Tons**	**%**	**Tons**
Wood	46%	100,208	47%	8,253	40%	4,447	45%	112,908
Drywall	21%	45,467	20%	3,461	24%	2,630	21%	51,558
Masonry	14%	31,772	16%	2,837	15%	1,681	15%	36,290
Metal	1%	2,485	3%	476	3%	305	1%	3,266
Plastic	4%	9,002	2%	411	2%	195	4%	9,608
Cardboard	9%	18,925	6%	1,113	7%	740	8%	20,778
Other	5%	11,662	5%	950	10%	1,109	6%	13,721
Total	**100%**	**219,520**	**100%**	**17,500**	**100%**	**11,172**	**100%**	**248,192**





DEMOLITION WASTE

Demolition waste is normally combined with construction waste and described as "construction and demolition" (C&D). There are many definitions for C&D. Virtually every state has a slightly different definition for C&D waste. The EPA's *Characterization of Building-Related construction and Demolition Debris in the United States* (EPA530-R-98-010) contains a partial list of these varied state definitions. For the purpose of this study, C&D waste is defined as the waste resulting from new construction, remodeling, or the demolition of a structure.

The demolition component of C&D is quite different from the construction component. Construction waste materials tend to be more homogeneous (all new wood, or new drywall, etc.) and for the most part are easier to separate and recycle. The demolition waste materials tended to be mixed with a variety of materials, and more difficult to separate and recover.

Demolition loads fit into two broad categories; remodeling and debris.

The remodeling loads were often mixed with new construction materials. Residential remodeling loads had a higher percentage of wood while commercial remodeling projects contained more metal. Most remodeling loads arrived in open top roll-off containers or were self-hauled in pick-up or trailers.

Debris loads were essentially structures that were knocked down by heavy equipment and loaded onto dump trucks for transport to the landfill. Debris loads usually contained masonry materials (dirt, rock, concrete, and brick) that were mixed with wood, roofing, carpet, drywall and small amounts of metal. The materials were mixed and usually shredded, broken, and smashed. Therefore debris loads are much more difficult to recover materials. In many cases, a debris load consisted of dirt, rock, or masonry materials. These masonry loads were very heavy and tended to skew the overall numbers.

The following materials were observed and estimated as part of the demolition waste component:

Wood: Wood waste from the demolition or remodeling of a structure. The wood was typically weathered, painted, and in many cases attached to some other material.

Drywall: Gypsum wallboard, which has been removed from a structure.

Roofing: Shingles that were torn off of existing roofs in anticipation of putting new shingles on the structure. In most cases these shingles were delivered to the landfill in dump trucks or trailers and not mixed with any other materials.

Masonry: Inert materials such as brick, concrete, rock, and dirt that were removed from a demolition site. These materials were normally mixed with other demolition materials such as wood, drywall, etc.

Metal: Metallic items that were removed during the remodeling or demolition of a structure.

Carpet: Carpeting that was removed and disposed of during the remodeling and or demolition of a structure.

Other: Any other materials, not listed above, that was removed and disposed of during the remodeling and or demolition of a structure. These included insulation, roofing insulation board, plastics, and small amounts of MSW or bulky items.

The Demolition Waste Component

About 13 percent of the solid waste in Missouri landfills is demolition waste. This percentage varies greatly from metropolitan areas to rural areas. As was the case in construction waste, the metropolitan demolition component is much higher than rural demolition waste.

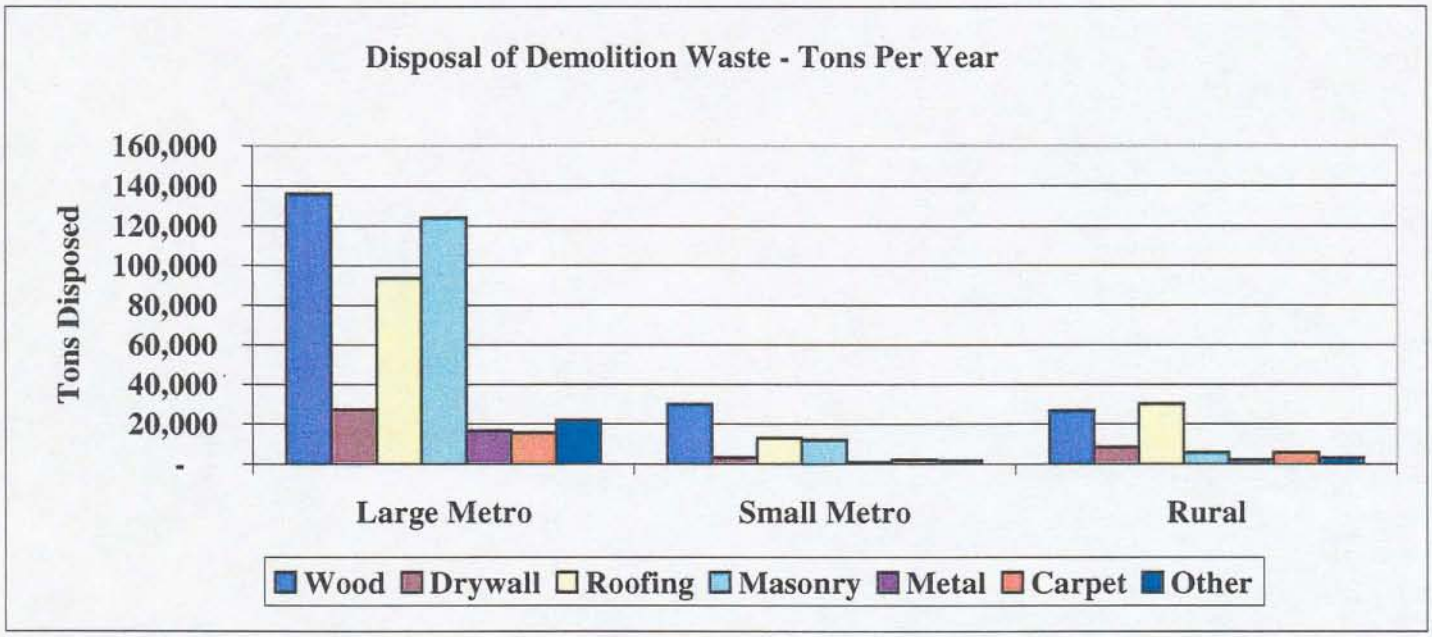
Unlike the construction waste component, the percentage of demolition waste materials (wood, dry wall, etc.) differed greatly from metropolitan areas to rural areas.

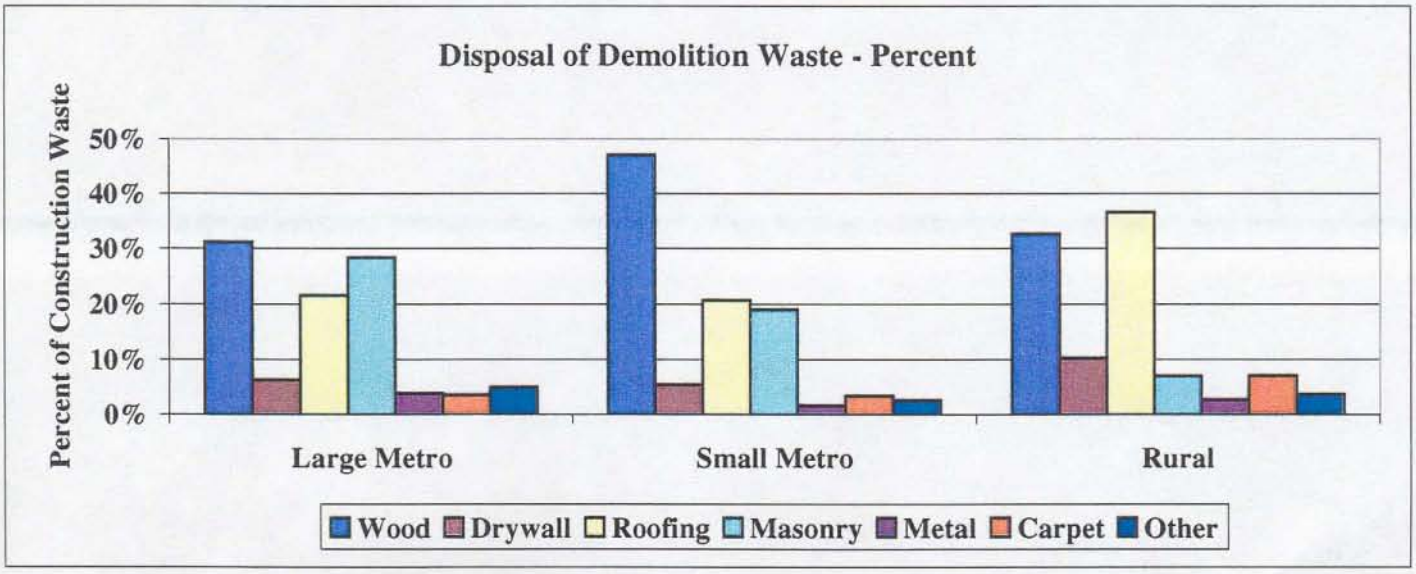
1. Roofing waste was significantly higher in rural areas. The age of many structures may be older in rural areas than the metropolitan areas, thereby requiring more repairs (tear off and re-roofing).
2. The percentage of masonry (dirt, rock etc.) was significantly less in rural areas. Ordinances and enforcement on demolition projects in rural areas may be less restrictive than metropolitan areas. Also, some masonry loads (dirt and rock, etc.) may be illegally disposed in rural areas
3. Wood waste was significantly higher in small metropolitan areas. During the observation period at the City of St. Joseph Landfill several trucks containing wood debris from a flood related demolition project were recorded. The unusually large amount of demolition debris received during the observation period may have inflated the amount of this material normally received by the landfill.

The table and graphs on the following page illustrate the distribution of demolition waste materials in Missouri landfills. The demolition waste for each of the observed landfills can be found in the landfill chapters.

Demolition Waste Component

	Large Metro		Small Metro		Rural		State Average	
Materials	%	Tons	%	Tons	%	Tons	%	Tons
Wood	31%	136,045	47%	29,980	33%	26,827	33%	192,852
Drywall	6%	27,392	5%	3,471	10%	8,413	7%	39,276
Roofing	22%	93,866	21%	13,155	37%	30,096	24%	137,117
Masonry	28%	123,924	19%	12,100	7%	5,770	24%	141,794
Metal	4%	16,651	2%	1,073	3%	2,265	3%	19,989
Carpet	4%	15,779	3%	2,188	7%	5,843	4%	23,810
Other	5%	21,961	3%	1,653	4%	3,027	5%	26,641
Total	100%	436,426	100%	63,620	100%	82,241	100%	582,287





INDUSTRIAL WASTE

Industrial waste is difficult to define. In the broadest sense all waste from commercial operations could fall into the industrial category. The waste from a fast food restaurant is technically industrial processed waste because the waste (food scraps, paper, plastics) are all part of the manufacturing process resulting from the creation of a product. However, it is difficult to separate some of this waste from the normal municipal solid waste (MSW).

In many cases, the waste from small manufacturing, commercial, and institutional generators is collected in packer trucks. These packer trucks make hundreds of stops each day and combine the waste from each stop. In many cases the same truck that picks up residential waste will also pick up commercial and institutional waste. In fact, these small waste commercial generators were included in the waste sorts of MSW conducted in 1996-97.

For the purpose of this study industrial waste is defined as follows:

- Waste from an industrial, manufacturing, or commercial operation
- Waste that was visibly homogeneous (all the same type of material)
- Waste from a single waste generator and not combined with other generators

In most cases the industrial waste was delivered to the landfill in open top roll-off containers, roll-off compactor units, dump trucks, or oversized trailers. The materials within these vehicles and/or containers was a result of a manufacturing or industrial process. In many cases the waste materials were wooden pallets, crating material, strapping, or cardboard. These materials were not a direct waste product of the manufacturing process, but they were an indirect waste product of the manufacturer.

The following materials were observed and estimated as part of the industrial waste component:

Cardboard: Corrugated containers. Whole, flattened, shredded, or baled.

Paper: Paper materials included wrapping waste, overruns from printing, and office paper from a single waste generator.

Food: Human or animal food wastes resulting from processing or overruns.

Metal: Metallic waste material from a single waste generator. Does not include metal sludges, which were categorized as "other".

Wood: Includes wooden palates, crating, waste from wood processing and sawdust.

Plastics: All plastic resin waste including, processed waste, packing materials, and plastic resin sludges.

Textiles: Includes clothing, rags, and processed cloth waste.

Rubber: Includes auto and truck tires from tire shredders, and processed rubber waste materials and overruns.

Other: All industrial processed wastes that were not included above. The great majority of this category was waste products from metal processing plants. This included foundry sand, aluminum ore waste products, and carbon black.

The Industrial Waste Component

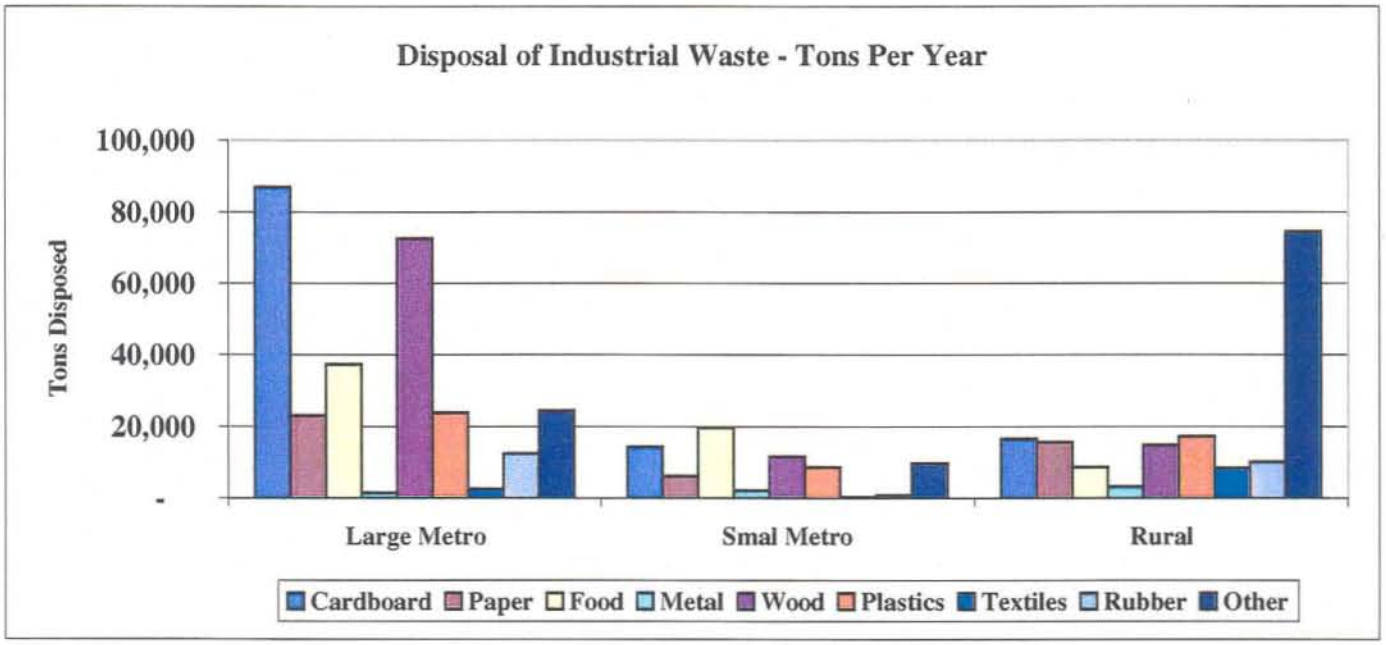
About 12 percent of the solid waste in Missouri landfills is industrial waste (as it is described above). The industrial waste component varied greatly from one landfill to another. Food wastes were considerably higher in the western portion of the state (Kansas City and St. Joseph). Large amounts of aluminum ore were received at the Lemons landfill in Dexter. Large amounts of rubber waste were received at the Peerless and Fred Weber landfills (from the Tire Shredders) and Butler County (from the Gates Rubber plant). Oak Ridge and Lamar received large amounts of foundry sand from local foundries.

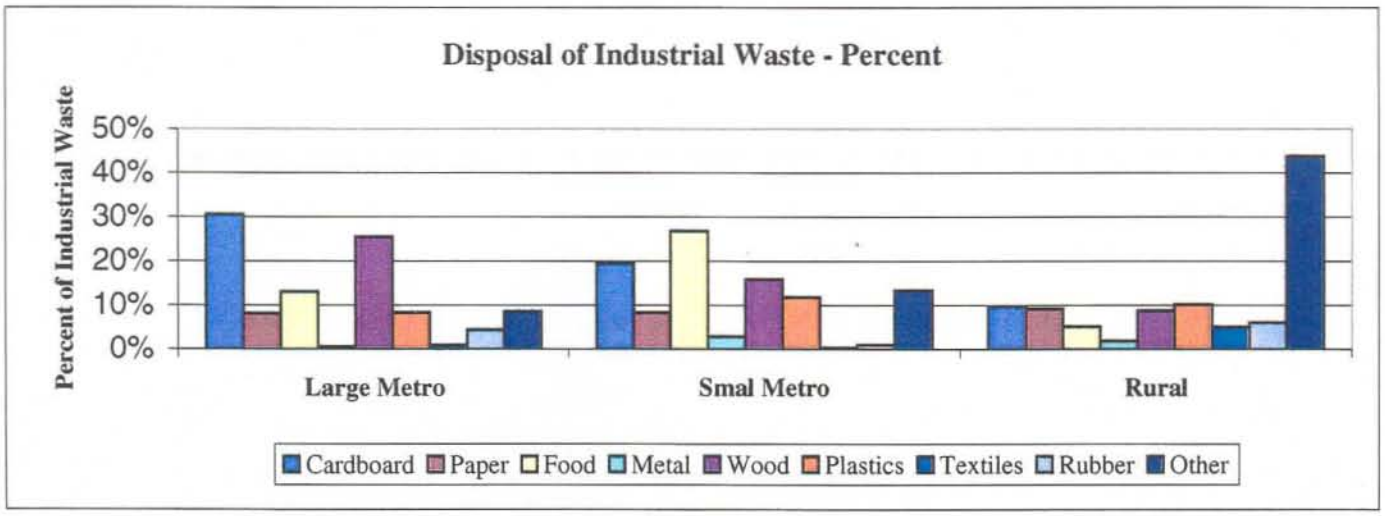
Cardboard (in the form of boxes) and wood (in the form of pallets, crates and sawdust from wood processing plants) accounted for more than 50% of the large metropolitan industrial waste. Food waste was the most prevalent industrial material in the small metropolitan landfills. Waste products from metal processing plants (aluminum smelting by products, foundry sand, and carbon black) accounted for almost half of the rural industrial waste component.

The table and graphs on the following page illustrate the distribution of industrial waste materials in Missouri landfills. The industrial waste for each of the observed landfills can be found in the landfill chapters.

Industrial Waste Component

	Large Metro		Small Metro		Rural		State Average	
Materials	%	Tons	%	Tons	%	Tons	%	Tons
Cardboard	31%	87,000	20%	14,397	10%	16,662	22%	118,059
Paper	8%	23,025	8%	6,149	9%	15,761	9%	44,935
Food	13%	37,333	27%	19,698	5%	8,691	12%	65,722
Metal	0%	1,414	3%	2,110	2%	3,216	1%	6,740
Wood	26%	72,612	16%	11,741	9%	14,960	19%	99,313
Plastics	8%	23,926	12%	8,703	10%	17,363	9%	49,992
Textiles	1%	2,496	0%	253	5%	8,516	2%	11,265
Rubber	4%	12,507	1%	752	6%	10,261	4%	23,520
Other	9%	24,438	13%	9,844	44%	74,629	21%	108,911
Total	100%	284,752	100%	73,546	100%	170,060	100%	528,358





OTHER WASTE

The "Other" category includes all the materials that do not fit neatly into one of the previously discussed waste components. This is a category that is often overlooked by solid waste management planners but represents a very significant portion of the waste stream.

The following materials were observed and estimated as part of the "other" waste component:

Bulky items: Includes furniture, mattresses, box springs, bicycles, large appliances, and any other household item that will not fit into a normal size trash bag.

Soil: Includes contaminated and non-contaminated soil. This soil was unloaded in a separate area of the landfill and normally used for daily cover. If the soil was unloaded on the face and mixed immediately it was classified as demolition masonry.

Asbestos: Insulation made with asbestos fibers and declared to be special waste. This item was handled with special care at the landfill. In most cases the asbestos loads were estimated by volume and therefore a 3:1 ratio was used to convert volumes to weight.

Other: This category included everything that did not fit into any of the components and material categories mentioned previously. Materials included municipal sewage sludge, unidentifiable sludge, commercial yard waste and stumps, and all other unidentifiable materials.

The "Other" Waste Component

The other waste component was the most surprising part of the study. Most solid waste planners understand the importance of MSW, C&D, and industrial waste. However, during observation periods over 10% of the total solid waste received at landfills fell into the "other" category. By far the highest percentage material was soil (69%).

We don't normally think of soil as solid waste but it was received as waste, reported to DNR as waste, and put into the landfill as waste. There were two main categories of soil.

Contaminated soil came from remediation projects (soil around underground tanks, soil from a hazardous spill area, etc.). The contaminated soil was normally set off to the side of the working face and allowed to "air out" for a period of time. At some later time this materials was used for daily cover.

Clean soil was also delivered to the landfill and listed as solid waste. Some landfills gave special rates to contractors that brought clean soil to the landfill because it saved the landfill the expense of hauling daily cover. However at each of the observed landfills, this clean soil, used for daily cover, was reported as solid waste and the surcharge paid to DNR.

About 13% of the Other waste component were bulky items. These were normally furniture, mattresses, and other large items that could not be neatly put into a trash bag for pick up. Clean-up contractors or individuals hauling their own bulky items in a pick-up or trailer brought many of the bulky items to the landfill. Many rural communities have a "clean-up" week and the amount of bulky material received was higher during these times. The City of Kansas City has two trucks with grapple arms that pick up bulky items in the Kansas City area year round.

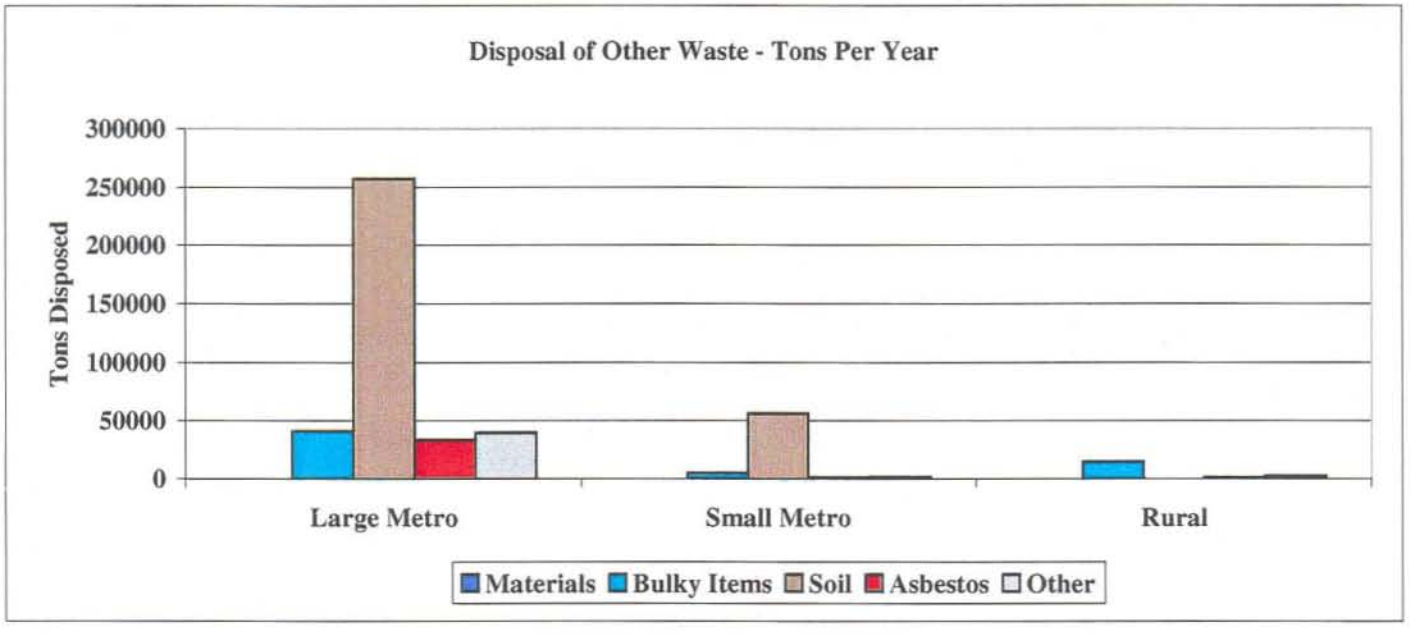
Asbestos was recorded at 0.8% but that figure is misleading. Asbestos is charged for by the cubic yard. Therefore if a 40-yard closed container is hauled with asbestos, the landfill charges for 40 yards. The universal conversion rate is 3:1 (3 cubic yards equal 1 ton). However asbestos is normally light and therefore those conversion rates tend to inflate the actual figures.

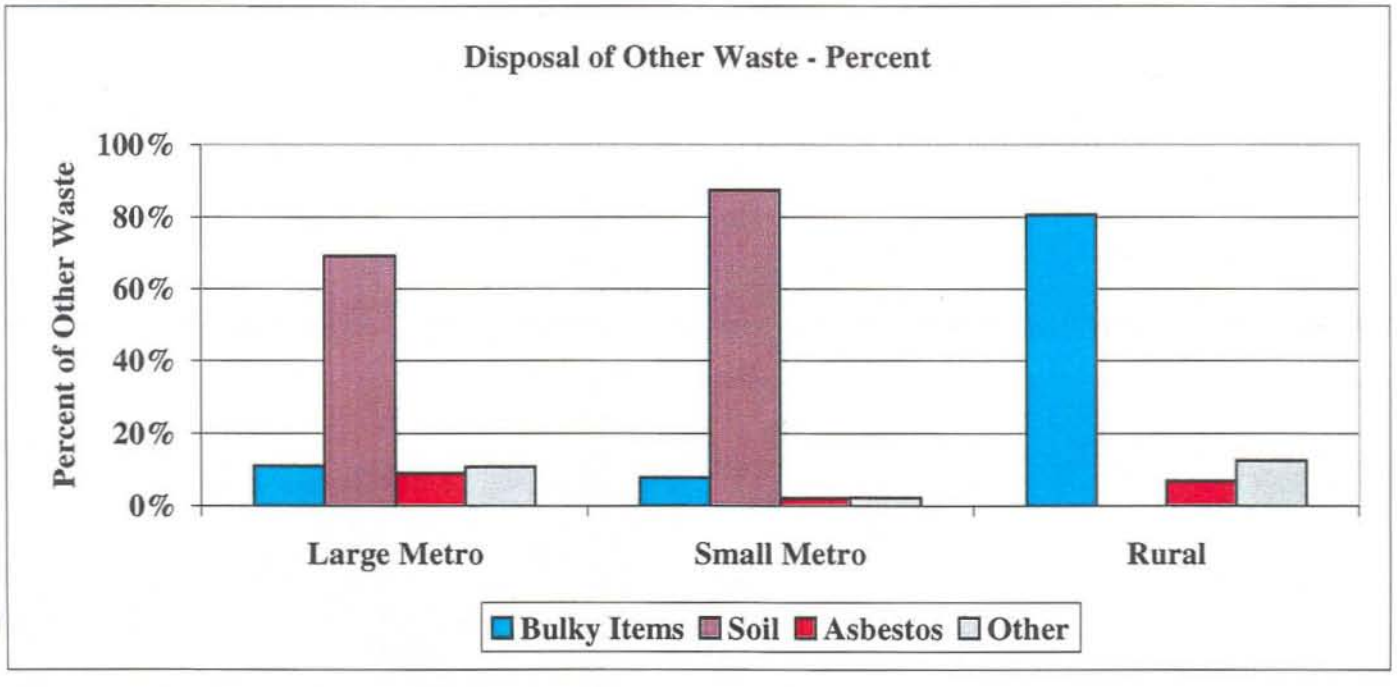
The remainder of the Other waste component was sewage sludge, commercial yard waste, stumps, and organic materials from non-industrial processes. The sewage sludge was very heavy and most loads weighed over 15 tons.

The table and graphs on the following page illustrate the distribution of other waste materials in Missouri landfills. The other waste for each of the observed landfills can be found in the landfill chapters.

The Other Waste Component

	Large Metro		Small Metro		Rural		State Average	
Materials	%	Tons	%	Tons	%	Tons	%	Tons
Bulky Items	11%	41,096	8%	5,071	81%	14,616	13%	60,783
Soil	69%	257,316	88%	56,290	0%	-	69%	313,606
Asbestos	9%	33,826	2%	1,369	7%	1,250	8%	36,445
Other	11%	40,038	2%	1,490	13%	2,270	10%	43,798
Total	**100%**	**372,276**	**100%**	**64,321**	**100%**	**18,136**	**100%**	**454,733**





GEOGRAPHICAL VARIATIONS IN SOLID WASTE DISPOSAL

The population densities of Missouri fall into three main categories. According to the Missouri State Census Data Center, Missouri is comprised of two large metropolitan areas, three small metropolitan areas, and the remainder is classified as rural. The composition and quantity of waste received by a landfill is greatly affected by the density of the population it serves.

Metropolitan areas have more regulations associated with waste management than their rural counterparts. For example; most metropolitan areas have bans on burning MSW but many rural areas do not, most industries locate in a metropolitan area to take advantage of labor forces and efficient transportation networks, and construction and demolition waste is more prevalent in metropolitan areas. Therefore the composition of solid waste varied significantly between metropolitan and rural landfills.

The following three sections of this report characterize the solid waste components of the large metropolitan, small metropolitan, and rural areas of the state. All observations were done between October 1998 and May of 1999. The estimated tonnage for each material and component is based on actual tonnage reported to the Missouri Department of Natural Resources.

All percentages are based on observations and extrapolations as explained in the introduction. The percentage of waste components and their materials were multiplied by the actual tonnage reported to Missouri DNR. Those tonnage totals were then combined with other geographically similar landfills to produce a profile of each type of landfill (large metropolitan, small metropolitan, and rural).

LARGE METROPOLITAN AREAS

Over half of Missouri's population resides within the states two large metropolitan areas. According to the Missouri State Census Data, the population of the St. Louis metropolitan area is 2,444,099, and the population of the Kansas City Metropolitan area is 1,566,280. However there are major difference between the waste flows from each area. Both metropolitan areas export waste to neighboring states.

St. Louis

The five St. Louis landfills (three sanitary and two C&D) received 1,767,353 tons of waste in 1998. The Oak Ridge Landfill in West St. Louis County is owned by Superior Waste Services. The Bridgeton Landfill in Bridgeton is owned by Allied Waste Services. The Fred Weber Inc. Landfill in Maryland Heights is owned and operated by Fred Weber Inc. The Peerless C&D landfill is located in West St. Louis County, and the Rockhill C&D landfill is located in an old quarry in Rockhill.

In addition, the St. Louis area exports a considerable amount of waste to Illinois. The City of St. Louis South Transfer station exported about 280,000 tons, the Waste Management Inc. transfer stations exported over 66,000 plus individual packer loads, and Republic exported about 30,000 tons to Illinois in 1998. The State of Illinois reported receiving 1,154,657 tons of waste from Missouri.

In addition to the export situation, the ownership of private hauling companies and landfills seem to change almost weekly. The largest national companies in the solid waste industry are vertically integrated. It makes good business sense to own the hauling division, transfer station, transportation companies and of course the final destination for most solid waste, the landfill.

The table on page 142 lists the composition of the three St. Louis landfills and the table on page 143 combines the sanitary and C&D waste for the five St. Louis landfills (3 sanitary and 2 C&D).

The Chart on page 145 illustrates the waste distribution and composition of St. Louis solid waste. The bar graph at the bottom of page 145 illustrates the tonnage for all materials regardless of their origins. The materials are combined into the following categories.

Paper:	Includes MSW, construction cardboard, industrial cardboard and paper.
Glass:	MSW only
Metals:	Includes metals from MSW, construction, demolition, and industrial.
Plastics:	Includes MSW, construction, and industrial.
Organics:	Includes MSW, industrial food, textiles, and rubber.
Inorganics:	Includes MSW, construction and demolition drywall, construction and demolition masonry, and soil
Wood:	Includes construction, demolition, and industrial wood.
Roofing:	Demolition roofing only
Other Items:	Includes "other" items from each component plus demolition carpet and asbestos.
Bulky Items:	Includes furniture and other materials too large to be disposed in bags.

ST. LOUIS SANITARY LANDFILL COMPONENTS

MATERIAL	Oak Ridge		Fred Weber		Bridgeton		Total St. Louis	
	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*
Municipal Solid Waste								
Paper	20.5%	53,778	11.6%	37,411	24.9%	227,412	21.3%	318,601
Glass	3.2%	8,359	1.8%	5,812	3.9%	35,369	3.3%	49,540
Metals	3.8%	9,937	2.1%	6,869	4.6%	42,025	3.9%	58,831
Plastics	7.9%	20,769	4.5%	14,478	9.6%	87,825	8.2%	123,073
Organics	16.9%	44,438	9.6%	30,859	20.6%	187,771	17.6%	263,068
Inorganics	2.6%	6,909	1.5%	4,756	3.2%	29,308	2.7%	40,973
TOTAL MSW	55.0%	144,190	31.2%	100,185	66.7%	609,710	57.0%	854,085
								-
Construction Waste								-
Wood	2.1%	5,587	7.6%	24,518	2.1%	19,274	3.3%	49,379
Dry Wall	1.3%	3,390	4.1%	13,210	0.8%	7,153	1.6%	23,754
Masonry	1.8%	4,649	1.3%	4,333	0.8%	7,551	1.1%	16,532
Metal	0.0%	128	0.2%	634	0.0%	99	0.1%	861
Plastic	0.1%	367	0.6%	1,797	0.2%	2,086	0.3%	4,250
Cardboard	0.2%	567	1.4%	4,544	0.5%	4,471	0.6%	9,582
Other	0.2%	580	0.7%	2,325	0.1%	695	0.2%	3,600
TOTAL CONSTRUCTION	5.8%	15,268	16.0%	51,361	4.5%	41,330	7.2%	107,958
								-
Demolition Waste								-
Wood	2.1%	5,629	8.9%	28,745	2.1%	18,777	3.5%	53,152
Dry Wall	0.1%	337	1.8%	5,812	0.8%	6,855	0.9%	13,004
Roofing	0.6%	1,608	8.1%	25,892	0.6%	5,266	2.2%	32,765
Masonry	2.1%	5,629	10.0%	32,021	1.9%	17,784	3.7%	55,434
Metal	0.3%	798	1.8%	5,812	0.3%	2,285	0.6%	8,895
Carpet	0.4%	972	1.3%	4,227	0.5%	4,173	0.6%	9,372
Other	0.2%	571	2.5%	8,137	0.1%	993	0.6%	9,702
TOTAL DEMOLITION	5.9%	15,545	34.4%	110,648	6.1%	56,133	12.2%	182,325
								-
Industrial Waste								-
Cardboard	1.4%	3,761	1.9%	6,129	4.8%	43,416	3.6%	53,307
Paper	1.2%	3,190	0.7%	2,114	0.7%	6,557	0.8%	11,861
Food	0.5%	1,395	0.0%	-	0.0%	-	0.1%	1,395
Metal	0.1%	247	0.0%	106	0.0%	99	0.0%	452
Wood	0.7%	1,753	0.9%	2,959	4.0%	36,263	2.7%	40,975
Plastic	1.1%	2,981	0.5%	1,691	0.9%	8,643	0.9%	13,315
Textiles	0.0%	-	0.1%	211	0.3%	2,285	0.2%	2,496
Rubber	0.1%	158	2.7%	8,560	0.0%	199	0.6%	8,917
Other	3.2%	8,487	0.0%	-	0.4%	4,073	0.8%	12,560
TOTAL INDUSTRIAL	8.4%	21,972	6.8%	21,770	11.1%	101,536	9.7%	145,278
								-
Special Wastes								-
Bulky Items	0.5%	1,335	4.2%	13,527	0.7%	6,160	1.4%	21,022
Soil and Inert Materials	24.4%	64,056	0.0%	-	8.0%	73,320	9.2%	137,376
Asbestos	0.0%	-	0.0%	-	1.2%	10,829	0.7%	10,829
Other	0.0%	-	7.4%	23,778	1.6%	14,604	2.6%	38,383
TOTAL SPECIAL	24.9%	65,391	11.6%	37,305	11.5%	104,913	13.9%	207,609
								-
TOTAL WASTE STREAM	100%	262,365	100%	321,269	100%	913,621	100%	1,497,255

* Based on observation data

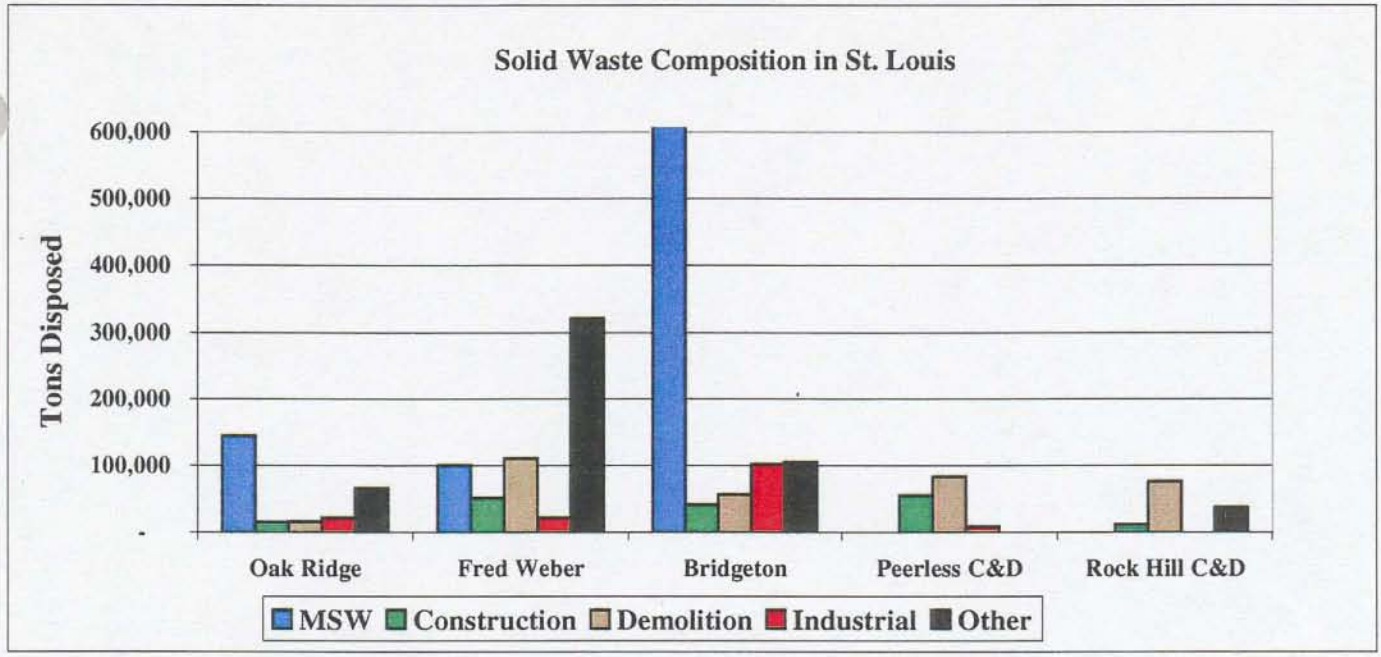
TOTAL ST. LOUIS LANDFILL COMPONENTS

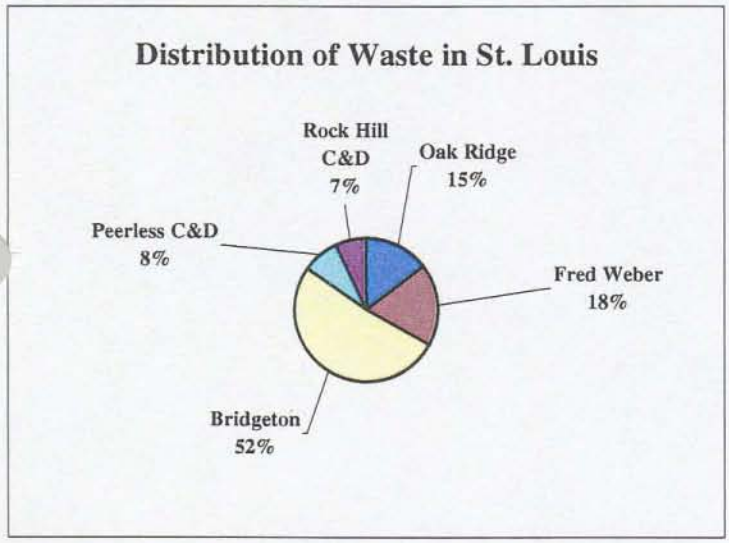
MATERIAL	Peerless		Rockhill		Other Landfills**		Total St. Louis	
	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage**
Municipal Solid Waste								
Paper	0.0%	-	0.0%	-	21.3%	318,601	18.0%	318,601
Glass	0.0%	-	0.0%	-	3.3%	49,540	2.8%	49,540
Metals	0.0%	-	0.0%	-	3.9%	58,831	3.3%	58,831
Plastics	0.0%	-	0.0%	-	8.2%	123,073	7.0%	123,073
Organics	0.0%	-	0.0%	-	17.6%	263,068	14.9%	263,068
Inorganics	0.0%	-	0.0%	-	2.7%	40,973	2.3%	40,973
TOTAL MSW	0.0%	-	0.0%	-	57.0%	854,085	48.3%	854,085
Construction Waste								
Wood	15.0%	21,977	4.8%	5,984	3.3%	49,379	4.4%	77,341
Dry Wall	7.3%	10,742	2.2%	2,773	1.6%	23,754	2.1%	37,269
Masonry	5.3%	7,728	0.4%	511	1.1%	16,532	1.4%	24,770
Metal	0.2%	301	0.0%	-	0.1%	861	0.1%	1,162
Plastic	1.3%	1,973	0.4%	438	0.3%	4,250	0.4%	6,661
Cardboard	3.3%	4,823	1.1%	1,387	0.6%	9,582	0.9%	15,792
Other	4.8%	7,015	0.5%	657	0.2%	3,600	0.6%	11,272
TOTAL CONSTRUCTION	37.3%	54,559	9.5%	11,750	7.2%	107,958	9.9%	174,267
Demolition Waste								
Wood	13.5%	19,703	24.3%	30,141	3.5%	53,152	5.8%	102,996
Dry Wall	3.4%	4,933	1.4%	1,679	0.9%	13,004	1.1%	19,615
Roofing	18.7%	27,375	8.1%	9,998	2.2%	32,765	4.0%	70,139
Masonry	12.1%	17,675	25.0%	30,944	3.7%	55,434	5.9%	104,053
Metal	1.2%	1,781	1.8%	2,189	0.6%	8,895	0.7%	12,866
Carpet	1.6%	2,411	0.4%	511	0.6%	9,372	0.7%	12,294
Other	6.1%	8,961	0.1%	146	0.6%	9,702	1.1%	18,809
TOTAL DEMOLITION	56.6%	82,839	61.0%	75,608	12.2%	182,325	19.3%	340,772
Industrial Waste								
Cardboard	0.3%	438	0.0%	-	3.6%	53,307	3.0%	53,745
Paper	0.5%	685	0.0%	-	0.8%	11,861	0.7%	12,546
Food	0.0%	-	0.0%	-	0.1%	1,395	0.1%	1,395
Metal	0.3%	493	0.0%	-	0.0%	452	0.1%	945
Wood	1.1%	1,562	0.0%	-	2.7%	40,975	2.4%	42,537
Plastic	0.8%	1,233	0.0%	-	0.9%	13,315	0.8%	14,548
Textiles	0.0%	-	0.0%	-	0.2%	2,496	0.1%	2,496
Rubber	2.5%	3,590	0.0%	-	0.6%	8,917	0.7%	12,507
Other	0.6%	849	0.0%	-	0.8%	12,560	0.8%	13,409
TOTAL INDUSTRIAL	6.1%	8,851	0.0%	-	9.7%	145,278	8.7%	154,129
Special Wastes								
Bulky Items	0.0%	-	0.0%	-	1.4%	21,022	1.2%	21,022
Soil and Inert Materials	0.0%	-	29.5%	36,491	9.2%	137,376	9.8%	173,867
Asbestos	0.0%	-	0.0%	-	0.7%	10,829	0.6%	10,829
Other	0.0%	-	0.0%	-	2.6%	38,383	2.2%	38,383
TOTAL SPECIAL	0.0%	-	29.5%	36,491	13.9%	207,609	13.8%	244,100
TOTAL WASTE STREAM	100%	146,249	100%	123,849	100%	1,497,255	100%	1,767,353

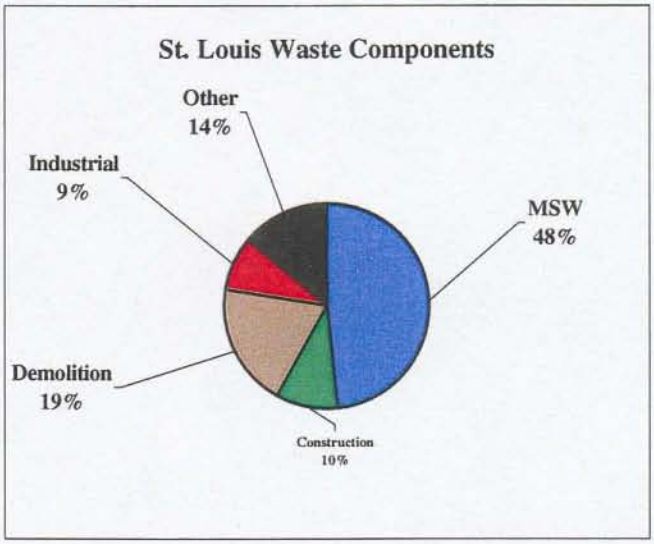
* Based on observation data

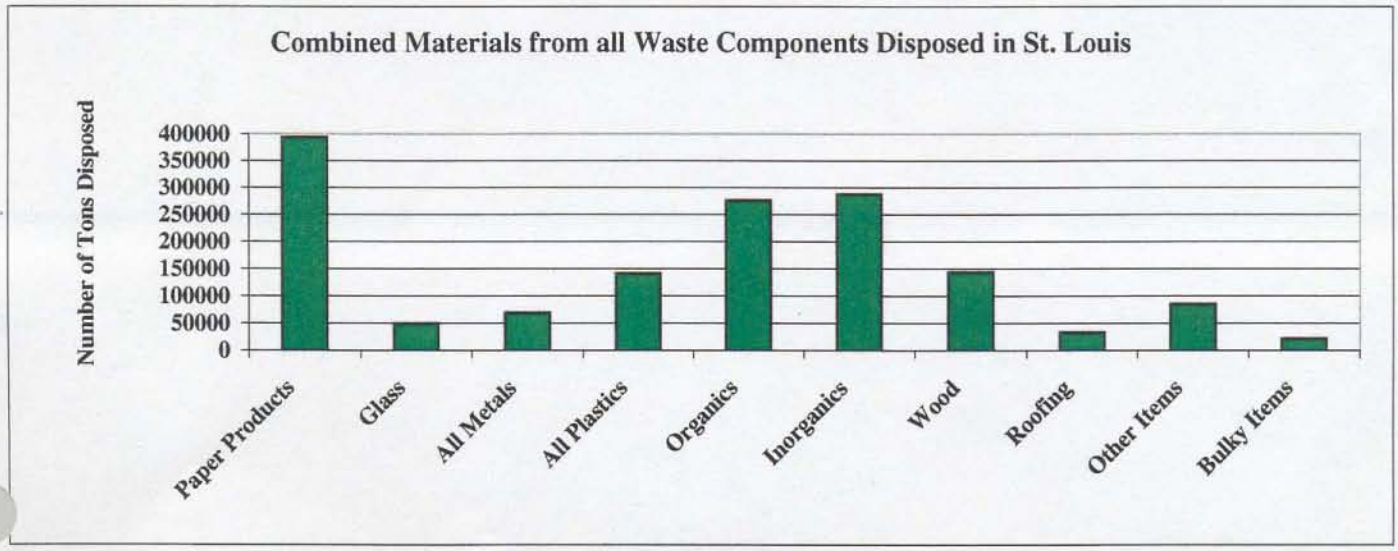
** Includes observed data from Oak Ridge, Bridgeton, and Fred Weber landfill's

ST. LOUIS LANDFILL COMPONENTS









Kansas City

Prior to March 1999 there were three Missouri landfills in the greater Kansas City area. The Courtney Ridge Landfill in Sugar Creek, Missouri is owned and operated by Waste Management Inc. All MSW from the City of Kansas City is picked up in City refuse trucks and taken to the Courtney Ridge Facility. There are also several industrial parks near the landfill. The Courtney Ridge Landfill was observed in February of 1999 and results are on page 39.

Allied Waste Services owned and operated the Southeast Landfill in Kansas City until it closed in March of 1999. They received MSW from independent haulers, BFI, and Deffenbaugh. Due to their location near the older portion of the metropolitan area, they received higher quantities of demolition materials. During the observation period they received sizable amounts of contaminated soil from underground tank remediation projects and the City of Kansas City Street Department. The Southeast Landfill was observed in December of 1998 and the results are on page 87.

The City of Lee's Summit also owns and operates a landfill. However the City of Lee's Summit does not operate a municipal waste hauling service. The individual waste hauler contracts all residential and commercial hauling. The Lee's Summit Landfill was observed in May 1999 but an error in the scale software program made the scale data unreliable. Therefore the data from that observation period was not used. A weighted average of the Courtney Ridge and Southeast landfills was used to estimate the waste components at Lee's Summit.

Some of the Kansas City waste is exported to Kansas. The State of Kansas reports that 395,712 tons of waste was received from Missouri in 1995. However that figure is somewhat misleading. The state line runs directly through the greater Kansas City Metropolitan area and many waste loads (both packers and self-haul) are picked up in Missouri and driven to a nearby Kansas landfill. The State of Kansas does not track these individual trucks (their import numbers primarily reflect transfer trailers arriving from out of state).

The table on page 148 lists the composition of the three Kansas City landfills.

The Chart on page 149 illustrates the waste distribution and composition for Kansas City solid waste. The bar graph at the bottom of page 149 illustrates the tonnage for all materials regardless of their origins. The materials are combined into the following categories.

Paper:	Includes MSW, construction cardboard, industrial cardboard and paper.
Glass:	MSW only
Metals:	Includes metals from MSW, construction, demolition, and industrial.
Plastics:	Includes MSW, construction, and industrial.
Organics:	Includes MSW, industrial food, textiles, and rubber.
Inorganics:	Includes MSW, construction and demolition drywall, construction and demolition masonry, and soil
Wood:	Includes construction, demolition, and industrial wood.
Roofing:	Demolition roofing only
Other Items:	Includes "other" items from each component plus demolition carpet and asbestos.
Bulky Items:	Includes furniture and other materials too large to be disposed in bags.

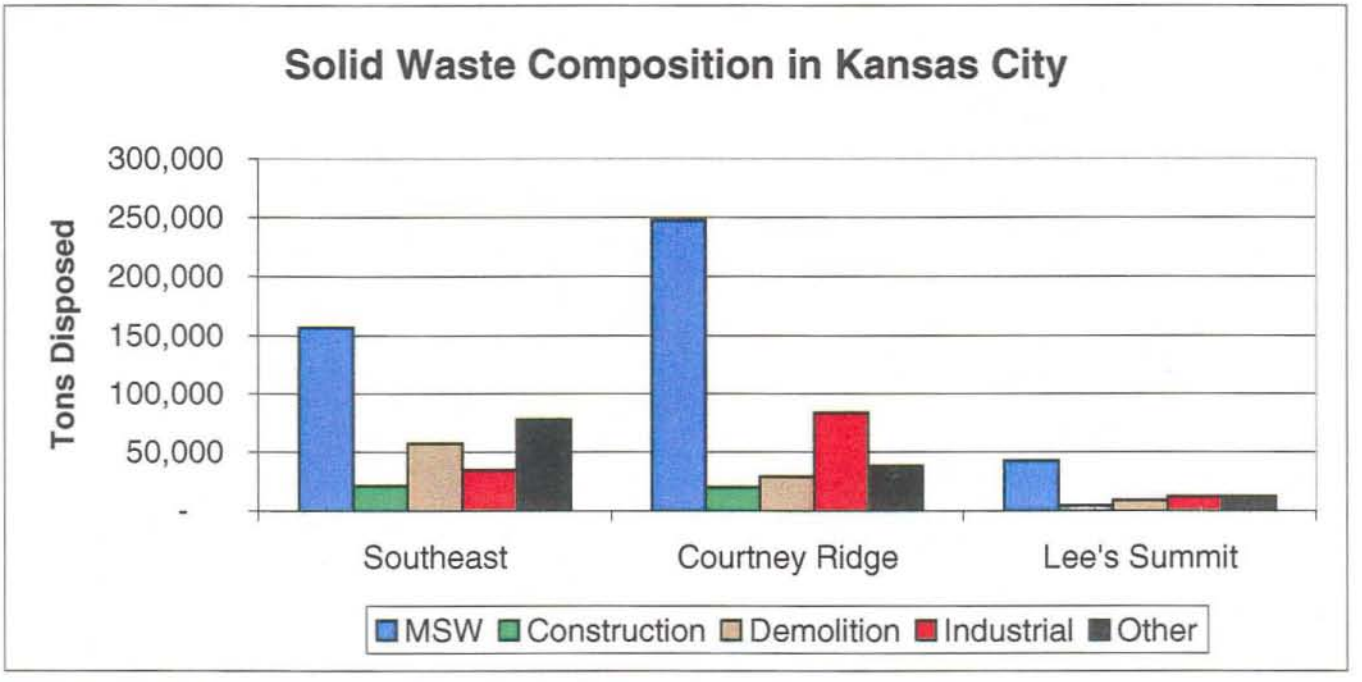
KANSAS CITY SOLID WASTE COMPONENTS

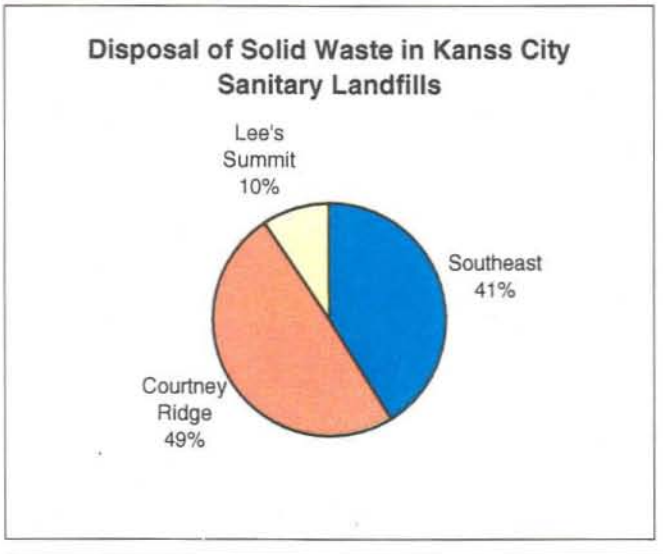
MATERIAL	Southeast		Courtney Ridge		Lee's Summit		Total Kansas City	
	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage**	Pct.	Estimated Tonnage
Municipal Solid Waste								
Paper	16.8%	58,515	21.6%	90,357	19.4%	15,652	19.4%	164,524
Glass	2.6%	9,092	3.4%	14,338	3.1%	2,501	3.1%	25,931
Metals	3.1%	10,802	4.1%	17,032	3.6%	2,905	3.6%	30,738
Plastics	6.5%	22,613	8.5%	35,604	7.6%	6,132	7.6%	64,349
Organics	13.9%	48,335	18.2%	76,212	16.2%	13,070	16.2%	137,617
Inorganics	2.2%	7,538	2.8%	11,836	2.5%	2,017	2.5%	21,391
TOTAL MSW	45.1%	156,894	59.1%	247,399	52.7%	42,519	52.7%	446,813
Construction Waste								
Wood	2.9%	10,102	2.5%	10,344	2.7%	2,178	2.7%	22,625
Dry Wall	0.9%	3,147	1.0%	4,244	1.0%	807	1.0%	8,198
Masonry	1.4%	4,896	0.3%	1,299	0.8%	645	0.8%	6,840
Metal	0.3%	909	0.1%	414	0.2%	161	0.2%	1,484
Plastic	0.2%	715	0.4%	1,626	0.3%	242	0.3%	2,583
Cardboard	0.3%	1,065	0.5%	2,069	0.4%	323	0.4%	3,456
Other	0.1%	303	0.0%	87	0.1%	81	0.1%	470
TOTAL CONSTRUCTION	6.1%	21,137	4.8%	20,083	5.4%	4,357	5.4%	45,576
Demolition Waste								
Wood	5.6%	19,660	2.4%	10,162	3.9%	3,147	3.9%	32,968
Dry Wall	1.2%	4,305	0.6%	2,665	0.9%	726	0.9%	7,697
Roofing	4.2%	14,609	1.6%	6,697	2.8%	2,259	2.8%	23,566
Masonry	4.5%	15,775	0.6%	2,483	2.4%	1,936	2.4%	20,194
Metal	0.3%	1,197	0.6%	2,589	0.5%	403	0.5%	4,189
Carpet	0.3%	1,204	0.5%	2,281	0.5%	403	0.5%	3,888
Other	0.2%	824	0.6%	2,329	0.4%	323	0.4%	3,475
TOTAL DEMOLITION	16.5%	57,574	7.0%	29,205	11.3%	9,117	11.3%	95,896
Industrial Waste								
Cardboard	3.4%	11,889	4.3%	18,139	3.9%	3,147	3.9%	33,175
Paper	0.8%	2,860	1.6%	6,813	1.3%	1,049	1.3%	10,721
Food	1.1%	3,862	6.9%	28,849	4.3%	3,469	4.3%	36,180
Metal	0.1%	295	0.0%	173	0.1%	81	0.1%	549
Wood	2.4%	8,315	4.4%	18,533	3.5%	2,824	3.5%	29,672
Plastic	1.3%	4,616	0.9%	3,955	1.1%	888	1.1%	9,458
Textiles	0.0%	-	0.0%	-	0.0%	-	0.0%	-
Rubber	0.0%	-	0.0%	-	0.0%	-	0.0%	-
Other	0.8%	2,937	1.7%	7,284	1.3%	1,049	1.3%	11,271
TOTAL INDUSTRIAL	10.0%	34,775	20.0%	83,746	15.5%	12,506	15.5%	131,027
Special Wastes								
Bulky Items	1.5%	5,113	3.2%	13,347	2.4%	1,936	2.4%	20,396
Soil and Inert Materials	19.1%	66,441	2.1%	8,939	9.8%	7,907	9.8%	83,287
Asbestos	1.8%	6,326	3.4%	14,251	2.7%	2,178	2.7%	22,755
Other	0.0%	-	0.4%	1,655	0.2%	161	0.2%	1,816
TOTAL SPECIAL	22.4%	77,880	9.1%	38,192	15.1%	12,183	15.1%	128,255
TOTAL WASTE STREAM	100%	348,260	100%	418,625	100%	80,682	100%	847,567

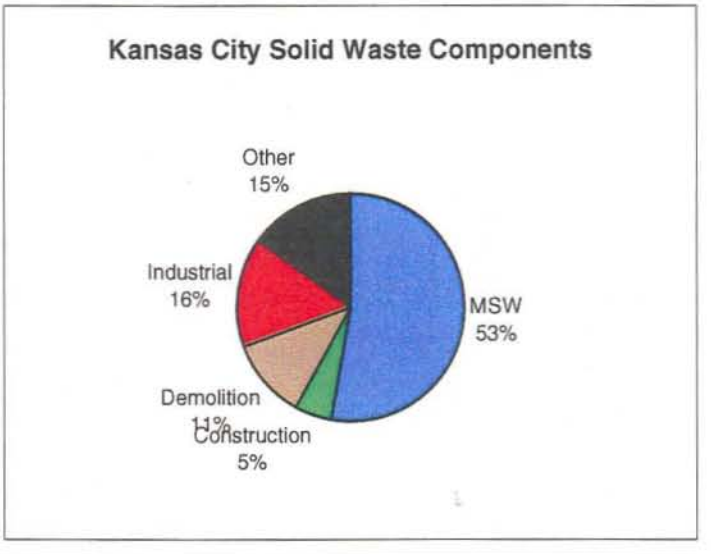
* Based on observation data

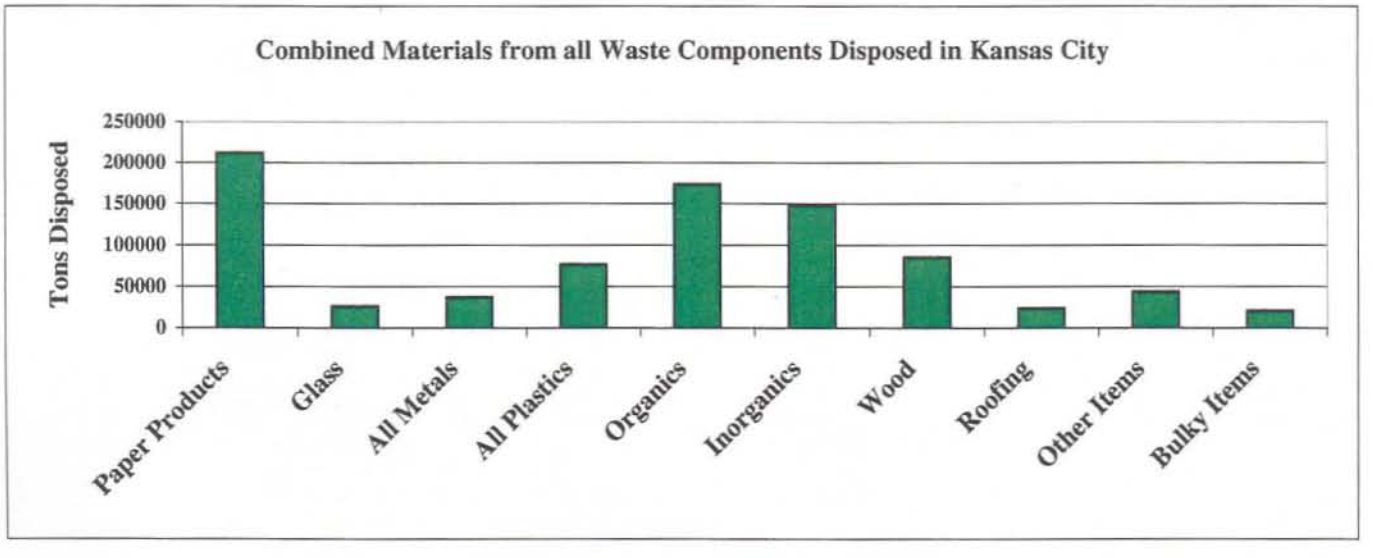
** Based on weighted average from Southeast and Courtney Ridge.

KANSAS CITY SOLID WASTE COMPONENTS









Large Metropolitan Solid Waste Components

The landfills within the two large metropolitan areas within Missouri disposed of 2,614,920 tons of solid waste in 1998. There was of course some import and export of waste so it is difficult to determine waste generation numbers without a long term, tedious study to track every load of solid waste.

The Table on page 152 lists the percentage of solid waste components and the materials within those components, based on observation data. The estimated tonnage is the 1998 tonnage of the combined landfills multiplied by the observed percentage.

The St. Louis numbers include the construction and demolition landfills at Peerless and Rockhill, but the Kansas City numbers do not include any construction and demolition landfills. The only C&D landfills in the Kansas City metropolitan area is located in Kansas and therefore not part of this study.

The Chart on page 153 illustrates the waste distribution and composition for St. Louis and Kansas City solid waste. The bar graph at the top of page 153 depicts the difference in the Kansas City and St. Louis waste components. The bar graph at the bottom of page 153 illustrates the tonnage for all materials regardless of their origins. The materials are combined into the following categories:

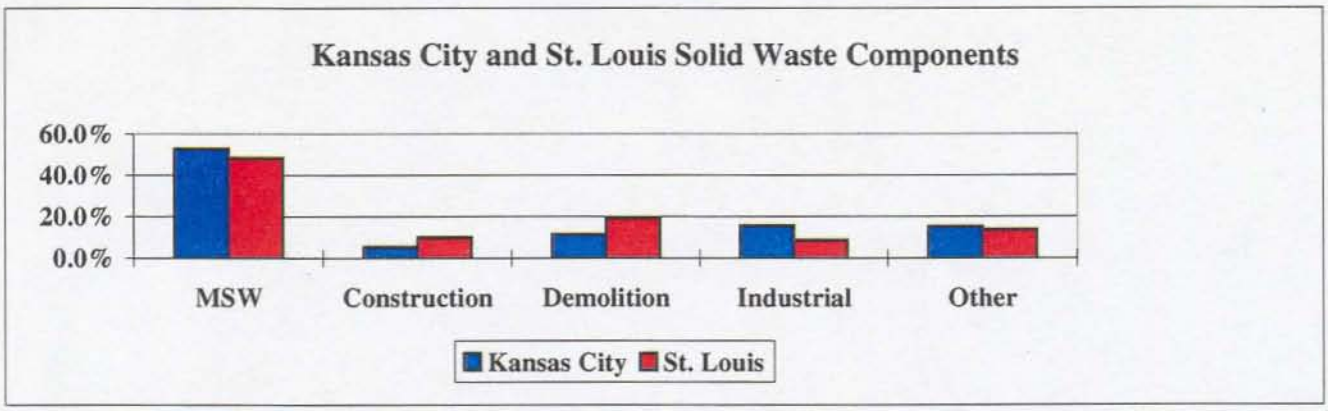
Paper:	Includes MSW, construction cardboard, industrial cardboard and paper.
Glass:	MSW only
Metals:	Includes metals from MSW, construction, demolition, and industrial.
Plastics:	Includes MSW, construction, and industrial.
Organics:	Includes MSW, industrial food, textiles, and rubber.
Inorganics:	Includes MSW, construction and demolition drywall, construction and demolition masonry, and soil
Wood:	Includes construction, demolition, and industrial wood.
Roofing:	Demolition roofing only
Other Items:	Includes "other" items from each component plus demolition carpet and asbestos.
Bulky Items:	Includes furniture and other materials too large to be disposed in bags.

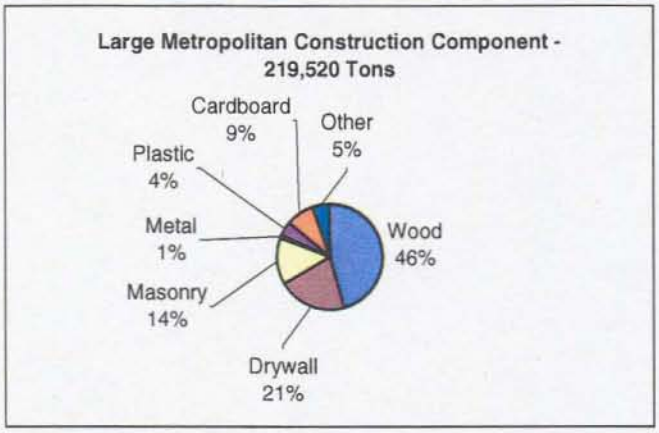
LARGE METROPOLITAN SOLID WASTE COMPONENTS

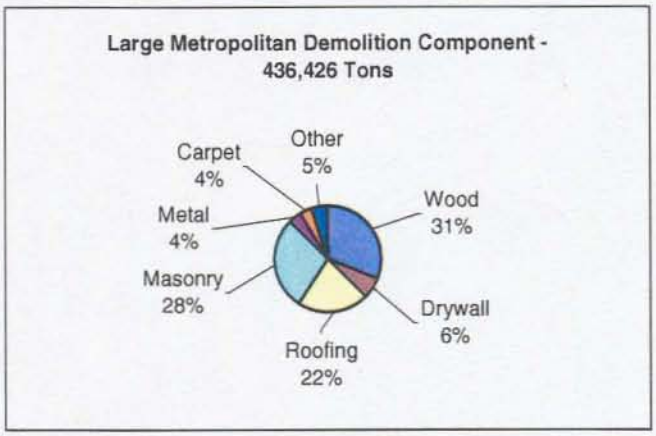
MATERIAL	Kansas City		St. Louis		Total Large Metro	
	Pct.	Estimated Tonnage	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage
Municipal Solid Waste						
Paper	19.4%	164,524	18.0%	318,601	18.5%	483,125
Glass	3.1%	25,931	2.8%	49,540	2.9%	75,471
Metals	3.6%	30,738	3.3%	58,831	3.4%	89,569
Plastics	7.6%	64,349	7.0%	123,073	7.2%	187,422
Organics	16.2%	137,617	14.9%	263,068	15.3%	400,685
Inorganics	2.5%	21,391	2.3%	40,973	2.4%	62,364
TOTAL MSW	52.7%	446,813	48.3%	854,085	49.7%	1,300,898
Construction Waste						
Wood	2.7%	22,625	4.4%	77,341	3.8%	99,966
Dry Wall	1.0%	8,198	2.1%	37,269	1.7%	45,467
Masonry	0.8%	6,840	1.4%	24,770	1.2%	31,610
Metal	0.2%	1,484	0.1%	1,162	0.1%	2,646
Plastic	0.3%	2,583	0.4%	6,661	0.4%	9,244
Cardboard	0.4%	3,456	0.9%	15,792	0.7%	19,248
Other	0.1%	470	0.6%	11,272	0.4%	11,742
TOTAL CONSTRUCTION	5.4%	45,576	9.9%	174,267	8.4%	219,843
Demolition Waste						
Wood	3.9%	32,968	5.8%	102,996	5.2%	135,964
Dry Wall	0.9%	7,697	1.1%	19,615	1.0%	27,312
Roofing	2.8%	23,566	4.0%	70,139	3.6%	93,705
Masonry	2.4%	20,194	5.9%	104,053	4.8%	124,247
Metal	0.5%	4,189	0.7%	12,866	0.7%	17,055
Carpet	0.5%	3,888	0.7%	12,294	0.6%	16,182
Other	0.4%	3,475	1.1%	18,809	0.9%	22,284
TOTAL DEMOLITION	11.3%	95,896	19.3%	340,772	16.7%	436,668
Industrial Waste						
Cardboard	3.9%	33,175	3.0%	53,745	3.3%	86,920
Paper	1.3%	10,721	0.7%	12,546	0.9%	23,267
Food	4.3%	36,180	0.1%	1,395	1.4%	37,575
Metal	0.1%	549	0.1%	945	0.1%	1,494
Wood	3.5%	29,672	2.4%	42,537	2.8%	72,209
Plastic	1.1%	9,458	0.8%	14,548	0.9%	24,006
Textiles	0.0%		0.1%	2,496	0.1%	2,496
Rubber	0.0%		0.7%	12,507	0.5%	12,507
Other	1.3%	11,271	0.8%	13,409	0.9%	24,680
TOTAL INDUSTRIAL	15.5%	131,027	8.7%	154,129	10.9%	285,156
Special Wastes						
Bulky Items	2.4%	20,396	1.2%	21,022	1.6%	41,418
Soil and Inert Materials	9.8%	83,287	9.8%	173,867	9.8%	257,154
Asbestos	2.7%	22,755	0.6%	10,829	1.3%	33,584
Other	0.2%	1,816	2.2%	38,383	1.5%	40,199
TOTAL SPECIAL	15.1%	128,255	13.8%	244,100	14.2%	372,355
TOTAL WASTE STREAM	100%	847,567	100%	1,767,353	100%	2,614,920

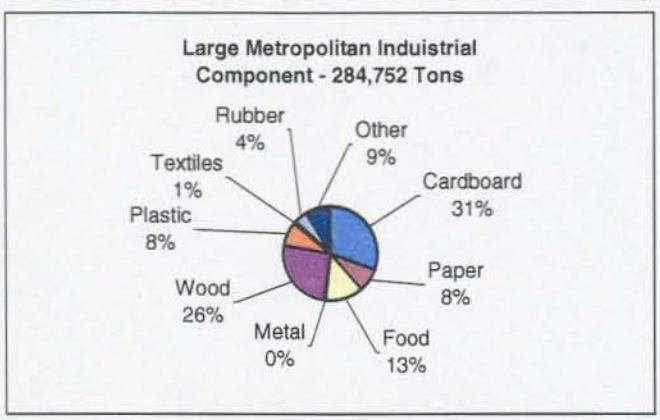
*Includes Rockhill and Peerless C&D landfills

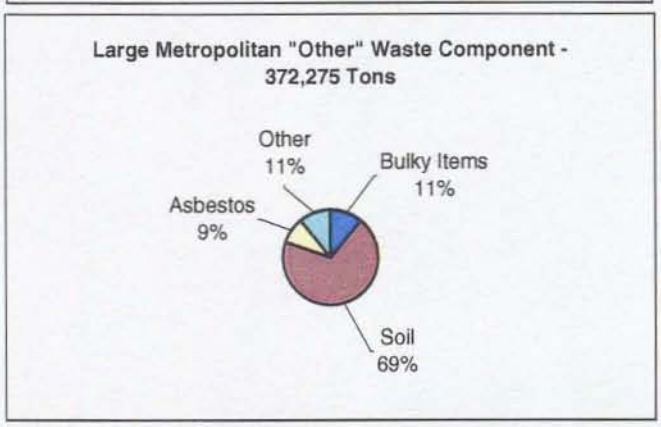
LARGE METROPOLITAN SOLID WASTE COMPONENTS

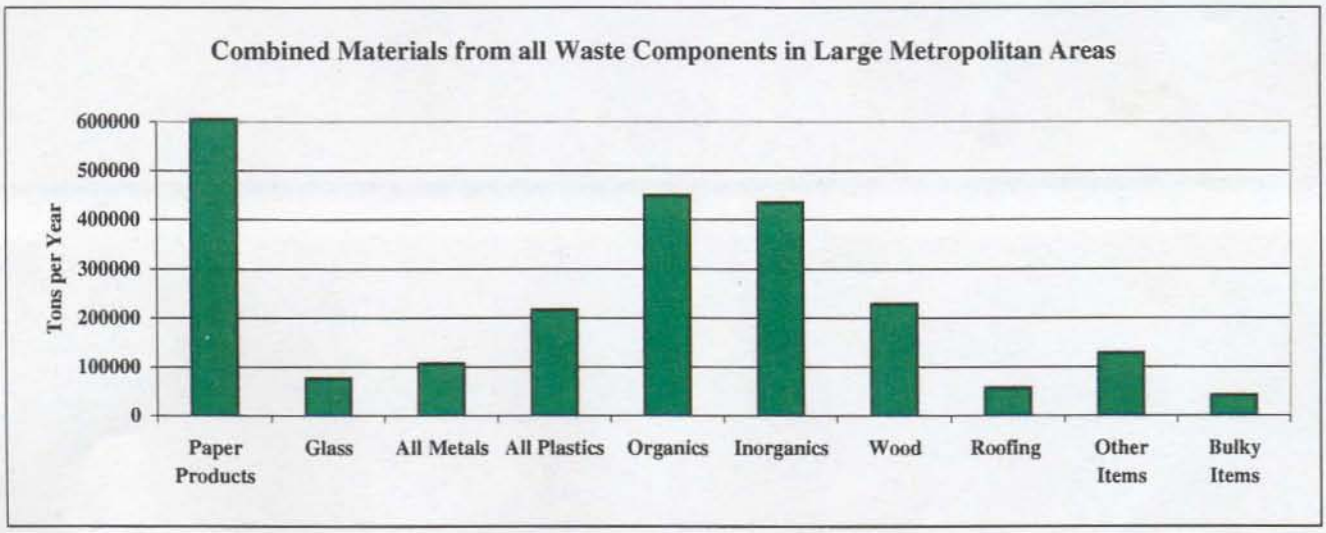












SMALL METROPOLITAN AREAS

There are three small metropolitan areas within the state of Missouri according to the Missouri State Census Data Center. These are the Springfield metropolitan area (240,593), The Columbia metropolitan area (112,379), and the St. Joseph metropolitan area (83,083). The remaining population centers are classified as rural.

The three metropolitan areas have different waste characteristics than St. Louis or Kansas City. They also have different waste characteristics than their rural counterparts.

City of Columbia

The City of Columbia owns and operates their own landfill. They also operate a fleet of refuge trucks that collect all of the residential waste within the City of Columbia and most of the commercial waste. The City of Columbia has been active in waste management for several years and have implemented some very progressive waste reduction and recycling programs. Columbia is the only City in the U.S. to have an independent bottle deposit bill. Landfill observation was done in October of 1998 and results are on page 27.

City of St. Joseph

The City of St. Joseph also owns and operates their landfill. However the City has contracted the residential waste hauling to Deffenbaugh waste services and all residential and commercial waste collected within the city limits by Deffenbaugh is hauled to their landfill in Kansas. However, industrial waste in compactor units and roll-off were delivered to the St. Joseph Landfill. The landfill observation was done in November of 1998 and results are on page 33.

City of Springfield

The City of Springfield owns and operates their own landfill but due to limited time and resources this landfill was not observed. However, from a waste perspective, Springfield is like St. Joseph in many ways. BFI, which hauls to their landfill in Lamar, or Waste Management Inc., which hauls to their landfill in Hartsville (Black Oak), collect most of the residential and commercial waste in Springfield. Both the Lamar and Black Oak landfills were observed. The Springfield landfill receives less waste than any of the other landfills observed. Although Springfield is the third largest metropolitan area in the state, the landfill only received 101,284 tons in 1998. The percentage of waste found at the St. Joseph Landifll was applied to the tonnage for Springfield.

Waste Components for Small Metropolitan Areas

There were some significant differences in the solid waste components of small metropolitan areas when compared to large metro areas and rural areas. The MSW component was much less than either the large metro landfills or the rural landfills. The waste components at the City of Columbia landfill was very close to state averages, but the St. Joseph (and Springfield because it was considered similar to St. Joseph) percentages were very different.

The table on page 156 list the results for the three small metro landfills observed, and the charts on page 157 illustrate those findings.

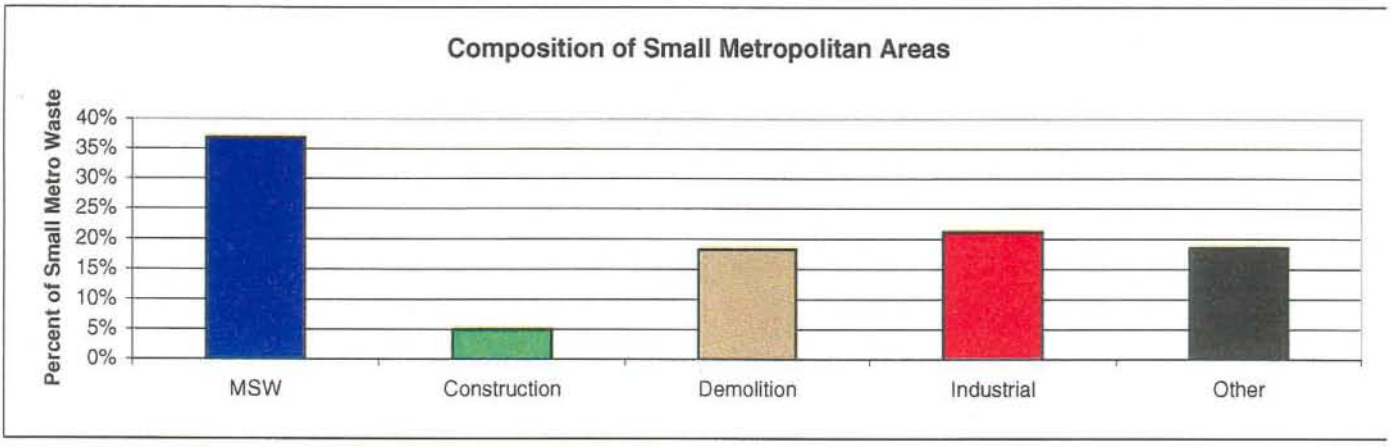
SMALL METROPOLITAN SOLID WASTE COMPONENTS

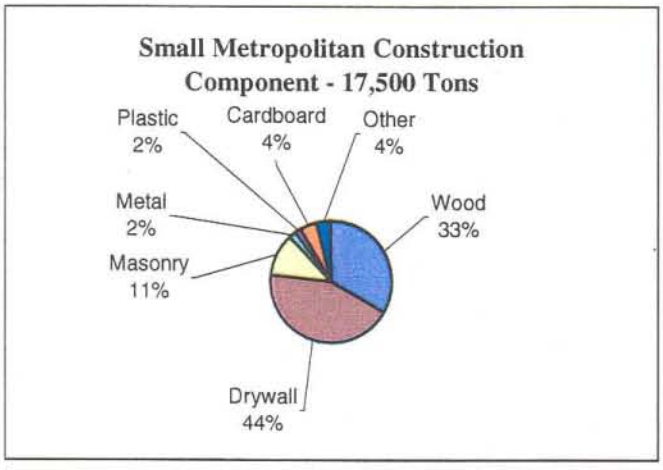
MATERIAL	Columbia		St. Joseph		Springfield		Total Small Metro	
	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage**	Pct.	Estimated Tonnage
Municipal Solid Waste								
Paper	24.1%	30,285	10.0%	11,995	10.0%	10,128	15.1%	52,408
Glass	2.1%	2,691	1.6%	1,943	1.6%	1,621	1.8%	6,255
Metals	3.1%	3,858	1.8%	2,186	1.8%	1,823	2.3%	7,866
Plastics	7.2%	9,064	3.2%	3,852	3.2%	3,241	4.7%	16,158
Organics	16.3%	20,518	7.4%	8,939	7.4%	7,495	10.6%	36,951
Inorganics	5.0%	6,324	1.0%	1,246	1.0%	1,013	2.5%	8,582
TOTAL MSW	57.8%	72,739	25.1%	30,161	25.1%	25,422	36.9%	128,322
Construction Waste								
Wood	4.0%	4,975	1.5%	1,759	1.5%	1,519	2.4%	8,253
Dry Wall	1.3%	1,693	0.8%	957	0.8%	810	1.0%	3,461
Masonry	0.3%	408	1.1%	1,315	1.1%	1,114	0.8%	2,837
Metal	0.2%	288	0.1%	87	0.1%	101	0.1%	476
Plastic	0.2%	246	0.1%	63	0.1%	101	0.1%	411
Cardboard	0.7%	850	0.1%	161	0.1%	101	0.3%	1,113
Other	0.7%	892	0.0%	58	0.0%	-	0.3%	950
TOTAL CONSTRUCTION	7.4%	9,352	3.7%	4,400	3.7%	3,748	5.0%	17,500
Demolition Waste								
Wood	4.1%	5,200	11.2%	13,437	11.2%	11,344	8.6%	29,980
Dry Wall	1.1%	1,440	0.9%	1,119	0.9%	912	1.0%	3,471
Roofing	3.8%	4,722	3.8%	4,585	3.8%	3,849	3.8%	13,155
Masonry	3.0%	3,724	3.8%	4,527	3.8%	3,849	3.5%	12,100
Metal	0.5%	576	0.2%	294	0.2%	203	0.3%	1,073
Carpet	0.3%	415	0.8%	963	0.8%	810	0.6%	2,188
Other	1.0%	1,209	0.2%	242	0.2%	203	0.5%	1,653
TOTAL DEMOLITION	13.7%	17,285	20.9%	25,167	20.9%	21,168	18.3%	63,620
Industrial Waste								
Cardboard	5.3%	6,682	3.5%	4,169	3.5%	3,545	4.1%	14,397
Paper	1.2%	1,462	2.1%	2,560	2.1%	2,127	1.8%	6,149
Food	1.4%	1,806	8.1%	9,688	8.1%	8,204	5.7%	19,698
Metal	0.1%	155	0.9%	1,044	0.9%	912	0.6%	2,110
Wood	3.0%	3,787	3.6%	4,308	3.6%	3,646	3.4%	11,741
Plastic	4.6%	5,818	1.3%	1,569	1.3%	1,317	2.5%	8,703
Textiles	0.2%	253	0.0%	-	0.0%	-	0.1%	253
Rubber	0.6%	752	0.0%	-	0.0%	-	0.2%	752
Other	1.7%	2,101	3.5%	4,198	3.5%	3,545	2.8%	9,844
TOTAL INDUSTRIAL	18.1%	22,815	22.9%	27,537	22.9%	23,194	21.2%	73,546
Special Wastes								
Bulky Items	1.7%	2,185	1.3%	1,569	1.3%	1,317	1.5%	5,071
Soil and Inert Materials	0.0%	-	25.4%	30,564	25.4%	25,726	16.2%	56,290
Asbestos	0.0%	-	0.6%	761	0.6%	608	0.4%	1,369
Other	1.2%	1,490	0.0%	-	0.0%	-	0.4%	1,490
TOTAL SPECIAL	2.9%	3,675	27.4%	32,894	27.4%	27,752	18.5%	64,321
TOTAL WASTE STREAM	100%	125,867	100%	120,158	100%	101,284	100%	347,309

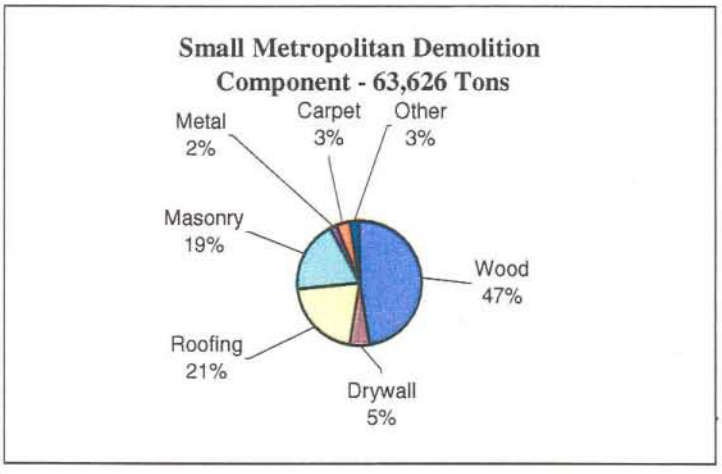
* Based on observation data

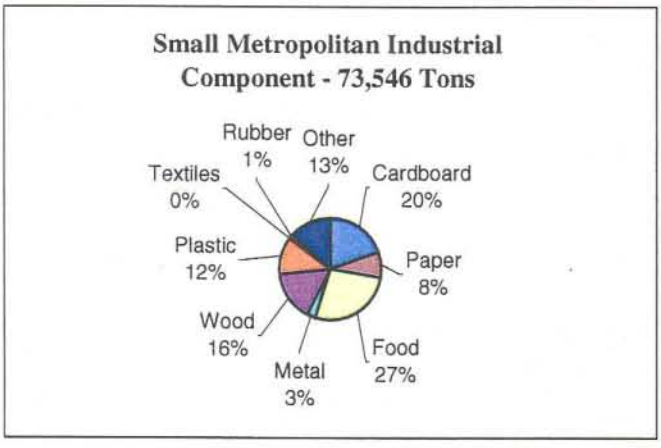
**City of Springfield landfill was not observed. Estimates are based on the City of St. Joseph landfill.

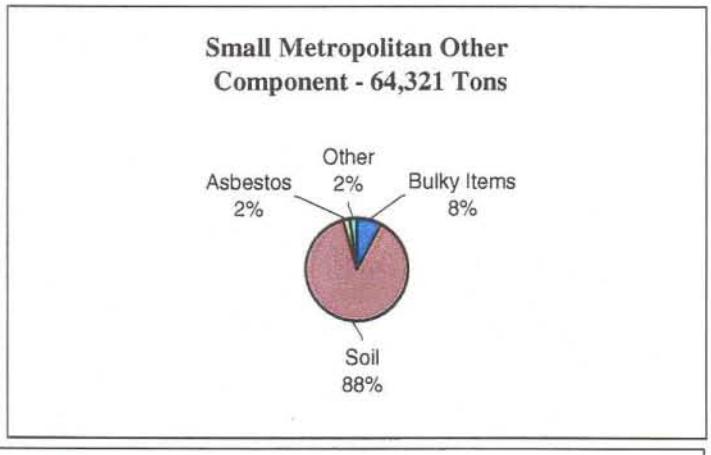
SMALL METROPOLITAN SOLID WASTE COMPONENTS

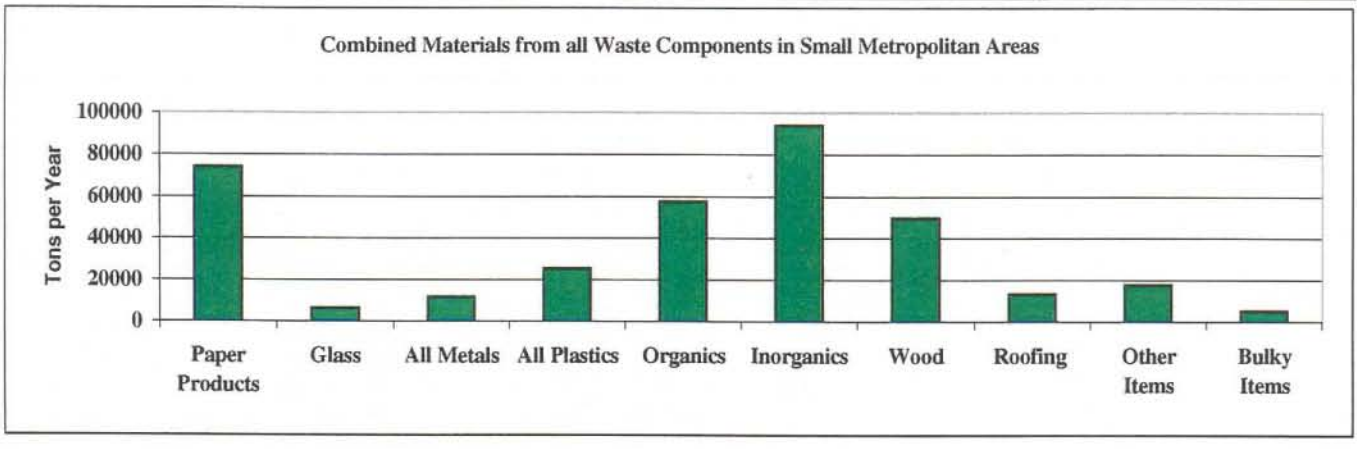












RURAL AREAS

Much of the state of Missouri is rural. There are some larger cities outside of the metropolitan areas (Joplin 41,000, Cape Girardeau 35,000, and Jefferson City 35,000), but for the most part these areas are sparsely populated compared to the metropolitan areas. The population of rural Missouri is about two million. The following rural landfills were observed.

Black Oak

The Black Oak Landfill is located near Hartsville, MO and is owned and operated by Waste Management Inc. The large majority of waste received at their landfill was MSW from their transfer stations in Springfield, Lebanon, Roll, and St. Roberts. Since the landfill was observed, the operation of two of the transfer stations (Phelps County and St. Roberts) has been taken over by Superior Waste Services, and the waste from these transfer stations are no going to the Oak Ridge Landfill in St. Louis County. The landfill observation was conducted in April and the results are on page 9.

Butler County

The Butler County Landfill is located near Poplar Bluff, MO and is owned and operated by Allied Waste Services. Much of their waste is MSW received from independent transfer stations in Park Hills, Fredericktown, and the Bootheel. The landfill observation was conducted in October 1998 and the results are on page 21.

Lamar Landfill

The Lamar Landfill is located near Lamar, MO and is owned and operated by BFI. Much of their waste is MSW received from their transfer station in Springfield. The landfill observation was conducted in October 1998 and the results are on page 51.

Lemons Landfill

The Lemons Landfill is located near Dexter, MO and is operated by Allied Waste Services. Much of their waste is MSW received from transfer stations in Cape Girardeau, Jackson, and Pemiscot County. Landfill observation was conducted in January 1999. The results are on page 57.

Maple Hill Landfill

The Maple Hill Landfill is located near Macon, MO. and is owned and operated by Superior Waste Services. Much of their waste was MSW received from their own fleet of packer trucks and transfer stations in Bethany and Mexico, MO. The landfill observation was conducted in April 1999 and the results are on page 63.

Waste Components of Rural Landfills

Almost 82% of the waste received in rural landfills was MSW. They received about the same percentage of industrial waste as the state average but were considerably lower in construction, demolition and other waste categories.

The table on pages 160 and 161 list the results for the five rural landfills observed and the estimated waste components for rural landfills not observed. The charts on pages 163 and 165 illustrate those findings.

RURAL SOLID WASTE COMPONENTS

MATERIAL	Black Oak		Butler Co.		Lamar		Lemons	
	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage*
Municipal Solid Waste								
Paper	35.6%	100,943	27.7%	33,823	27.0%	45,467	26.5%	51,961
Glass	5.5%	15,711	4.2%	5,135	3.8%	6,339	4.1%	8,105
Metals	6.6%	18,671	6.2%	7,556	5.5%	9,203	4.9%	9,608
Plastics	13.7%	38,935	11.0%	13,399	11.9%	20,052	10.2%	20,065
Organics	29.4%	83,335	23.8%	29,101	25.3%	42,725	21.9%	42,941
Inorganics	4.6%	12,978	3.5%	4,250	3.3%	5,565	3.4%	6,667
TOTAL MSW	95.4%	270,573	76.3%	93,263	76.7%	129,351	71.1%	139,347
Construction Waste								
Wood	0.1%	304	0.7%	885	0.3%	581	0.2%	425
Dry Wall	0.0%	76	0.8%	1,003	0.0%	43	0.1%	288
Masonry	0.3%	911	0.0%	-	0.0%	-	0.0%	-
Metal	0.0%	-	0.0%	-	0.1%	112	0.0%	-
Plastic	0.0%	-	0.0%	-	0.0%	-	0.0%	-
Cardboard	0.0%	76	0.1%	177	0.1%	101	0.0%	-
Other	0.0%	-	0.2%	302	0.2%	293	0.0%	-
TOTAL CONSTRUCTION	0.5%	1,366	1.9%	2,368	0.7%	1,129	0.4%	712
Demolition Waste								
Wood	0.3%	759	1.1%	1,328	1.7%	2,798	2.9%	5,752
Dry Wall	0.1%	228	1.9%	2,278	0.1%	222	0.6%	1,111
Roofing	0.3%	835	3.8%	4,657	3.7%	6,156	2.1%	4,052
Masonry	0.1%	152	0.2%	285	0.2%	282	1.2%	2,353
Metal	0.0%	76	0.0%	-	0.2%	410	0.1%	294
Carpet	0.2%	455	0.8%	950	0.5%	890	0.4%	719
Other	0.1%	379	0.0%	-	0.4%	646	0.0%	65
TOTAL DEMOLITION	1.0%	2,884	7.8%	9,499	6.8%	11,403	7.3%	14,346
Industrial Waste								
Cardboard	0.7%	1,897	0.4%	515	2.3%	3,797	1.2%	2,418
Paper	0.3%	835	0.3%	322	0.4%	616	3.6%	7,124
Food	0.0%	-	0.0%	-	0.0%	-	0.9%	1,765
Metal	0.0%	-	0.0%	-	0.6%	1,085	0.1%	131
Wood	0.6%	1,594	0.3%	386	0.7%	1,207	2.4%	4,641
Plastic	0.1%	304	0.4%	515	0.7%	1,128	2.4%	4,771
Textiles	0.0%	-	1.4%	1,670	0.8%	1,359	0.7%	1,438
Rubber	0.0%	-	2.5%	3,022	0.3%	524	0.6%	1,176
Other	0.0%	-	7.7%	9,350	9.2%	15,432	8.8%	17,255
TOTAL INDUSTRIAL	1.6%	4,630	12.9%	15,780	14.9%	25,147	20.8%	40,719
Special Wastes								
Bulky Items	1.4%	4,023	1.0%	1,275	0.5%	823	0.5%	967
Soil and Inert Materials	0.0%	-	0.0%	-	0.0%	-	0.0%	-
Asbestos	0.0%	-	0.0%	-	0.4%	737	0.0%	-
Other	0.0%	-	0.0%	-	0.0%	-	0.0%	-
TOTAL SPECIAL	1.4%	4,023	1.0%	1,275	0.9%	1,560	0.5%	967
TOTAL WASTE STREAM	100%	283,475	100%	122,185	100%	168,591	100%	196,092

* Based on observation data

** Based on the weighted average from the 5 observed landfills and the 2 C&D landfills observed.

*** Total estimated material based on observation data and weighted average from remaining rural landfills.

RURAL SOLID WASTE COMPONENTS

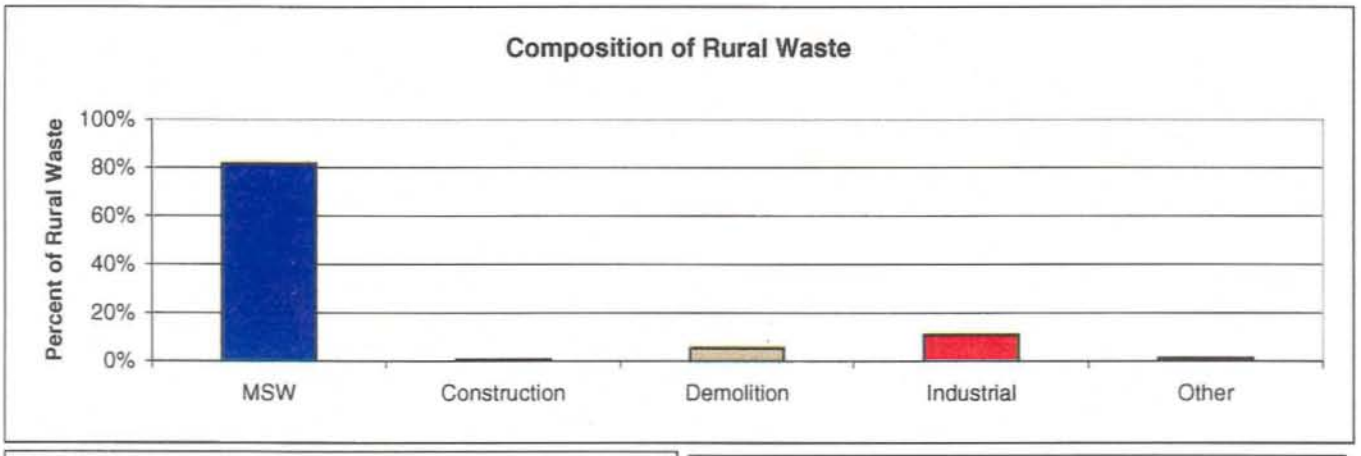
Maple Hill		Other Rural Landfil		Total Rural Landfills		MATERIAL
Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage**	Pct.	Estimated Tonnage***	
						Municipal Solid Waste
29.1%	33,441	30.0%	192,321	30.0%	457,956	**Paper**
4.0%	4,646	4.5%	28,912	4.5%	68,848	**Glass**
5.4%	6,152	5.8%	37,054	5.8%	88,243	**Metals**
11.7%	13,481	12.0%	76,736	12.0%	182,669	**Plastics**
25.2%	28,991	25.7%	164,434	25.7%	391,527	**Organics**
2.4%	2,749	3.6%	23,335	3.6%	55,543	**Inorganics**
77.8%	89,460	81.6%	522,792	81.6%	1,244,785	**TOTAL MSW**
						Construction Waste
0.3%	393	0.3%	1,859	0.3%	4,447	**Wood**
0.1%	131	0.2%	1,090	0.2%	2,630	**Dry Wall**
0.1%	65	0.1%	705	0.1%	1,681	**Masonry**
0.1%	65	0.0%	128	0.0%	305	**Metal**
0.1%	131	0.0%	64	0.0%	195	**Plastic**
0.1%	65	0.1%	321	0.0%	740	**Cardboard**
0.1%	65	0.1%	449	0.1%	1,109	**Other**
0.8%	916	0.7%	4,680	0.7%	11,172	**TOTAL CONSTRUCTION**
						Demolition Waste
4.3%	4,908	1.8%	11,283	1.8%	26,827	**Wood**
0.9%	1,047	0.6%	3,526	0.6%	8,413	**Dry Wall**
1.5%	1,767	2.0%	12,629	2.0%	30,096	**Roofing**
0.2%	262	0.4%	2,436	0.4%	5,770	**Masonry**
0.5%	524	0.2%	962	0.1%	2,265	**Metal**
0.3%	393	0.4%	2,436	0.4%	5,843	**Carpet**
0.6%	654	0.2%	1,282	0.2%	3,027	**Other**
8.3%	9,555	5.4%	34,554	5.4%	82,241	**TOTAL DEMOLITION**
						Industrial Waste
0.9%	1,047	1.1%	6,988	1.1%	16,662	**Cardboard**
0.2%	262	1.0%	6,603	1.0%	15,761	**Paper**
2.8%	3,272	0.6%	3,654	0.6%	8,691	**Food**
0.6%	654	0.2%	1,346	0.2%	3,216	**Metal**
0.7%	851	1.0%	6,282	1.0%	14,960	**Wood**
2.9%	3,338	1.1%	7,308	1.1%	17,363	**Plastic**
0.4%	458	0.6%	3,590	0.6%	8,516	**Textiles**
1.1%	1,243	0.7%	4,295	0.7%	10,261	**Rubber**
1.1%	1,243	4.9%	31,348	4.9%	74,629	**Other**
10.8%	12,369	11.1%	71,415	11.1%	170,060	**TOTAL INDUSTRIAL**
						Special Wastes
1.2%	1,374	1.0%	6,154	1.0%	14,616	**Bulky Items**
0.0%	-	0.0%	-	0.0%	-	**Soil and Inert Materials**
0.0%	-	0.1%	513	0.1%	1,250	**Asbestos**
1.1%	1,309	0.2%	962	0.1%	2,270	**Other**
2.3%	2,683	1.2%	7,629	1.2%	18,137	**TOTAL SPECIAL**
100%	114,982	100.0%	641,069	100%	1,526,394	**TOTAL WASTE STREAM**

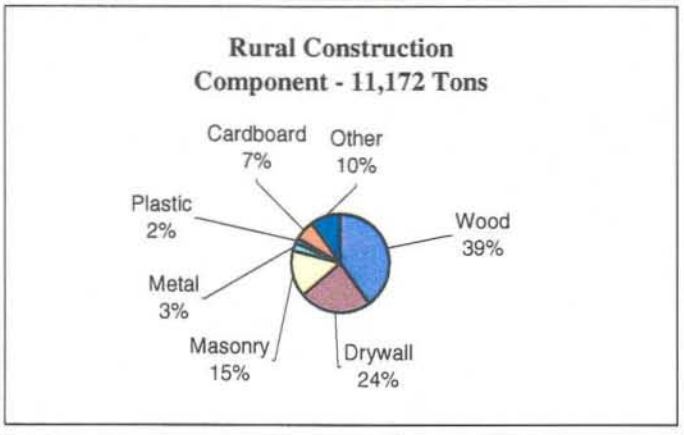
* Based on observation data

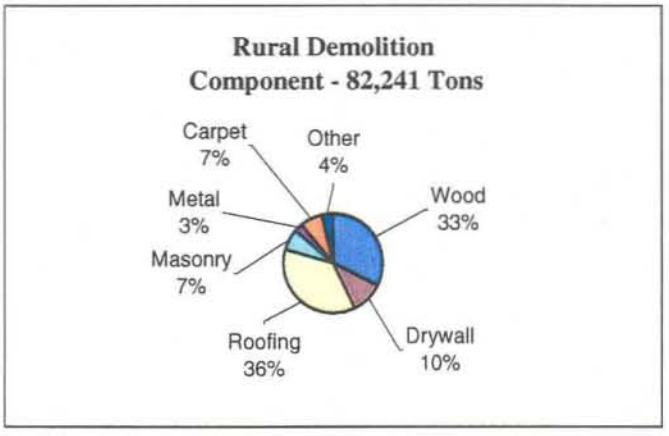
** Based on the weighted average from the 5 observed landfills and the 2 C&D landfills observed.

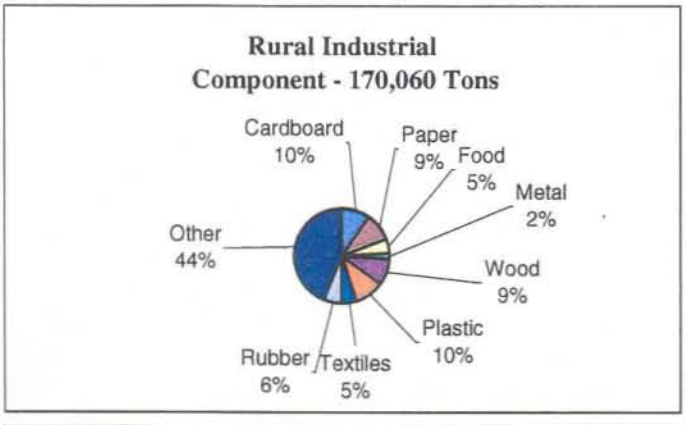
*** Total estimated material based on observation data and weighted average from remaining rural landfill:

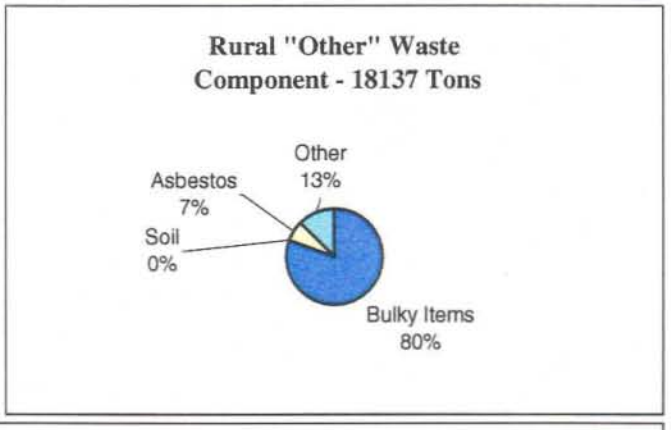
RURAL SOLID WASTE COMPONENTS

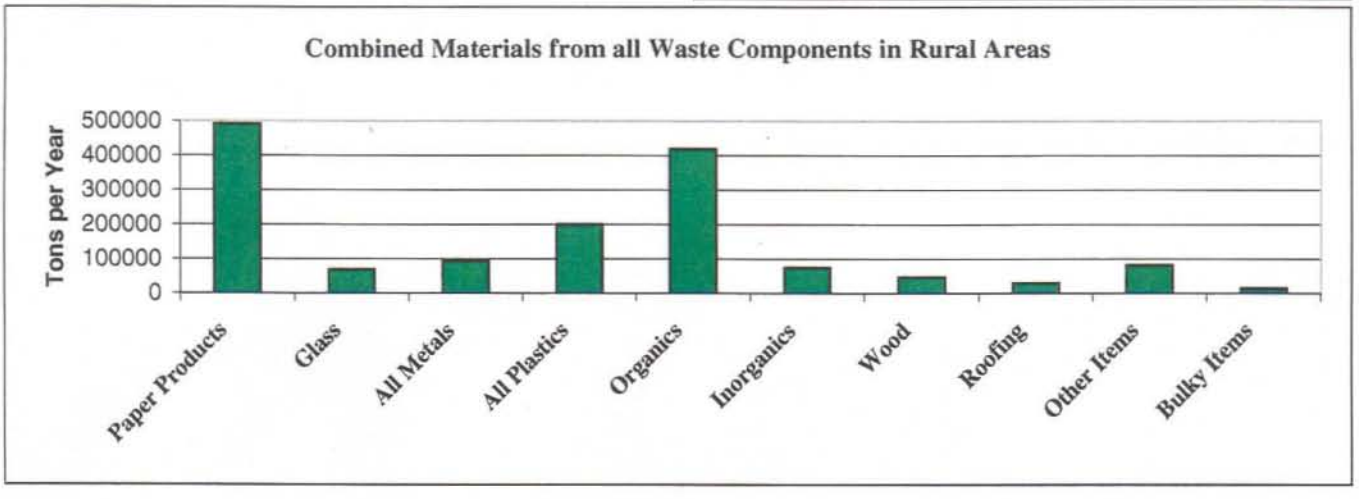




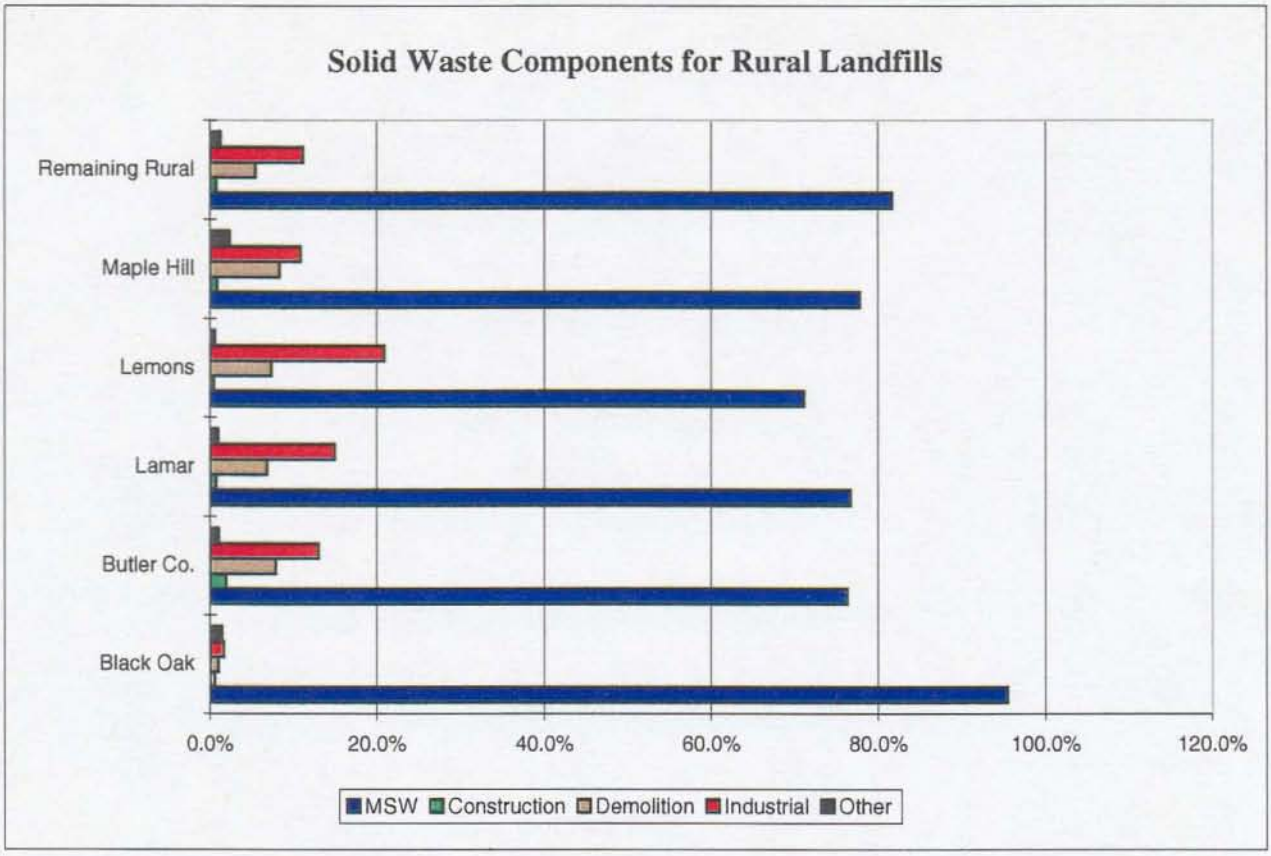


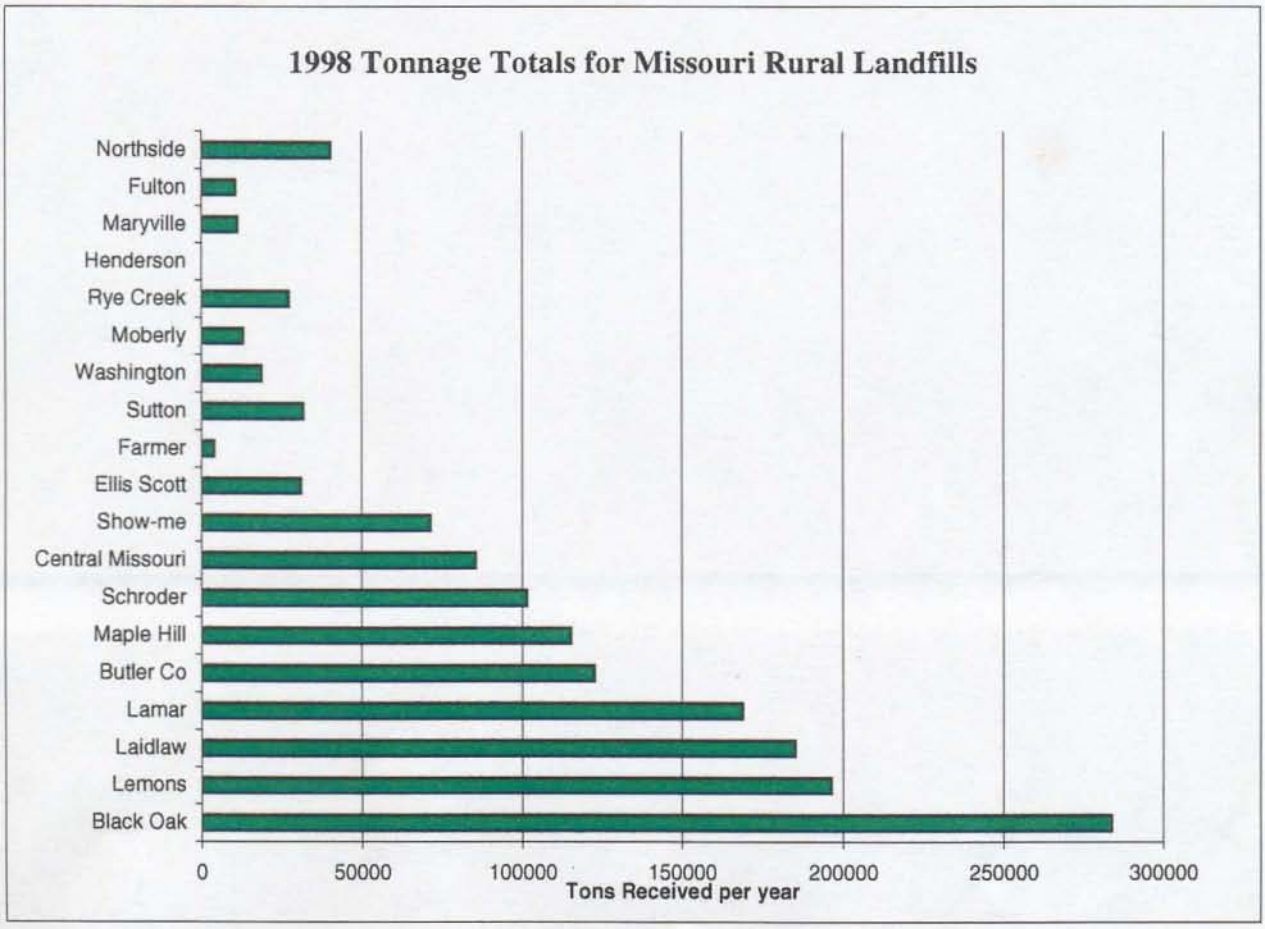






RURAL SOLID WASTE COMPONENTS





Summary

The Missouri Solid Waste Composition Study was a three-year project to understand the characteristics and composition of solid waste entering transfer stations and landfills in Missouri.

Phase I examined Municipal Solid Waste (MSW) in 19 of the state's 20 solid waste management districts. During this two year activity, 140,581 pounds of residential and commercial MSW was hand sorted into 6 major material categories, 26 minor material categories, and 16 potentially hazardous categories. The results were recorded by weight and volume. Those results are explained on pages 93-122.

Phase II examined the non-MSW waste components at 14 landfills throughout Missouri. Waste loads deposited at these 14 landfills were observed for a one-week period at each facility. The waste was subjectively analyzed and recorded into one of five solid waste components (MSW, construction, demolition, industrial, and "other"). A further visual examination of each load was made and the percentage of each major material was estimated. Those estimated percentages were then applied to the weight of each load to determine the weight of each material. The results of each of the solid waste components (other than MSW) are explained on pages 123-138.

There were some minor differences found between disposal facilities examined in Phase I (see the chart on page 109). However during Phase II there was considerable difference in the waste composition of the landfills observed. Some of these differences could be explained through demographic similarities of the areas surrounding the landfills. The landfills were grouped by population demographics into three categories (large metropolitan landfills, small metropolitan landfills, and rural landfills). Results based on these groupings are explained on pages 139-166.

The table on page 168 lists the solid waste components and materials by landfill type and total for Missouri.

The charts on page 169 depicts the total solid waste components, the MSW component, and the construction component, in both tons per year and percent of the total.

The charts on page 171 depict the demolition waste components, the industrial waste components, and the "other" waste components, in both tons per year and percent of the total.

The charts on page 173 depict the tonnage for each solid waste material within each waste component, and the combined materials from all waste components.

MISSOURI SOLID WASTE COMPONENTS

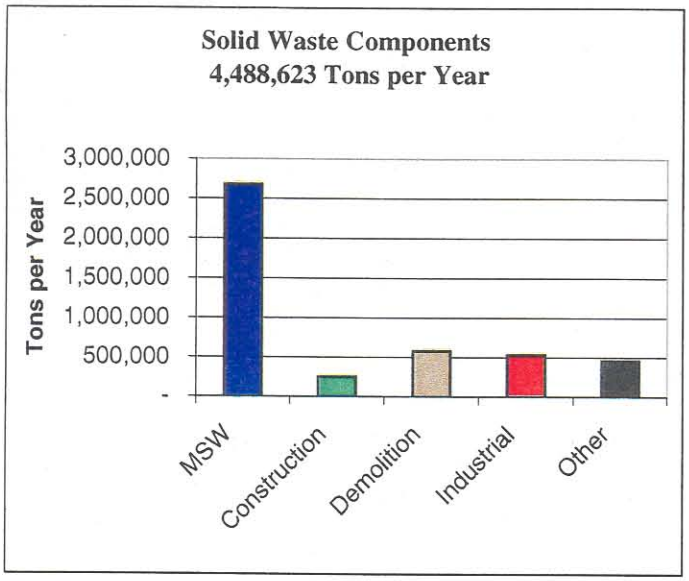
MATERIAL	Large Metro		Small Metro		Rural		All MO. Landfills	
	Pct.	Estimated Tonnage*	Pct.	Estimated Tonnage**	Pct.	Estimated Tonnage***	Pct.	Estimated Tonnage
Municipal Solid Waste								
Paper	18.5%	482,802	15.1%	52,408	30.0%	457,956	22.1%	993,166
Glass	2.9%	75,390	1.8%	6,255	4.5%	68,848	3.4%	150,493
Metals	3.4%	89,892	2.3%	7,866	5.8%	88,243	4.1%	186,001
Plastics	7.2%	187,745	4.7%	16,158	12.0%	182,669	8.6%	386,572
Organics	15.3%	400,524	10.6%	36,951	25.7%	391,527	18.5%	829,002
Inorganics	2.4%	62,767	2.5%	8,582	3.6%	55,543	2.8%	126,892
TOTAL MSW	49.8%	1,301,140	36.9%	128,322	81.6%	1,244,785	59.6%	2,674,247
Construction Waste								
Wood	3.8%	100,208	2.4%	8,253	0.3%	4,447	2.5%	112,908
Dry Wall	1.7%	45,467	3.1%	10,753	0.2%	2,630	1.3%	58,850
Masonry	1.2%	31,772	0.8%	2,837	0.1%	1,681	0.8%	36,290
Metal	0.1%	2,485	0.1%	476	0.0%	305	0.1%	3,266
Plastic	0.3%	9,002	0.1%	411	0.0%	195	0.2%	9,608
Cardboard	0.7%	18,925	0.3%	1,113	0.0%	740	0.5%	20,778
Other	0.4%	11,662	0.3%	950	0.1%	1,109	0.3%	13,721
TOTAL CONSTRUCTION	8.4%	219,520	5.0%	17,500	0.7%	11,172	5.5%	248,192
Demolition Waste								
Wood	5.2%	136,045	8.6%	29,980	1.8%	26,827	4.3%	192,852
Dry Wall	1.0%	27,392	1.0%	3,471	0.6%	8,413	0.9%	39,276
Roofing	3.6%	93,866	3.8%	13,155	2.0%	30,096	3.1%	137,117
Masonry	4.7%	123,924	3.5%	12,100	0.4%	5,770	3.2%	141,794
Metal	0.6%	16,651	0.3%	1,073	0.1%	2,265	0.4%	19,989
Carpet	0.6%	15,779	0.6%	2,188	0.4%	5,843	0.5%	23,810
Other	0.8%	21,961	0.5%	1,653	0.2%	3,027	0.6%	26,641
TOTAL DEMOLITION	16.7%	436,426	18.3%	63,620	5.4%	82,241	13.0%	582,287
Industrial Waste								
Cardboard	3.3%	87,000	4.1%	14,397	1.1%	16,662	2.6%	118,059
Paper	0.9%	23,025	1.8%	6,149	1.0%	15,761	1.0%	44,935
Food	1.4%	37,333	5.7%	19,698	0.6%	8,691	1.5%	65,722
Metal	0.1%	1,414	0.6%	2,110	0.2%	3,216	0.2%	6,740
Wood	2.8%	72,612	3.4%	11,741	1.0%	14,960	2.2%	99,313
Plastic	0.9%	23,926	2.5%	8,703	1.1%	17,363	1.1%	49,992
Textiles	0.1%	2,496	0.1%	253	0.6%	8,516	0.3%	11,265
Rubber	0.5%	12,507	0.2%	752	0.7%	10,261	0.5%	23,520
Other	0.9%	24,438	2.8%	9,844	4.9%	74,629	2.4%	108,911
TOTAL INDUSTRIAL	10.9%	284,752	21.2%	73,546	11.1%	170,060	11.8%	528,358
Special Wastes								
Bulky Items	1.6%	41,096	1.5%	5,071	1.0%	14,616	1.4%	60,783
Soil and Inert Materials	9.8%	257,316	16.2%	56,290	0.0%	-	7.0%	313,606
Asbestos	1.3%	33,826	0.4%	1,369	0.1%	1,250	0.8%	36,445
Other	1.5%	40,038	0.4%	1,490	0.1%	2,270	1.0%	43,798
TOTAL SPECIAL	14.2%	372,275	18.5%	64,321	1.2%	18,137	10.1%	454,733
TOTAL WASTE STREAM	**100%**	**2,614,920**	**100%**	**347,309**	**100%**	**1,526,394**	**100%**	**4,488,623**

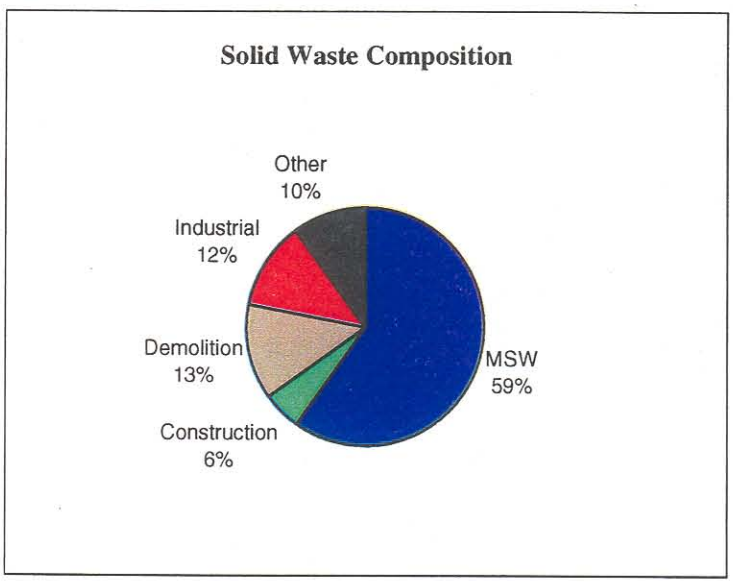
* Based on observation data from 5 sanitary and 2 C&D landfills, plus weighted average for Lee's Summit

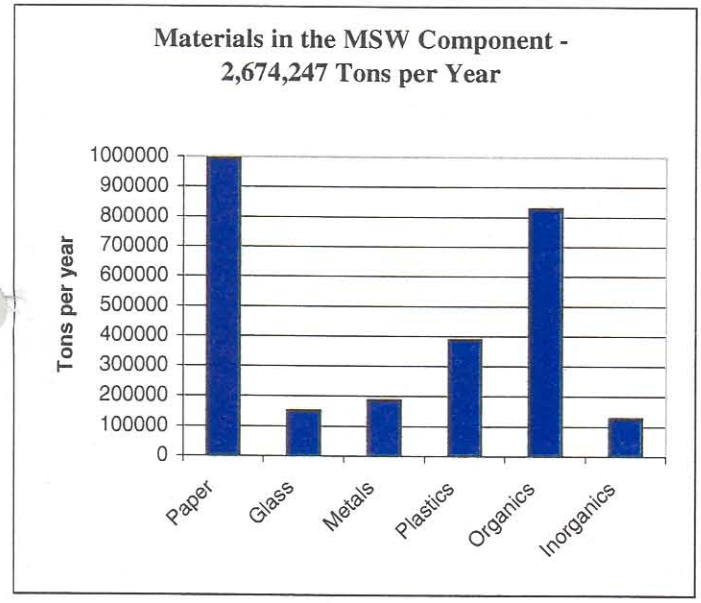
** Based on observation data from 2 landfills, plus the weighted average for Springfield.

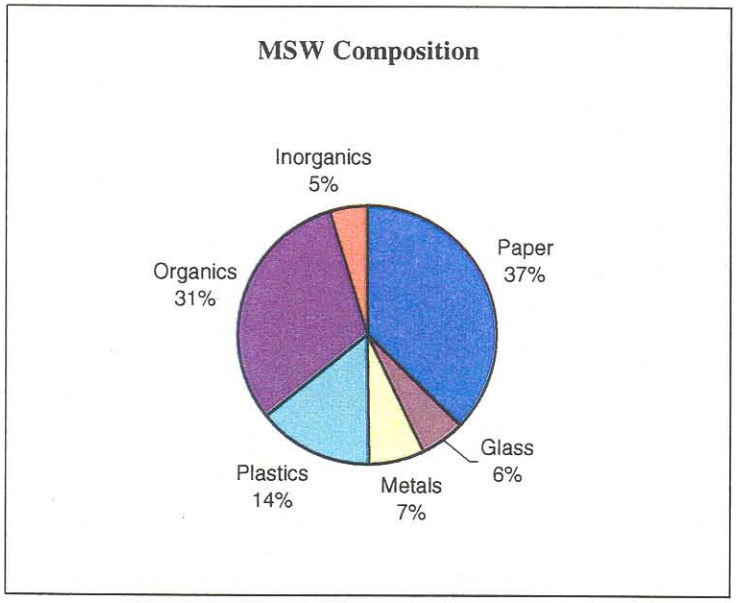
*** Based on observation data from 5 landfills, plus the weighted average from 14 sanitary and 2 C&D rural landfills

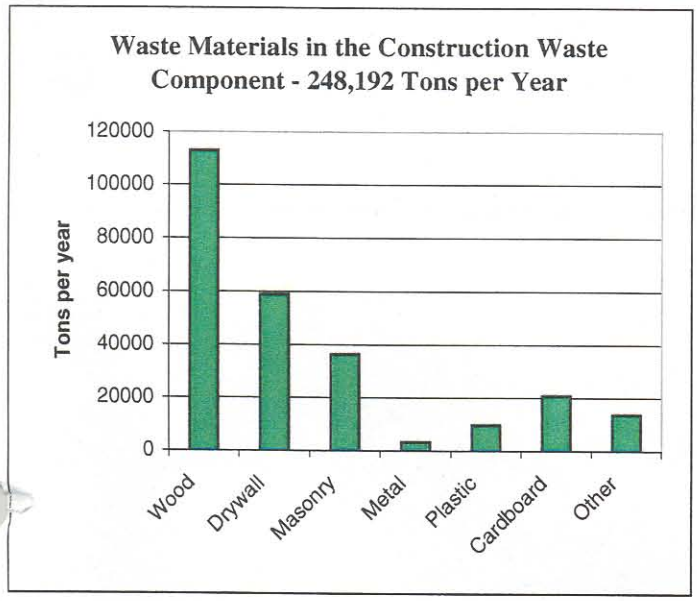
MISSOURI SOLID WASTE COMPONENTS

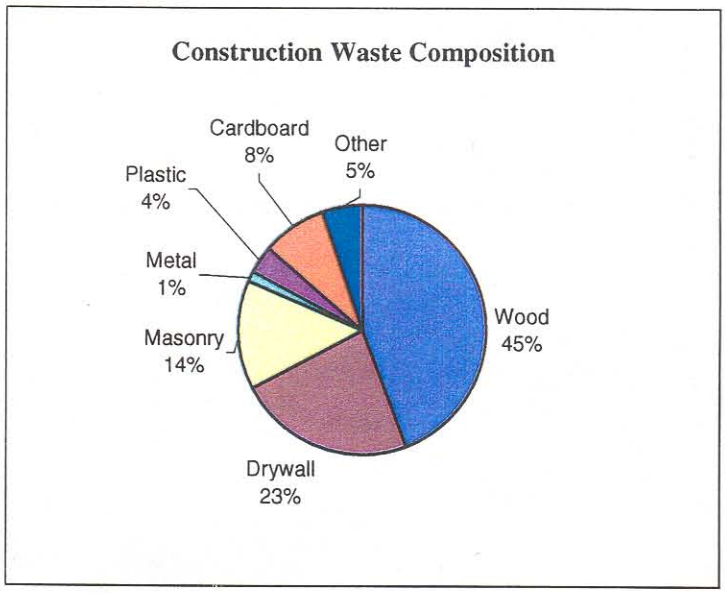




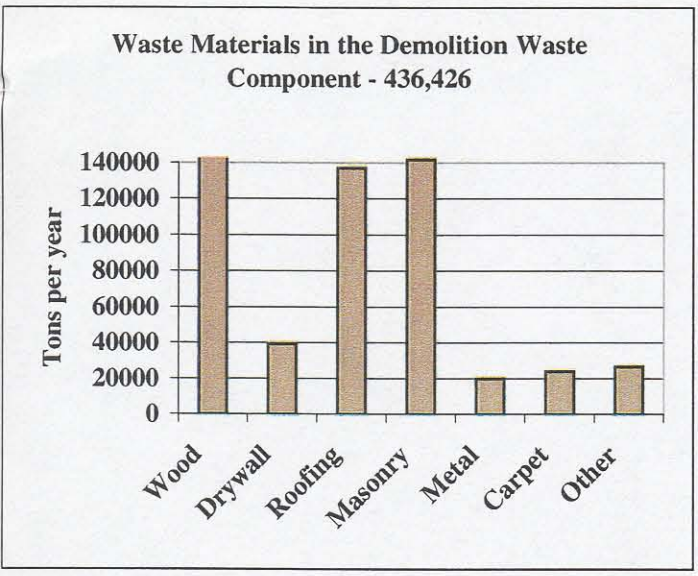


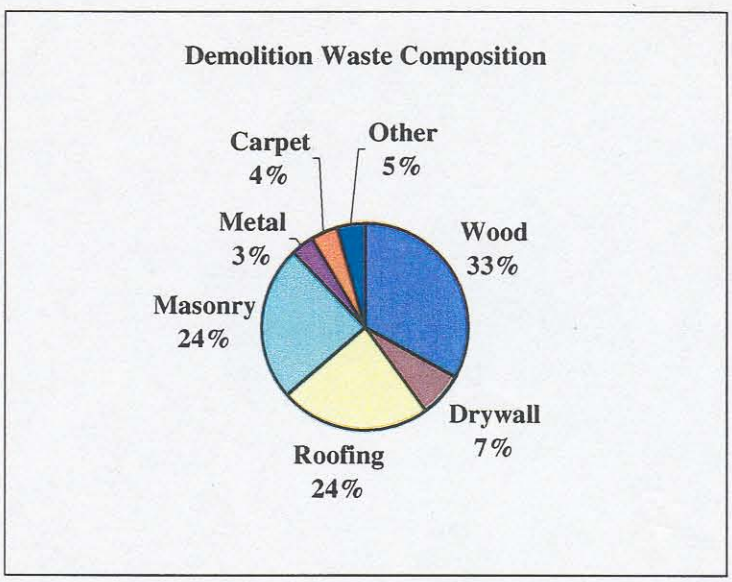


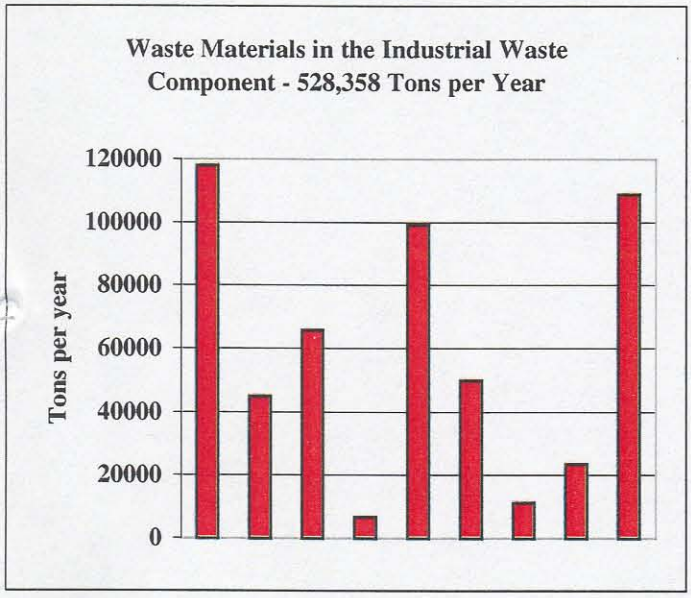


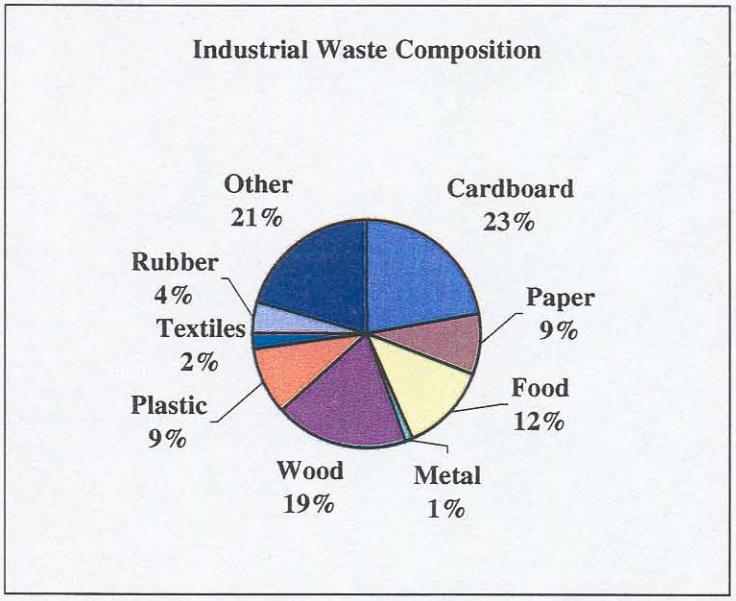


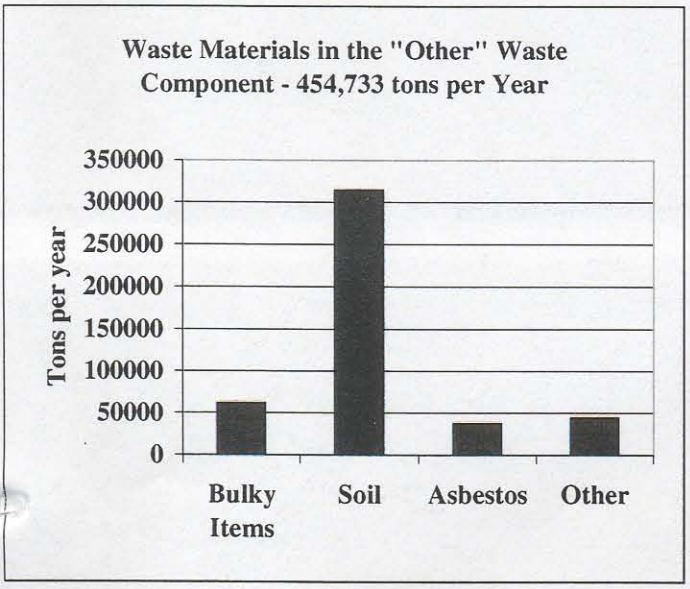
MISSOURI SOLID WASTE COMPONENTS

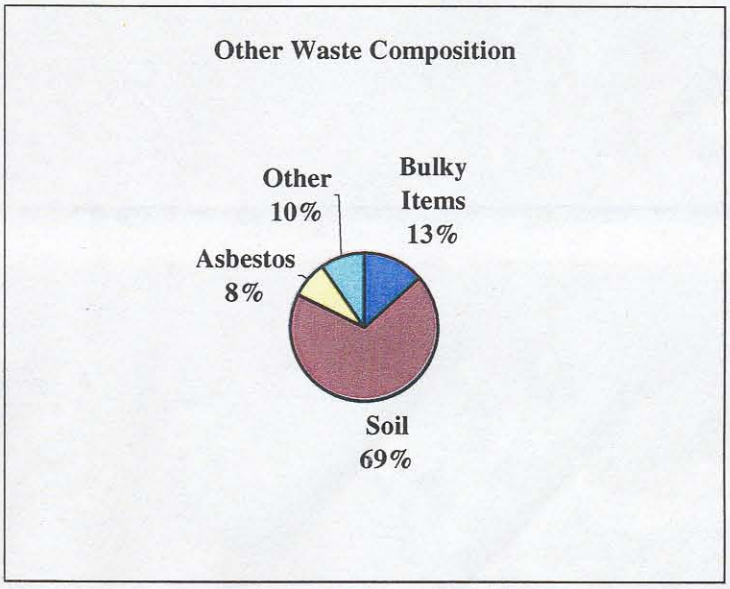
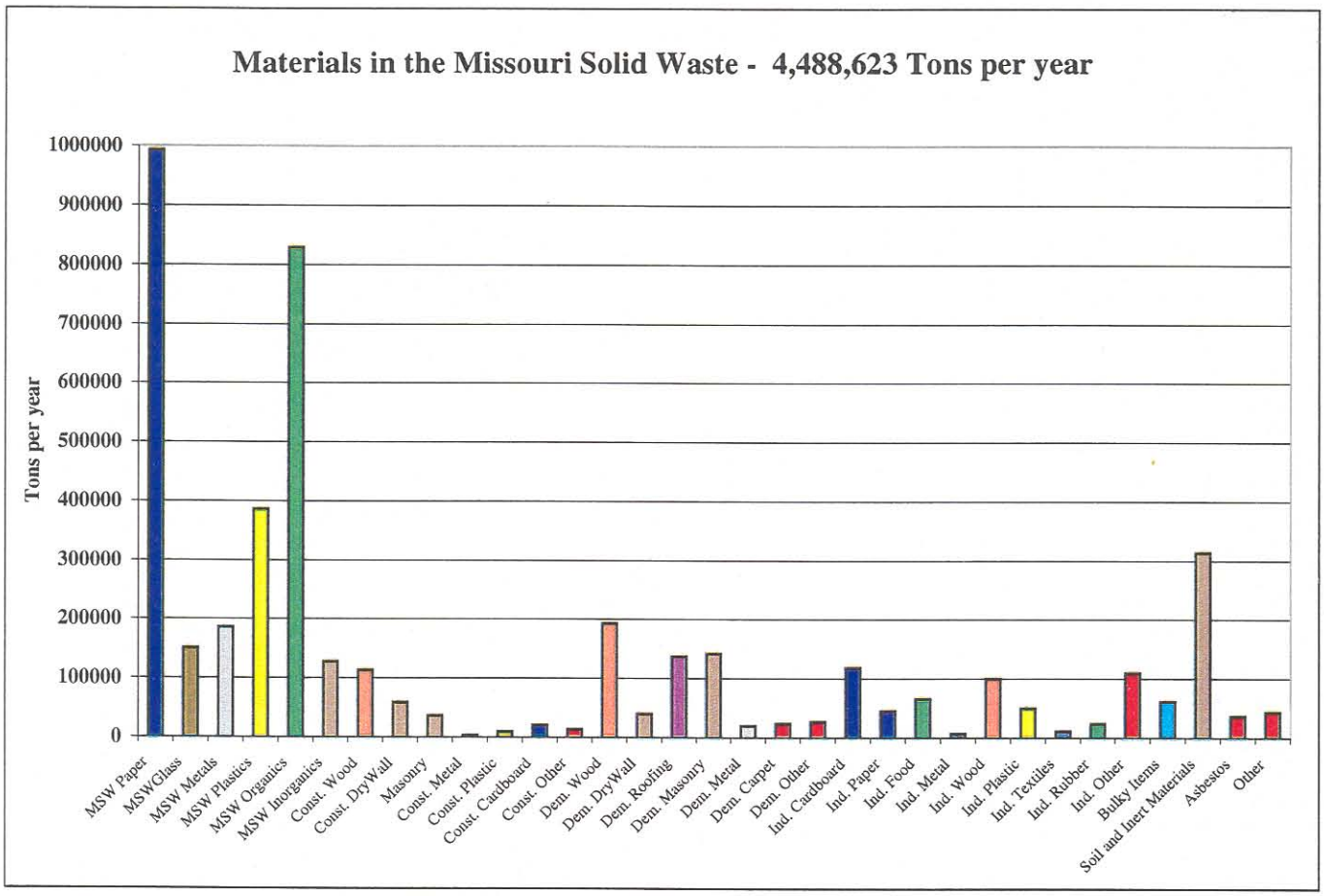
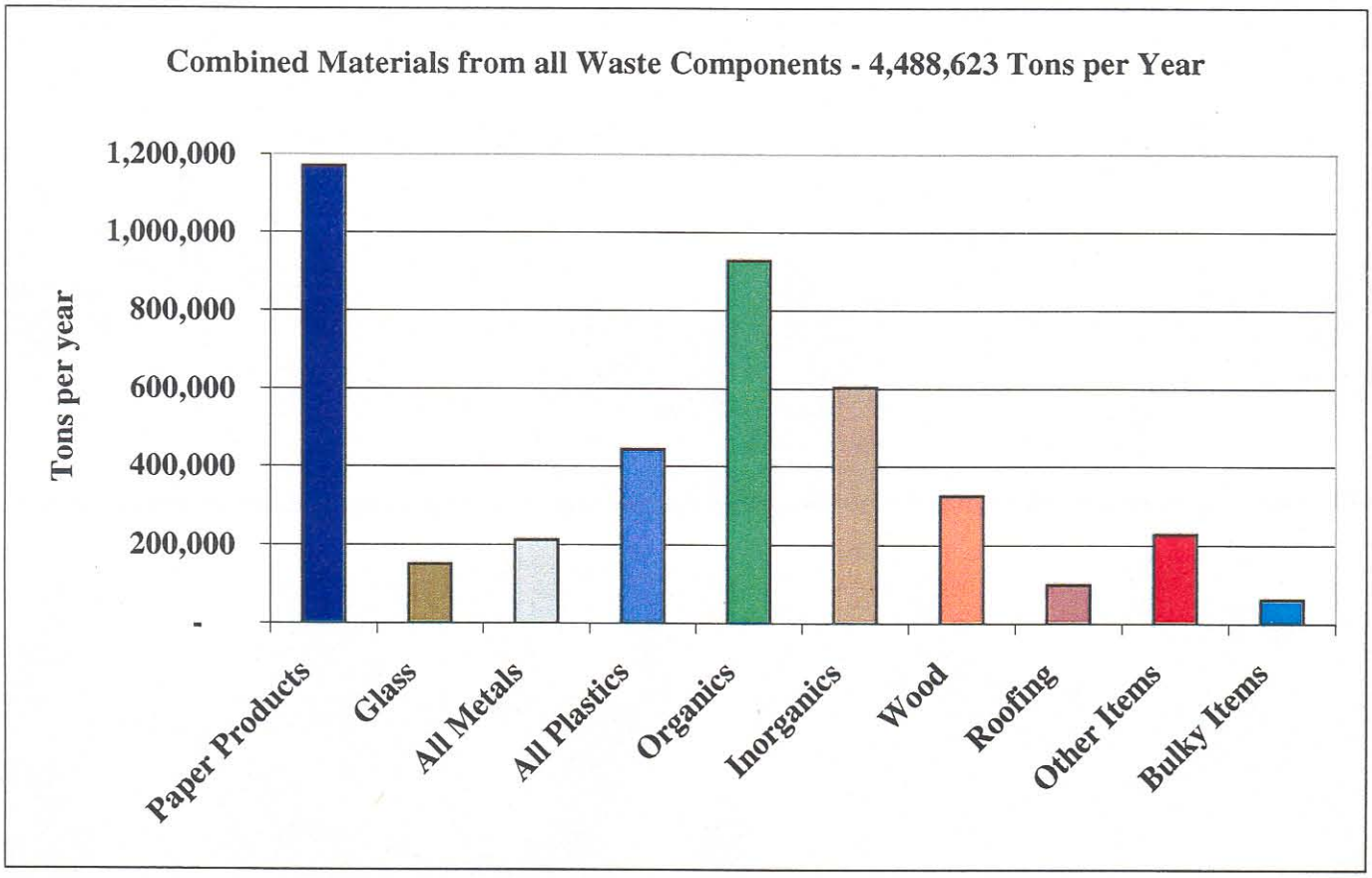












MISSOURI SOLID WASTE COMPONENTS