



# **State-wide Waste Composition Draft Results**

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**PROP Data Management Workshop  
October 31, 2002**



**R·W·BECK**

# Objective

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- Provide an overview of the range of results available from the State-wide Waste Composition project
- Present examples of how to apply the results to your planning efforts
- Introduce Recycling Composition Study sample results
- Obtain feedback on data needs

# Disposal vs. Generation

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- Disposal: MSW that is disposed or incinerated (excludes recycled materials)
- Generation: Includes all MSW that is recycled and disposed or incinerated
- Report Focus: Disposed MSW
- Computer Model: Disposed and recycled MSW

# Summary of Field Data Collection

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- Over 1,100 samples of waste physically sorted
- Sampling Plan designed to achieve representation by
  - DEP Region
  - Demographic area
    - Urban
    - Suburban
    - Rural
  - Generating Sector
    - Residential
    - Commercial

# Statistical Overview

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# Data Management Procedures

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- Raw data collected on custom forms
- Data entry on specially-designed spreadsheet
  - QC round 1
- Sample weights converted to percentages and statistically analyzed via custom database
  - QC round 2
- Sample data aggregated based on generation indicators

# Statistical Measures and Methods

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- “Representativeness” of Samples
- Sample Mean Composition
- Confidence Intervals
- Level of Confidence
- Sampling Error
- Weighted Average Aggregation

# Aggregation of Data

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- 36 Discrete Waste Sub-streams!
- Aggregated by:



- The result—LOTS OF NUMBERS!

# NE Region Urban Residential (continued)

	Material	Composition	Lower Bound	Upper Bound	Sampling Error
	<b>Total Paper</b>	<b>38.1%</b>	<b>34.6%</b>	<b>41.7%</b>	<b>10.9%</b>
1	Newspaper	4.2%	3.3%	5.1%	24.4%
2	Corrugated Cardboard	4.1%	3.0%	5.3%	32.2%
3	Office	1.1%	0.7%	1.6%	49.6%
4	Magazine/ Glossy	2.2%	1.5%	2.9%	37.7%
5	Polycoated/Aseptic Containers	0.6%	0.5%	0.7%	23.1%
6	Mixed (Other Recyclable)	5.6%	4.4%	7.0%	27.1%
7	Other (Non-recyclable)	20.4%	18.1%	22.8%	13.4%
	<b>Total Plastic</b>	<b>11.7%</b>	<b>10.7%</b>	<b>12.9%</b>	<b>11.0%</b>
8	#1 PET Bottles	1.0%	0.8%	1.2%	24.9%
9	#2 HDPE Bottles	0.8%	0.7%	1.0%	20.0%
10	#3-#7 Bottles	0.1%	0.0%	0.1%	64.3%
11	Expanded Polystyrene	0.9%	0.7%	1.1%	24.7%
12	Film Plastic	5.8%	5.2%	6.5%	13.3%
13	Other Rigid Plastic	3.1%	2.5%	3.8%	25.2%
	<b>Total Metal</b>	<b>3.3%</b>	<b>2.6%</b>	<b>4.0%</b>	<b>25.8%</b>
14	Steel Cans	1.3%	1.1%	1.6%	22.0%
15	Aluminum Cans	0.7%	0.5%	0.8%	28.2%
16	Other Ferrous	0.8%	0.4%	1.4%	71.0%
17	Other Aluminum	0.3%	0.2%	0.5%	44.1%
18	Other Non-Ferrous	0.1%	0.0%	0.2%	82.7%

# NE Region Urban Residential (continued)

	Material	Composition	Lower Bound	Upper Bound	Sampling Error
	<b>Total Glass</b>	<b>3.4%</b>	<b>2.5%</b>	<b>4.5%</b>	<b>34.5%</b>
19	Clear	1.7%	1.2%	2.3%	38.2%
20	Green	0.3%	0.2%	0.6%	74.9%
21	Amber	0.8%	0.4%	1.4%	72.9%
22	Other	0.6%	0.3%	0.9%	64.2%
	<b>Total Organics</b>	<b>39.0%</b>	<b>35.3%</b>	<b>42.8%</b>	<b>11.2%</b>
23	Yard Waste- Grass	0.4%	0.1%	0.7%	86.5%
24	Yard Waste- Other	1.2%	0.6%	2.2%	76.6%
25	Wood- Unpainted	0.6%	0.3%	1.1%	74.6%
26	Wood- Painted	1.8%	0.7%	3.4%	83.6%
27	Food Waste	21.1%	17.8%	24.6%	18.6%
28	Textiles	4.1%	3.2%	5.3%	29.2%
29	Diapers	4.6%	3.4%	5.9%	32.5%
30	Fines	2.1%	1.5%	2.8%	35.4%
31	Other Organics	3.0%	2.0%	4.2%	43.2%
	<b>Total Other Waste</b>	<b>4.5%</b>	<b>3.0%</b>	<b>6.1%</b>	<b>40.3%</b>
32	Electronics	0.5%	0.3%	0.9%	68.5%
33	Carpet	0.9%	0.4%	1.7%	78.1%
34	Drywall	0.2%	0.1%	0.3%	87.4%
35	Other C&D	0.4%	0.2%	0.8%	81.0%
36	HHW	0.1%	0.1%	0.2%	63.1%
37	Other Inorganics	2.3%	1.3%	3.5%	55.7%

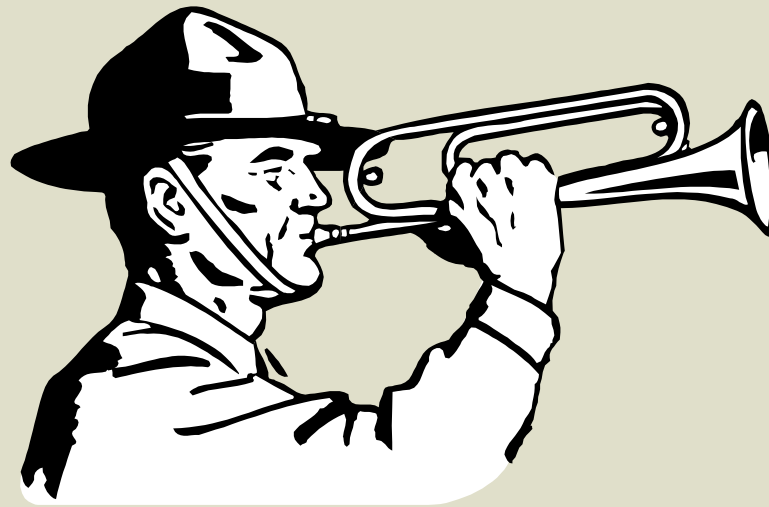
## NE Region Urban Residential (continued)

<b>Material</b>	<b>Sample Mean</b>	<b>Lower Bound</b>	<b>Upper Bound</b>	<b>Sampling Error</b>
<b>Paper</b>	<b>38.1%</b>	<b>34.6%</b>	<b>41.7%</b>	<b>10.9%</b>
<b>Plastic</b>	<b>11.7%</b>	<b>10.7%</b>	<b>12.9%</b>	<b>11.0%</b>
<b>Metal</b>	<b>3.3%</b>	<b>2.6%</b>	<b>4.0%</b>	<b>25.8%</b>
<b>Glass</b>	<b>3.4%</b>	<b>2.5%</b>	<b>4.5%</b>	<b>34.5%</b>
<b>Organics</b>	<b>39.0%</b>	<b>35.3%</b>	<b>42.8%</b>	<b>11.2%</b>
<b>Other Waste</b>	<b>4.5%</b>	<b>3.0%</b>	<b>6.1%</b>	<b>40.3%</b>

# Enough Statistics!

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Wake up!!!



# Aggregate Waste Composition

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## Aggregate Composition by DEP Region

Material	Minimum	Maximum
Paper	35.0%	38.8%
Plastic	12.4%	14.0%
Glass	2.3%	4.0%
Metal	4.7%	6.5%
Organics	32.3%	35.9%
Other Waste	5.9%	8.9%

# Variation in Waste Composition

## Comparison of Selected Demographic/Generator Pairs

Material	NC Urban Residential	SW Suburban Commercial	SE Rural Residential
Paper	28.6%	42.9%	35.6%
Plastic	11.6%	12.7%	10.8%
Glass	2.2%	3.1%	4.3%
Metal	7.2%	4.7%	5.2%
Organics	43.6%	24.8%	38.3%
Other Waste	6.9%	11.8%	5.7%

# Diversion Opportunities

No. of Regions in which material is in Top 10

<b>Material</b>	<b>Ranked 1 or 2</b>	<b>Ranked 3 or 4</b>	<b>Ranked 5 or 6</b>	<b>Ranked 7 thru 10</b>
Food Waste	6			
Non-recyclable paper	5	1		
OCC	1	5		
Film Plastic		3	3	
Newspaper		1	3	2
Mixed paper		1	2	3
Textiles			2	3
Office paper			1	2
Yard Waste			1	3
Other Rigid Plastic				6
Magazines				2

# Improvement on National Data

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<b>Material</b>	<b>Nat'l Data [1]</b>	<b>PA-Specific Data</b>
Glass	4.8%	2.3% - 4.0%
Aluminum Cans	0.7%	0.5% - 0.8%
Steel Cans	1.2%	0.9% - 1.7%
Plastic Bottles	1.9%	1.5% - 2.3%
Newspaper	6.5%	3.9% - 6.2%
Corrugated Cardboard	13.7%	6.3% - 10.2%
Office Paper	3.2%	2.5% - 5.5%
Yard Waste	12.0%	1.6% - 8.5%
Wood	3.4%	2.9% - 7.1%

[1] Source: Municipal Solid Waste in the U.S. 2000



# FAQs

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- “My county is about half suburban and half rural. What materials should I target in each area to achieve additional diversion?”
- “There are extensive residential recycling programs in place in my community, but no significant commercial recycling. What should I target in the commercial stream?”

## FAQs (continued)

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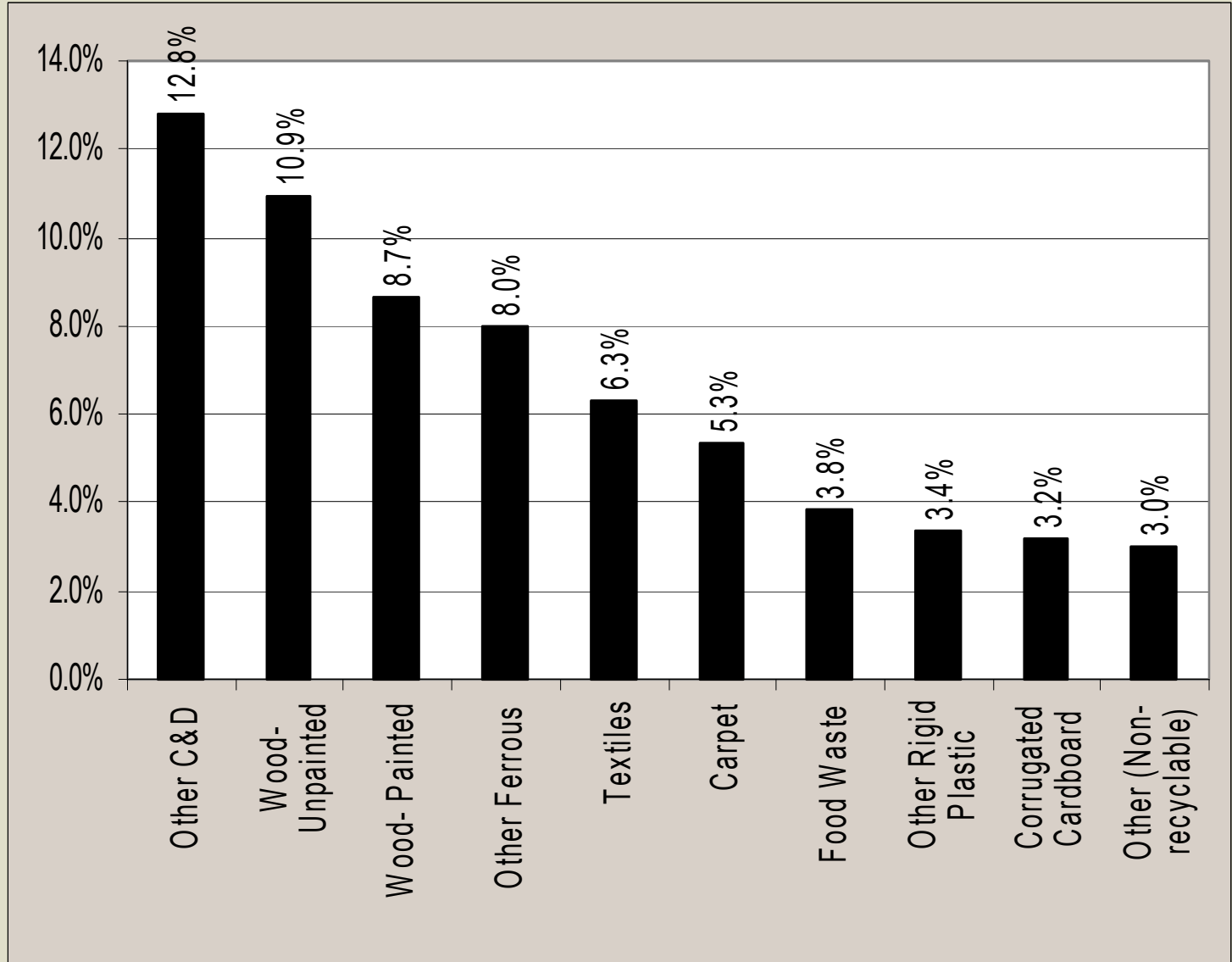
- “Which recycled material markets do we need to develop to get the most bang for our recycling buck?”
- “I don’t have reliable generation or disposal quantity data. What conclusions can I draw about my waste stream?”

# Other Findings

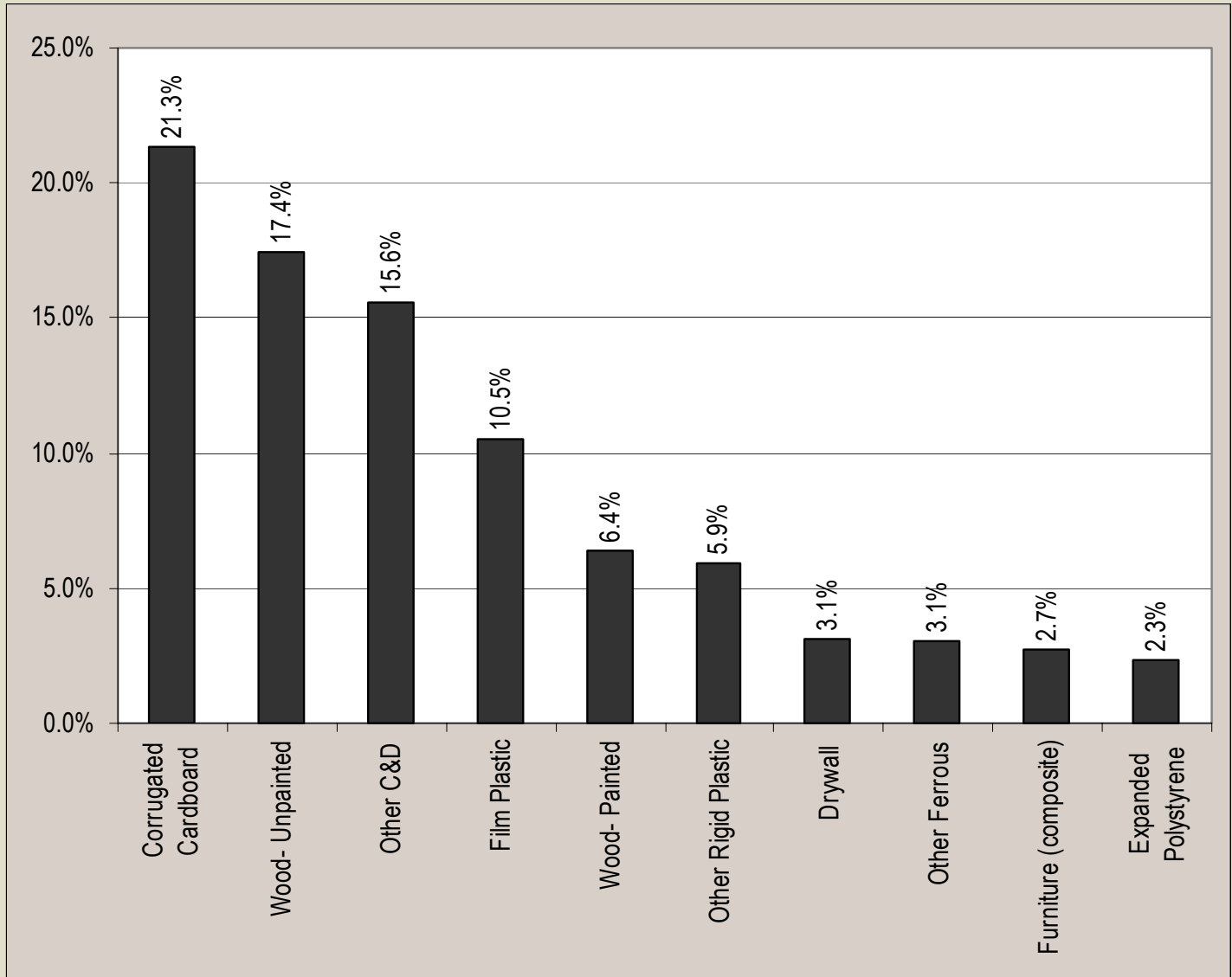
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- Self-haul waste composition
- Bulk waste composition
- Composition of packaging and non-packaging in the waste stream

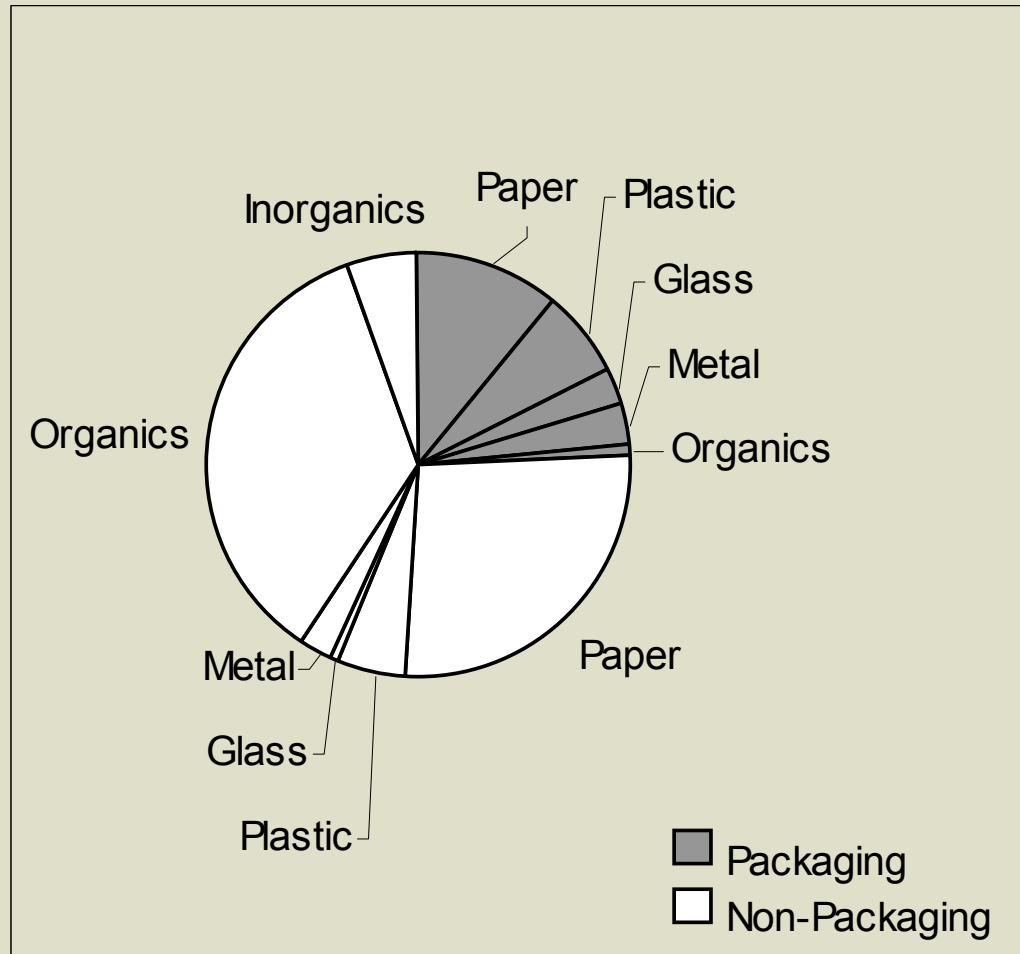
# Self-Haul Waste (Pct. by weight)



# Bulky MSW (Pct. by Volume)



# Packaging Analysis



# What Next?

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- Finalize Analysis and Report
  - Validate disposal and generation data
- Develop Statistical Model
  - Demographic characteristics
  - Waste system characteristics
- Distribute Beta Version of Model
- Compile Feedback
- Post Final Model on Internet for State-wide Use
- Don't forget the video!!!

# Recycling Composition Study Update

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- All scheduled MRF sorts completed
  - Centre County: curb sort & drop-off
  - Northern Tier: curbs sort & drop-off
  - Lackawanna County: dual stream curbside
  - Pittsburgh Recycling: blue bag and dual stream curbside
  - Waste Management (York): single stream curbside

# Questions to be Answered

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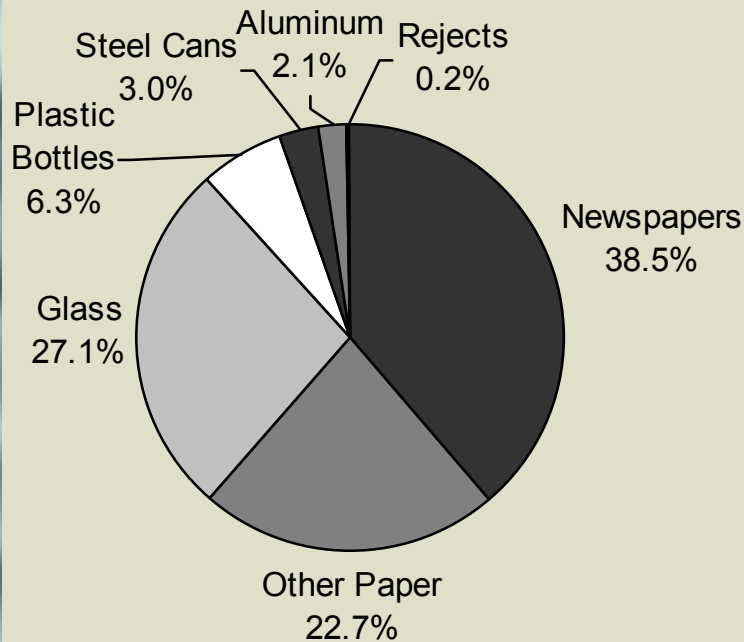
- How much do contamination rates vary...
  - By collection method?
  - By generator?
  - By program?
- How much recyclable material is lost during processing?

## Questions (continued)

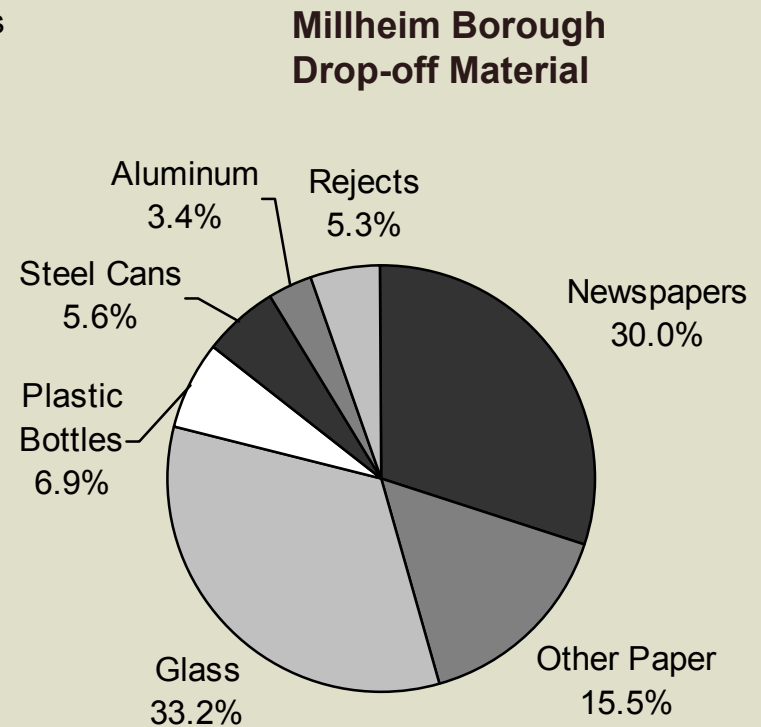
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- How prevalent is recovery of single-serve containers?
- What is the composition of mixed paper being recovered?
- What is the composition of “commingled containers” reported as a lump sum?

# Incoming Material Composition



**Centre COG Curbsort Material**

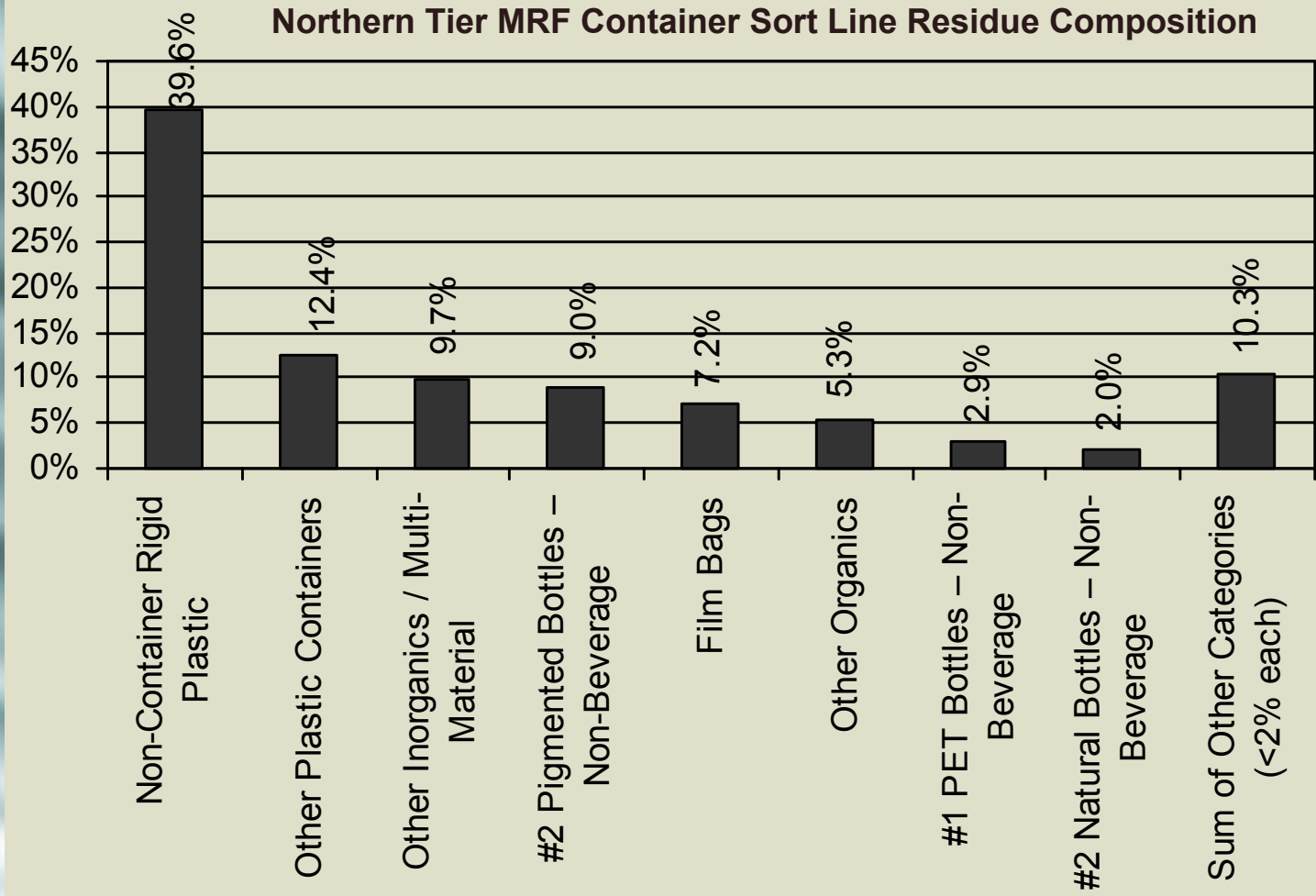


**Millheim Borough Drop-off Material**

*Note: Preliminary results only. Actual results may differ from those shown.*



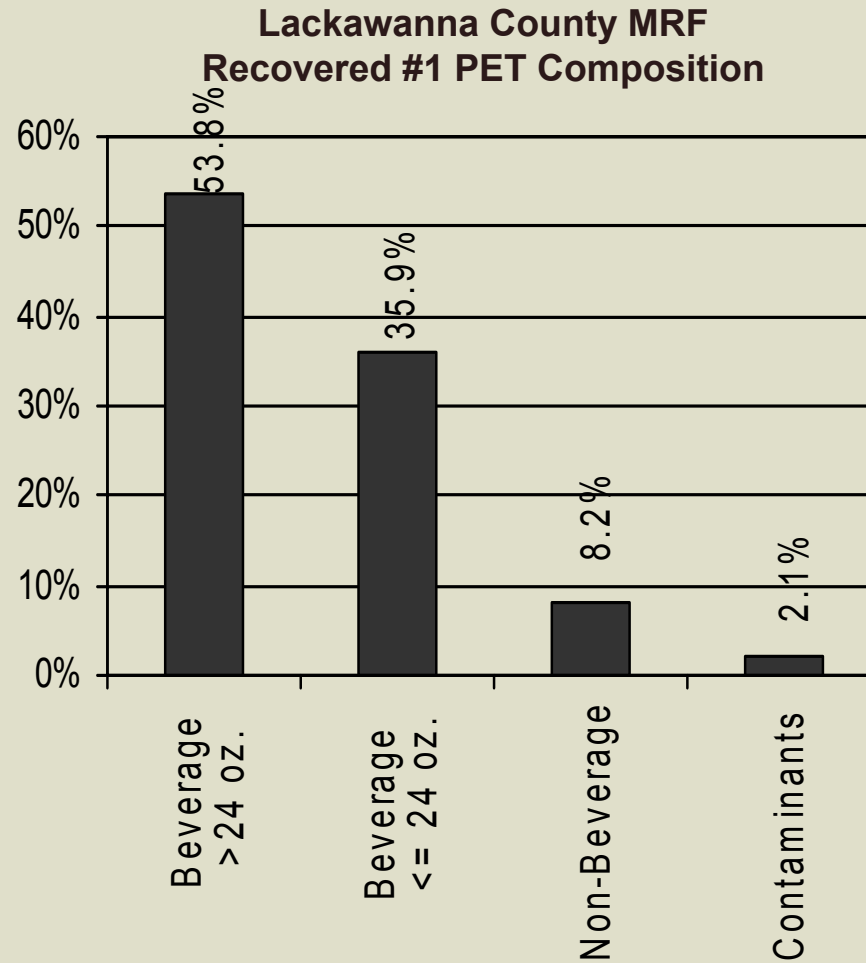
# Recycling “Yield Loss”



Note: Preliminary results only. Actual results may differ from those shown.



# Single-Serve Plastics Composition



*Note: Preliminary results only. Actual results may differ from those shown.*

# Schedule

- Waste Composition Study
  - Report—November 14
  - Educational Video—December 15
  - Model Development—January 15, 2003
- Recycling Composition Study
  - Analysis & report—December 15