

# Section I

## **INTRODUCTION**

In 2008 the Missouri Department of Natural Resources Solid Waste Management Program issued a Request for Proposals (RFP) to identify components and percentages of waste in the entire solid waste stream entering Missouri landfills. The Midwest Assistance Program (MAP) was awarded the contract for the study.

The Information contained within this report characterizes the composition of solid waste received by Missouri transfer stations and landfills during the study (June 2008 - October 2008). For the MSW sector components, this study incorporates the results determined in the MSW characterization study conducted by MAP in 2006-07. A complete description of the MSW sector can be found in the 2006-2007 Municipal Solid Waste Composition Study, available through The Missouri Department of Natural Resources Solid Waste Management Program web site ([www.dnr.mo.gov/env/swmp](http://www.dnr.mo.gov/env/swmp)).

The 2008 study observed solid waste received at 15 landfills and transfer stations between June and October, 2008. Each facility was observed for one week. Each solid waste load was observed, classified into one of six major waste sector categories (MSW, Construction waste, Demolition waste, Industrial waste, Other waste, and Special waste), and the percentage of each material within that sector was visually estimated and recorded. The percentages were applied to the actual weights received from the scale data to determine the tonnage for each material. The findings from this study are included in this report.

## **PURPOSE OF THE STUDY**

The Missouri Waste Composition Study is useful and necessary for the following reasons:

- The study provides a picture of the changes in the Missouri waste stream over the past decade.
- The study provides an estimate of the weight of materials that are discarded in Missouri landfills and the opportunities for reduction, reuse, and recycling. This information will assist state and district planners to more efficiently target grant programs.
- The study provides information on material sectors that are currently being disposed so that grant applicants can estimate available waste materials.
- The study provides information for municipal and private recycling programs. Municipal and private recyclers can use the data to predict material flows, collection vehicles needed, plan for processing and end market capacities, project revenues and operating expenses, and target educational materials.

## **HISTORY OF WASTE COMPOSITION STUDIES IN MISSOURI**

The first statewide waste composition study done in Missouri was The Missouri Statewide Resource Recovery Feasibility and Planning Study. This study was initiated by the Missouri Environmental Improvement and Energy Resource Authority (EI ERA) in 1987. Four municipal landfills (Springfield, Lee's Summit, Columbia, and Willow Springs) were sampled. This study was limited to MSW. The results of this study led to the passage of Senate Bill 530 and the creation of the twenty solid waste management districts throughout the state.

In 1996-1999, the Missouri Department of Natural Resource's Solid Waste Management Program funded the first statewide waste composition study to characterize and analyze the entire solid waste stream at Missouri landfills and transfer stations. The Study was conducted by the Midwest Assistance Program (MAP). MSW was studied from 1996-97. The entire waste stream was studied in 1998-99. The same methodology was used in both the 1996-99 study and the 2006-2007 MSW study and the current study. Therefore, conclusions about the changes in waste composition between these dates can be drawn without questioning the change in methods used to sample and process the data. Comparisons between the 1996-99 study and the 2008 study are discussed in Section III.

### **OTHER WASTE COMPOSITION OR CHARACTERIZATION STUDIES**

This study differs from various other waste characterization studies because it examines the entire waste stream entering Missouri sanitary landfills. Almost every state has conducted site specific waste composition or characterizations studies of one type or another to determine what is "in" their solid waste. A variety of methods have been used in these studies. Almost all of these studies concerned MSW but did not examine the remaining waste stream. Variables include sample locations, sample size, sort categories, and statistical manipulations. Comparing the results is often misleading because of the great differences in the methods used.

The state of California has conducted several waste characterization studies. Their web site describes their approach to characterizing solid waste at <http://www.ciwmb.ca.gov/WasteChar/>.

The U.S. Environmental Protection Agency (EPA) has used what is often referred to as the Franklin Method. Details on this waste characterization study can be found on the EPA website: <http://www.epa.gov/epawaste/nonhaz/municipal/msw99.htm>.

This method uses a *materials flow methodology*, which relies heavily on a mass balance approach. Using data gathered from industry associations, key businesses, and similar industry sources, and supported by government data from sources such as the Department of Commerce and the U.S. Census Bureau, this method estimates tons of materials and products generated, recycled, or discarded. Other sources of data, such as waste characterizations and surveys performed by governments, industry, or the press, supplement this data.

Other waste Characterizations that may be used to understand methodology are:

- Wisconsin Statewide Waste Characterization Study – May 2003 by Cascadia Consulting
- Iowa Statewide Waste Characterization Study – February 2006 by RW Beck
- Construction, Renovation and Demolition Waste Characterization Study – December 2000 by CG&s.

### **METHODOLOGY USED TO DETERMINE THE NON MSW COMPONENTS**

Previous studies determined the composition of the MSW. However, it was necessary to determine what percentage MSW is in the total waste stream. MSW is only one sector of the total waste disposed in Missouri. All the waste sectors must be examined and quantified before the percentage and quantity of MSW can be accurately estimated. The 2006-2007 study characterized the components of the MSW sector. That study determined

what percentage of each material was in the Missouri MSW sector. For instance, about 33.63% of the MSW was paper waste. But what did that percentage mean? How many tons of MSW paper is disposed annually? What percentage of the entire waste stream did MSW paper comprise?

Each landfill and transfer station that sends their waste out of state 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. The last complete tonnage report at the time of this writing was for the year ending 12/31/07.

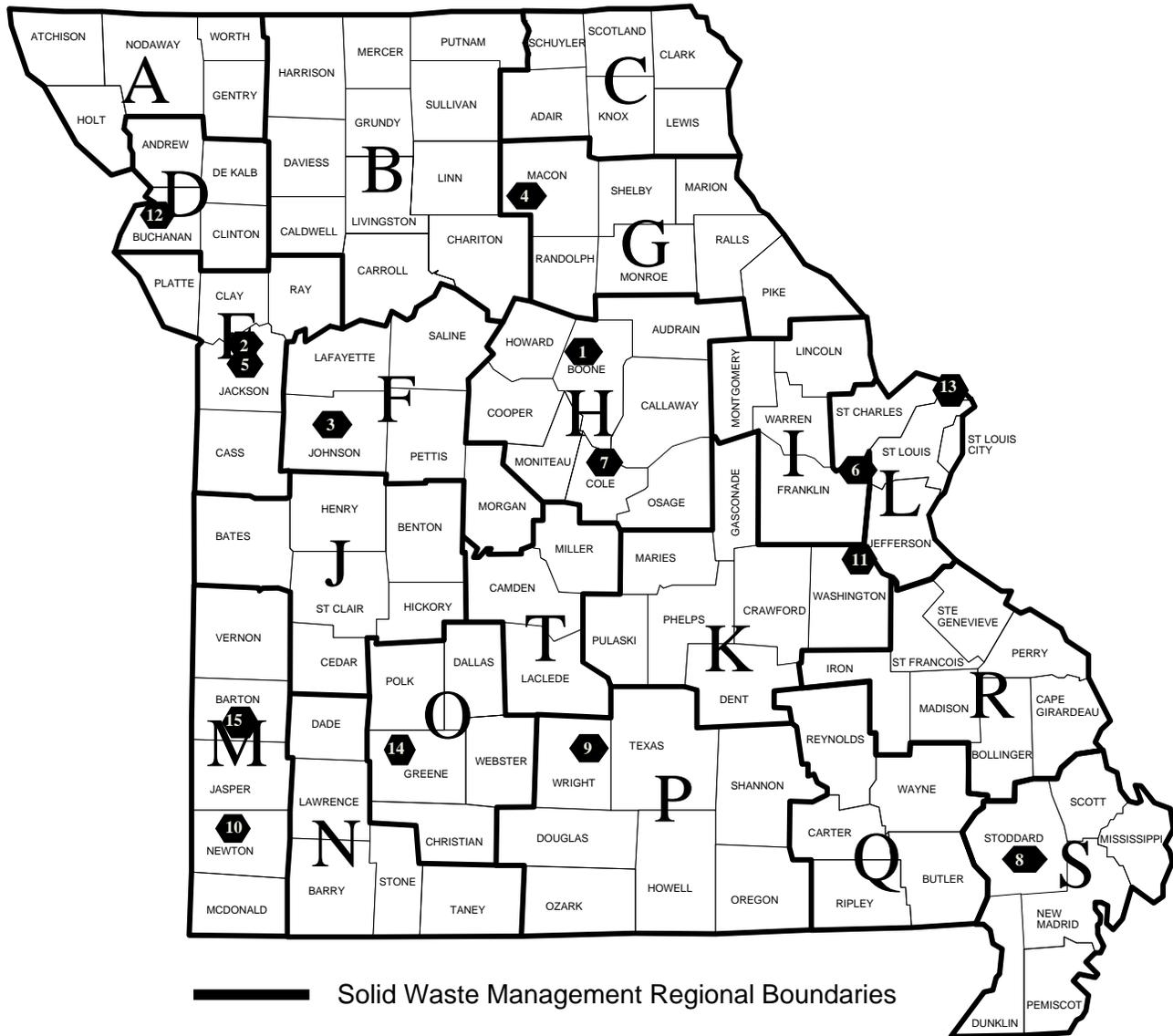
In 2007 DNR estimated that 6,364,557 tons of waste was disposed in Missouri landfills or sent to out of state landfills. However, it cannot be assumed that 33.63% of the entire waste stream is paper because the total waste stream is not exclusively MSW. There are other sectors in the waste stream (construction waste, demolition waste, industrial waste, etc.). The only way to know the true percentage of MSW paper in the total waste stream is to understand what the other waste sectors are, and what percent of the waste stream they comprise.

The 2008 Missouri Waste Composition Study determined that the best way to estimate waste sectors delivered to Missouri landfills and the materials within these sectors was to observe and record waste unloaded at Missouri landfills and transfer stations. The Missouri Department of Natural Resources Solid Waste Management Program selected the landfills and transfer stations to be observed during 2008. A total of 15 facilities were observed for a period of one week each. The week that was chosen for observation was deemed a 'typical' week and the waste composition were not significantly different than any other typical week (holiday weeks were avoided).

The map below identifies the landfills and transfer stations observed during the study.

# 2008 Missouri Waste Composition Study

## Sites Sampled by County and Solid Waste Management Regions



(LF=Landfill TS=Transfer Station)

- |                             |                      |                          |
|-----------------------------|----------------------|--------------------------|
| 1. Columbia LF              | 6. Fred Weber LF     | 11. Timber Ridge LF      |
| 2. Courtney Ridge LF        | 7. Jefferson City LF | 12. St. Joseph LF        |
| 3. Show Me (Warrensburg) LF | 8. Lemons LF         | 13. St. Louis (north) TS |
| 4. Maple Hill (Macon) LF    | 9. Black Oak LF      | 14. Springfield LF       |
| 5. Pink Hill Acres Demo LF  | 10. Neosho TS        | 15. Prairie View LF      |

The following table identifies the landfills and transfer stations where waste loads were observed and data collected during the 2008 study.

***Table I-1: Observation Locations and Dates***

<b>Observation Date</b>	<b>Landfills and TS</b>	<b>2007 Tonnage</b>	<b>Included in 1999 Study</b>	<b>Owner</b>
June 2-6	Columbia	175175	Yes	Municipal
June 9-13	Show Me	173894	No	Allied
June 16-20	Timber Ridge	172796	No	IESI
June 23-27	Maple Hill	168386	Yes	Veolia
July 7-11	Springfield	103140	No	Municipal
July 14-18	Black Oak	362734	Yes	Waste Corp
August 4-8	St. Louis TS	202891	No	Waste Mangmt
August 11-15	Lemons	108696	Yes	Allied
August 18-22	Courtney Ridge	520394	Yes	Allied
August 25-29	St. Joseph	136964	Yes	Municipal
September 8-12	Fred Weber	995443	Yes	Weber
September 15-19	Prairie View	581253	Yes	Allied
September 22-26	Jefferson City	200218	No	Allied
Sept 29 - Oct 3	Neosho TS	18683	No	Municipal
October 6-10	Pink Hill Acres	34659	No	Bowen
<b>2007 Tonnage</b>		<b>3955326</b>		

The method of observation was the same for each landfill. Data was collected by Environmental Data Services at each landfill for a one week period in the same way it was collected in 1999. Holiday weeks and special events that might skew the data were avoided. The date, time, truck number, and the owner of each vehicle bringing waste to the landfill was recorded when it arrived at the unloading area. When that vehicle unloaded, the composition of the waste was visually inspected and the percentage, by weight, of each component was estimated and entered as a percentage of the load. When traffic permitted, the observer walked around each load to visually characterize the materials within that load. If it was not possible to walk around the load, the observation was done as close as physically possible with the use of binoculars.

At the end of each day the weight of each load was obtained from the scale data and the percentage for each material that was observed within each load was calculated. The load weights and material percentages were entered into a Microsoft Excel spreadsheet for analysis.

The following table depicts the start and end date for each observation. It also summarizes the waste loads, hours, and tons observed at each facility.

**Table I-2: Sampling Data**

<b>Waste Facility</b>	<b>Start Date</b>	<b>End Date</b>	<b>Loads Observed</b>	<b>Hours Observed</b>	<b>Tons Observed</b>
Black Oak	14-Jul	18-Jul	369	50	7052
Columbia	2-Jun	6-Jun	717	50	3278
Courtney Ridge	18-Aug	22-Aug	1152	47	10627
Fred Weber	8-Sep	12-Sep	1305	40	12017
IESI Timber Ridge	16-Jun	20-Jun	341	52	3757
Jefferson City	22-Sep	26-Sep	460	48	3460
Lemons	11-Aug	15-Aug	223	45	2263
Maple Hill	23-Jun	26-Jun	343	40	3891
Neosho T.S.	29-Sep	3-Oct	95	45	403
Pink Hill Acres Demo	6-Oct	10-Oct	129	50	706
Prairie View	15-Sep	19-Sep	345	45	7887
Show - Me	9-Jun	13-Jun	345	47	4053
Springfield	7-Jul	11-Jul	521	36	1802
St. Joseph	25-Aug	29-Aug	646	46	3002
St. Louis T.S.	4-Aug	8-Aug	780	50	3164
<b>Totals</b>			<b>7771</b>	<b>691</b>	<b>67364</b>

**DEFINITION OF MISSOURI WASTE SECTORS**

The Missouri solid waste stream is made up of the following solid waste sectors:

**Construction and Demolition waste** loads were assessed separately instead of combining them into a collective C&D category. The reasoning was that construction waste is cleaner and more easily separated than demolition waste. Therefore if a material recycling program was instituted, it would be easier to source separate and reclaim construction waste rather than demolition waste. Waste was classified as demolition if the materials were attached to each other, pulverized, or unable to be easily separated. The construction and demolition waste sectors are characterized and discussed in Section II.

**Industrial waste** loads are byproducts of industrial or manufacturing processes. Industrial waste is normally homogeneous, containing a single waste product and/or its packaging. This waste was normally delivered to the waste facility in open top roll-off containers or compactor units. The industrial waste sector is characterized and discussed in Section II.

**Other waste** was defined by the solid waste management program as materials not included in the other sectors, such as, municipal sewage sludge, unidentifiable sludge, tree limbs and stumps. This waste sector is characterized and discussed in Section II.

**Special Waste** was defined as bulky items (including furniture, mattresses, box springs, bicycles, and large appliances), soil and inert materials, asbestos, tritium exit signs, and e-scrap (such as televisions, monitors, computers, computer peripherals and cellular phones). This waste sector is characterized and discussed in Section II.

**Municipal Solid Waste (MSW)** is defined as waste generated by residential, institutional, and commercial sources. MSW is normally disposed in dumpsters, small containers, or

plastic bags. MSW is normally delivered to the landfill or transfer station in front, side, or rear load packer trucks. The components of the MSW sector were determined in the 2006-2007 study.