

Section 2 BACKGROUND

Introduction

This section provides background information about the demographics, generator sectors, and disposed solid waste quantities in Pennsylvania. All of these variables were considered in developing a sampling plan for this study.

Demographic Overview

Pennsylvania, the nation's 6th most populous state, spans a land area of almost 45,000 square miles. In 2000, Pennsylvania was home to 12.3 million people living in 5.2 million housing units with a mean annual household income of \$51,100. Pennsylvania is comprised of 67 counties that are subdivided into six DEP planning regions based on geographical location. The communities within Pennsylvania vary from urban metropolitan areas such as Philadelphia and industrial centers such as Pittsburgh, through suburban regions outlying cities across the Commonwealth, down to thousands of small rural boroughs and townships that make up the majority of the Commonwealth's land area.

From the outset of this project, an objective was to differentiate waste composition between urban, suburban and rural areas. Accordingly, this project has relied on a Commonwealth database that defines all 2,579 incorporated municipalities within Pennsylvania as either urban, suburban or rural¹. Table 1 summarizes the number of communities in each DEP region that are urban, suburban and rural. As expected, the vast majority of the communities (73.5 percent) are rural. Only 21 municipalities, less than one percent, are characterized as urban.

¹ Source: Department of Environmental Protection

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Table 1 Community Demographic Summary

Region	Number of Communities				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	6	94	293	393	15.2%
Northcentral	2	15	408	425	16.5%
Northwest	2	26	363	391	15.2%
Southeast	2	165	72	239	9.3%
Southcentral	5	108	437	550	21.3%
Southwest	4	254	323	581	22.5%
State Totals	21	662	1,896	2,579	100.0%
Pct. of total	0.8%	25.7%	73.5%	100.0%	

Source: U.S. Census 2001

Table 2 presents another picture of the urban, suburban and rural demographics of Pennsylvania. This table shows the population breakdown by region and by demographic sector. Although the vast majority of communities are rural (see Table 1), as shown in Table 2 the population residing in rural areas is much smaller. Suburban areas contain the highest percentage of Pennsylvania's population, followed by rural areas. Philadelphia County (located in the Southeast Region) accounts for 12.4 percent of the total state population and 56 percent of the total urban population in the Commonwealth.

Table 2 Population Summary

Region	Population				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	323,762	589,788	710,318	1,623,868	13.2%
Northcentral	69,126	107,815	591,014	767,955	6.3%
Northwest	120,045	251,667	663,635	1,035,347	8.4%
Southeast	1,539,409	2,042,782	267,456	3,849,647	31.3%
Southcentral	276,890	926,053	1,181,392	2,384,335	19.4%
Southwest	391,178	1,540,325	688,399	2,619,902	21.3%
State Totals	2,720,410	5,458,430	4,102,214	12,281,054	100.0%
Pct. of total	22.2%	44.4%	33.4%	100.0%	

Source: U.S. Census 2001

Table 3 shows the distribution of the number of households by region and by demographic sector, as well as the persons per household. This table was developed by applying county-specific persons per household estimates from the 2000 Census to the population of each county, and aggregating by region and by demographic area.

Note that the persons per household does not appear to vary greatly between demographic areas, although the regional variation is higher.

Table 3 Housing Summary

Region	Households				Persons per Household
	Urban	Suburban	Rural	Total	
Northeast	132,258	243,830	284,368	660,457	2.46
Northcentral	28,266	44,479	241,385	314,130	2.44
Northwest	48,013	101,496	267,390	416,899	2.48
Southeast	620,521	786,844	100,799	1,508,165	2.55
Southcentral	110,266	369,733	467,418	947,417	2.52
Southwest	168,881	654,008	283,027	1,105,916	2.37
State Totals	1,108,206	2,200,390	1,644,387	4,952,983	2.48
Persons/HH	2.45	2.48	2.49	2.48	

Source: U.S. Census 2001

Tables 4, 5 and 6 present similar summaries of the number of commercial establishments, employment, and gross sales receipts, respectively. As expected, these commercial data track relatively closely with population. As of 2001, the Commonwealth contained roughly 368,000 businesses with 4.2 million employees generating over 728 million in gross sales.

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Table 4 Commercial Establishment Summary

Region	Number of Commercial Establishments				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	10,788	19,012	14,902	44,702	12.2%
Northcentral	2,253	4,328	12,737	19,318	5.3%
Northwest	3,796	9,787	18,148	31,731	8.6%
Southeast	42,383	67,952	7,370	117,705	32.0%
Southcentral	9,914	31,907	33,271	75,092	20.4%
Southwest	15,764	48,519	14,843	79,126	21.5%
State Totals	84,898	181,505	101,271	367,674	100.0%
Pct. of total	23.1%	49.4%	27.5%	100.0%	

Source: ESRI-BIS 2001 projections based on U.S. Census Bureau data

Table 5 Employment

Region	Employment				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	137,870	227,906	121,079	486,855	11.7%
Northcentral	34,212	48,735	118,387	201,334	4.8%
Northwest	54,357	122,076	167,848	344,281	8.2%
Southeast	465,733	841,068	63,202	1,370,003	32.8%
Southcentral	145,774	434,103	332,718	912,595	21.9%
Southwest	220,156	500,628	138,488	859,272	20.6%
State Totals	1,058,102	2,174,516	941,722	4,174,340	100.0%
Pct. of total	25.3%	52.1%	22.6%	100.0%	

Source: ESRI-BIS 2001 projections based on U.S. Census Bureau data

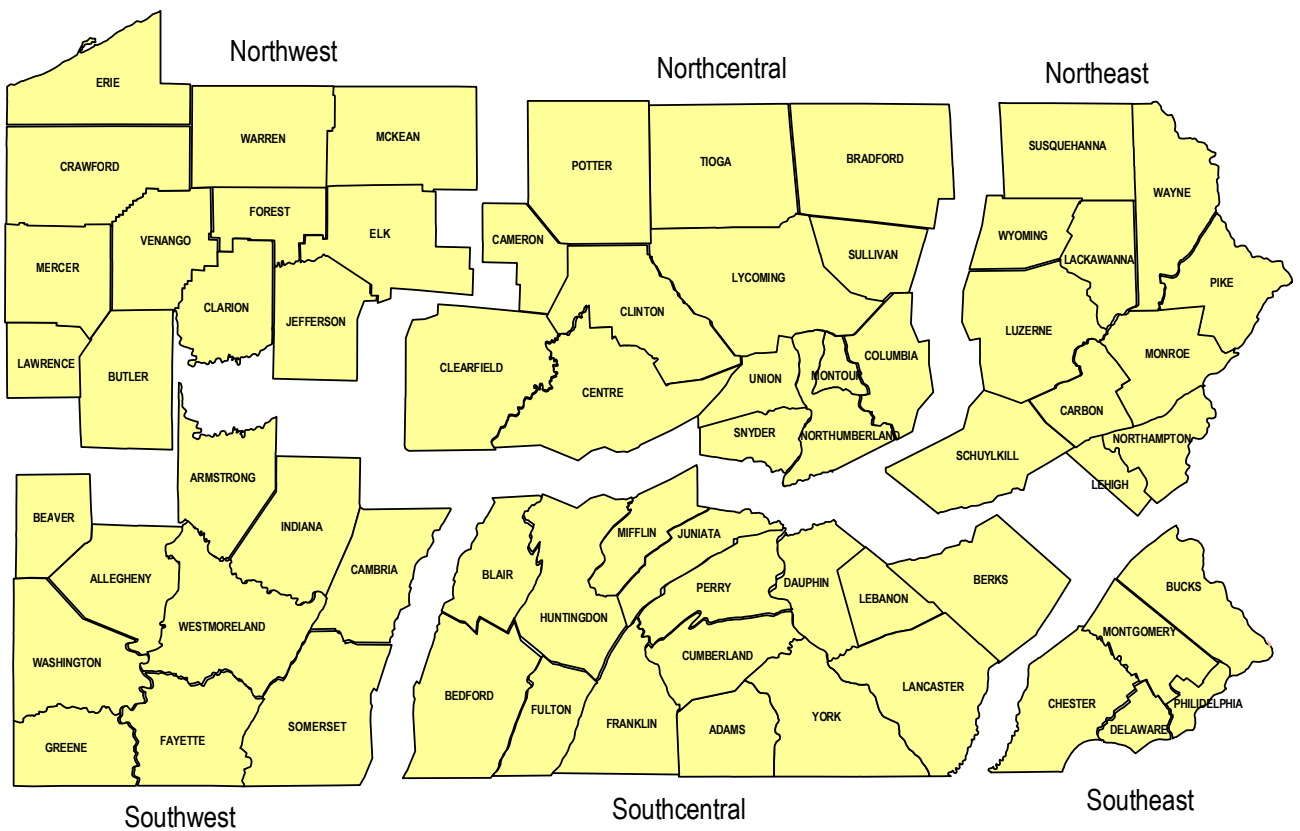
Table 6 Gross Sales Receipts

Region	Gross Receipts				Percent of Total
	Urban	Suburban	Rural	Total	
Northeast	\$20,329,169	\$43,816,581	\$22,085,942	\$86,231,692	11.8%
Northcentral	\$4,769,629	\$8,205,883	\$19,322,419	\$32,297,931	4.4%
Northwest	\$8,189,540	\$21,983,433	\$31,976,162	\$62,149,135	8.5%
Southeast	\$63,009,874	\$170,209,073	\$12,168,363	\$245,387,310	33.7%
Southcentral	\$20,628,004	\$79,548,884	\$61,984,406	\$162,161,294	22.3%
Southwest	\$26,749,188	\$87,530,172	\$26,103,544	\$140,382,904	19.3%
State Totals	\$143,675,404	\$411,294,026	\$173,640,836	\$728,610,266	100.0%
Pct. of total	19.7%	56.4%	23.8%	100.0%	

Source: U.S. Census 2001

Figure 1 illustrates the geographic breakdown of the Commonwealth's six regions.

Figure 1 Pennsylvania Regions



Waste Generating Sectors

This study sought to independently estimate the composition of waste from the following two generating sectors:

- **Residential Waste** – Solid waste collected by public or private haulers from single-family or multi-family residential dwellings; and
- **Commercial Waste** – Solid waste collected by public or private haulers from any non-residential source, such as offices, restaurants, retail establishments, malls, institutions, warehouses, hotels, etc.

Note that waste from large multi-unit dwellings such as apartments and condominiums is often collected by commercial front-end loading vehicles, and is therefore reported as “commercial waste” in some municipalities. Whenever possible, we attempted to treat waste from apartments and condominiums as residential waste, even if it was collected on so-called commercial trucks.

Throughout the study, data collection and analysis was performed to differentiate between these two generating sectors.

Waste Disposal Quantities

This section is divided into two subsections:

- County-level waste disposal data; and
- Apportionment of disposed waste.

County-Level Waste Disposal Data

The purpose of the field sampling and sorting that was performed for this project was to definitively characterize the composition of disposed² municipal solid waste (MSW). Accordingly, we have relied on landfilled and processed/incinerated material quantities that have been reported by the State’s landfills and waste-to-energy facilities (Facility Reports). All Pennsylvania facilities permitted to handle MSW report landfilled/processed material receipts to the Division of Reporting and Fee Collection on a quarterly basis. Materials are reported by county of origin. The Facility Reports database captured 9.3 million tons of MSW reported to be disposed in 2001.

Table 7 Summarizes the MSW reported to be disposed by region of origin in 2001.

² The terms “disposed “ and “disposal,” as used throughout the report, are intended to include municipal waste that is delivered to a municipal waste landfill or to a municipal waste processing facility such as a transfer station or resource recovery facility. It excludes source-separated recyclables that are delivered to a recycling facility or green waste (leaves, grass, yard waste) delivered to a composting facility.

Table 7 Regional MSW Disposal Quantities (Tons)

Region	MSW Tons
Northeast	1,281,588
Northcentral	469,179
Northwest	537,144
Southeast	3,572,730
Southcentral	1,636,192
Southwest	1,872,249
State Totals	9,369,082

We have opted to use the Facility Report database as a basis for aggregating disposed waste composition percentages in the remainder of our analysis. This data source was selected because it is based on a consistent reporting process that encompasses all Pennsylvania MSW facilities. Accordingly, the original sampling plan was based on the Facility Reports. However, to minimize the focus on the absolute quantities, we have opted to focus on State-wide and regional material quantity breakdowns in terms of percentages, rather than absolute tons. Where absolute material quantities are shown, they reflect the disposal quantities from the Commonwealth's Facility Reports.

Apportionment of Disposed Waste

Starting with the Facility Reports for the State-wide analysis, we have used a four-step process to apportion the Commonwealth's disposed waste stream by region, by generating sector (residential or commercial), and by demographic origin (urban, suburban and rural). These steps are described below:

- 1) Compile residential waste disposal rates by demographic sector;
- 2) Project aggregate residential waste disposal based on the residential waste disposal rates;
- 3) Statistically analyze and adjust county-level waste disposal totals (as reported in the Facility Reports); and
- 4) Calculate disposed commercial waste by netting out residential waste from county-level totals.

Throughout the study, R. W. Beck contacted many municipalities to verify the origin of samples taken at the 13 host facilities that participated in the study. When available during these telephone conversations, we also gathered information about residential waste collection and disposal. Many municipalities provide (or contract for) refuse collection for all residential households within the jurisdiction. These jurisdictions would be expected to have accurate annual residential waste disposal data, as well as detailed customer counts (i.e., number of households served, including single family and multi-family). Table 8 presents residential waste disposal rates for those

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communities that were found during the study to maintain detailed quantity and customer base information.

Table 8 Residential Waste Disposal Rates

Demographic Sector	Municipality	Region	Number of Units	Tons Disposed	Disposal Rate (tons/year)	Average Rate (tons/year)
Urban	City of Erie	NW	38,000	31,000	0.82	0.93
	Scranton City	NE	32,637	31,049	0.95	
	Sharon Borough	NW	2,380	2,265	0.95	
	State College Borough	NC	3,155	3,180	1.01	
Suburban	Blakley Borough	NE	2,802	3,188	1.14	1.18
	Centre Regional COG	NC	10,501	9,521	0.91	
	Dickson City Borough	NE	2,663	3,000	1.13	
	Dunmore Borough	NE	5,996	7,000	1.17	
	East Brandywine Township	SE	2,168	2,481	1.14	
	East Hempfield Township	SC	6,344	8,083	1.27	
	East Petersburg	SC	1,780	1,944	1.09	
	Lancaster Township	NW	3,975	5,051	1.27	
	Litz Borough	SC	3,245	4,421	1.36	
	Moosic Borough	NE	2,250	2,023	0.90	
	Plymouth Township	NE	4,463	6,956	1.56	
	Wesleyville Borough	NW	1,323	1,395	1.05	
	West Conshohocken	SE	500	695	1.39	
	Rural	East Donegal Township	SC	1,700	1,947	
Frackville		NE	1,732	1,740	1.00	
Mahanoy City		NE	2,109	2,164	1.03	
Mount Joy Borough		SC	2,250	2,484	1.10	
West Donegal Township		SC	2,194	2,216	1.01	

As shown in Table 8, the average residential waste disposal rates vary by demographic origin. These data suggest that urban households dispose of the least waste, followed by rural households. Suburban households dispose of the most waste. We note anecdotally that the rural communities shown above may not be representative of the range of rural communities in the Commonwealth, primarily because the communities in our survey provided collection to all households within their boundary. In many rural areas, there is no mandatory collection, which may result in waste being incinerated on site, composted, or illegally dumped. Note again that the residential waste disposal data points collected during the project were not selected based on representative sampling methods. It may be possible to improve on these estimates

with future representative surveying of additional urban, suburban and rural communities.

By applying these residential waste disposal rates to county-level household data, and proceeding through the steps described at the outset of this subsection, we have arrived at a breakdown of waste disposal from urban, suburban, and rural communities, including the residential and commercial waste streams. Table 9 summarizes this breakdown.

Table 9 Origin of Disposed Waste in Pennsylvania

Measure	Demographic Origin	Generating Sector Origin		
		Residential	Commercial	Total
Percentage	Urban	10.4%	16.7%	27.1%
	Suburban	26.2%	19.1%	45.3%
	Rural	17.6%	10.0%	27.6%
	Total	54.3%	45.7%	100.0%
Absolute Quantities [1]	Urban	976,187	1,564,279	2,540,466
	Suburban	2,459,299	1,785,064	4,244,363
	Rural	1,647,857	936,396	2,584,253
	Total	5,083,343	4,285,739	9,369,082

[1] Based on 2001 disposed MSW quantities as reported in Facility Reports.

The following observations can be made about the analysis shown in Table 9 above.

- **Generating Sector Origin:** Based on this methodology used to allocate State-wide disposed waste totals, we estimate that approximately 54 percent of the Commonwealth's disposed waste comes from residential generators, with 46 percent from commercial generators. This breakdown is in line with other composition and generation studies across the country that have attempted to evaluate the split between residential and commercial waste. Note that these numbers are estimates only, and that there are sources of both statistical and data-source error inherent in the estimates.
- **Demographic Origin:** Almost one half of the Commonwealth's disposed waste stream comes from regions within the Commonwealth that are classified as suburban. Interestingly, almost equal quantities of waste come from urban areas and rural areas.
- **Residential Waste Origin:** Within the residential generating sector, the majority of waste again comes from suburban demographic areas. However, a significantly greater fraction of residential waste comes from the Commonwealth's rural areas as compared to urban areas.
- **Commercial Waste Origin:** Within the commercial generating sector, there is almost as much waste originating in urban areas as from suburban areas, with rural commercial waste trailing behind.

Based on available data from other regions of the country, we believe the 54/46 percent residential/commercial split is within ranges reported in other generation and composition studies across the country that have evaluated such a split.