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Measuring Recycling
A Guide for State and Local Governments

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Measuring Recycling

A Guide for State and Local Governments

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About This Guide

This guide is designed to help state and local agencies measure municipal solid waste (MSW) recycling. It contains instructions, definitions, case studies, tips, forms, and worksheets to help calculate an MSW recycling rate. Information is provided to help track broad categories of recycled materials and commodity-specific categories, if desired. All features of the guide, including the survey forms and worksheets, can be used by both state and local governments that measure recycling.

For more information, or to order documents on issues related to recycling measurement, call the U.S. Environmental Protection Agency's RCRA/Superfund Hotline at 800 424-9346.

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Introduction

SECTION 1

Recycling is an important part of integrated solid waste management (ISWM)—the complementary use of source reduction, recycling, combustion, and landfilling to manage municipal solid waste (MSW). In the ISWM hierarchy, recycling (including composting) is the preferred waste management option, after source reduction, to reduce potential risks to human health and the environment, divert wastes from landfills and combustors, conserve energy, and slow the depletion of nonrenewable natural resources. This guide can help you measure your progress in recycling and promote consistency among states and localities.

In recent years, many state and local governments have set recycling goals and implemented systems for determining their progress in meeting those goals. As of 1993, approximately 40 states were collecting and maintaining data on recycling; 26 of these calculated an actual recycling rate.[1] "Measuring recycling" typically entails surveying generators, collectors, processors, and end users of MSW and recyclables to collect data on one or more of the following:

- Overall tonnages of municipal waste discarded and materials recycled.
- Tonnages of broad categories of materials, such as paper, recycled.
- Tonnages of specific categories of materials, such as newsprint, recycled.

Recycling measurement is different from the measurement of waste diversion in that data are collected on the amount of materials recycled or composted rather than on the amount of disposed solid waste.

Currently, not everyone defines recycling or the processes that constitute recycling in the same way. Definitions of MSW also vary. There is no standard approach for how or where to collect the needed data. The methods used to calculate a recycling rate also differ from one area to another. All of these factors can make it difficult to collect and analyze data and to compare the effectiveness of recycling programs from one region to another.

From 1992 to 1994, the Council of State Governments conducted the State Data Collection project under a U.S. Environmental Protection Agency (EPA) grant. The project identified current and future state plans for data collection and opportunities for consistency in recycling measurement. The project concluded that a uniform, national method for measuring recycling rates be developed. Subsequent interviews with state officials indicated states are open to switching to a standard

[1]Council of State Governments. 1993. *Data Collection for Recyclable Materials Collection and Marketing: Interim Report.*

national system if the new approach gives them flexibility and guidance on important data collection and measurement issues. Moreover, state officials bound to their existing data collection systems, generally due to legislated requirements, indicated they were willing to recalculate their recycling rate using a standard methodology if one were developed. Officials in states that do not currently collect data indicated that the development of standard recycling measurement techniques could assist in convincing decision-makers to support future data collection efforts and would provide an off-the-shelf tool for creating a recycling measurement program. As a result of these conclusions, EPA worked with state and local officials to develop this recycling measurement guide.

This guide is designed to help promote consistency in the way recycling data are collected, measured, and reported by state and local governments. In order to achieve uniformity and address wide variations in what is counted as MSW and recycling from one area to another, a standard scope of materials to be measured is needed. EPA reviewed a wide range of scopes when developing the standard measurement methodology presented in this guide. The selected scope relies on EPA's historical definition of MSW as contained in the EPA report, *Characterization of Municipal Solid Waste in the United States.* This scope was chosen because it is broadly accepted and understood, the data are familiar and accessible throughout the 50 states, and default values can be extracted from the report if measurers have incomplete data. For practical purposes, the standard scope is wholly consistent with the definitions and distinctions made in this report.

Not all types of solid waste are included in the scope. Various items, including construction and demolition debris, manufacturing waste, and overissue newspapers to name a few, are excluded from the standard scope. Although recovery of these materials is not factored into the standard calculation used to determine a recycling rate, EPA encourages state and local governments to continue their efforts to promote the recycling of these items. In addition, space for collecting these data is provided on the survey forms included with this guide, which are designed to help obtain data on MSW disposal and recycling.

For those agencies desiring to perform recycling measurement for the first time, this guide provides a straightforward, cost-effective, and standardized system for compiling and calculating the necessary data. A step-by-step process for developing a recycling measurement program is outlined, complete with tips and case studies. This guide also provides information for those agencies with a measurement program already in place but interested in switching to the standardized approach. In addition, agencies interested in simply recalculating an overall recycling rate to be consistent with the standardized methodology will find this guide helpful.

Although numerous tips are offered in the guide for obtaining accurate data, EPA recognizes the need to balance the resources spent on recycling measurement against the larger goal of advancing integrated solid waste management. For this reason, EPA allows for the estimation of data in certain instances, providing that estimates are based on good, solid knowledge of the sources and flow of MSW within a region.

The methodology and recommendations presented in this guide represent the practical experience of many states and localities currently measuring recycling. Aside from establishing a voluntary, uniform method for calculating recycling rates, this guide offers state and local governments a number of benefits, including advice and recommendations for:

- Obtaining accurate data.
- Minimizing double counting.
- Identifying possible errors or omissions in data.
- Establishing relationships with the private sector to obtain commercial recycling information.
- Ensuring the private sector's confidentiality when reporting data.
- Using national waste characterization data to estimate waste generation when disposal data are not available.
- Accounting for imports and exports of MSW and recyclable materials.
- Streamlining and improving data collection.
- Reducing recycling measurement costs.

Although state and local governments can benefit from the information contained in this guide without adopting the standard recycling measurement methodology, doing so has many advantages. Standard data collection and calculation methods (including the

use of the survey forms included with this guide) can help achieve:

- Greater cooperation from information sources supplying data, who appreciate efforts to streamline and standardize reporting requirements.
- More opportunities to exchange information and advance recycling measurement techniques, since similar methods are employed nationwide.
- Fewer opportunities for manipulation of recycling data in order to meet recycling goals.
- Time and cost savings for everyone involved in data collection and analysis.
- Enhanced ability to improve waste handling and recycling programs, since standard recycling rates are produced that can be tracked against other programs.

In addition, standardization benefits the businesses and industry representatives that supply recycling and waste disposal data to state and local agencies. A recycling measurement system that involves standard definitions, survey forms, and reporting requirements simplifies and streamlines the reporting process for these data sources and reduces the amount of time and resources they must expend.

Elements of Standardization

SECTION 2

In order to produce comparable recycling rates, certain elements of recycling measurement must be consistent from one jurisdiction to another. These required elements of standardization are as follows:

- Include only the standard scope of MSW.
- Include only standard recycling activities.
- Use the standard equation for calculating a recycling rate.
- Account for imports and exports of materials.
- Obtain data on a calendar year basis.
- Report data in tons.

Even though the standardized recycling measurement system presented in this guide is voluntary, if you choose to implement this system in your state or locality, these components must be included in order for standardization to occur.

Other aspects of recycling measurement are flexible. These include:

- WHY to measure recycling.
- WHEN to collect the necessary data.
- WHO should collect and compile the information.
- WHERE to collect the information.
- HOW to collect, organize, and maintain the data.

This guide suggests preferred strategies for handling these flexible aspects of measurement, but since every jurisdiction is different, techniques that work effectively in one region may require modification in another.

Equation for Calculating the Standard Recycling Rate

$$MSW\ Recycling\ Rate\ (\%) = \frac{Total\ MSW\ Recycled}{Total\ MSW\ Generated^*} \times 100$$

*Total MSW Generated = Total MSW Recycled + Total MSW Disposed of

Standard Elements

The six elements detailed below comprise the standard methodology for measuring recycling. As such, they are required for states and localities that choose to implement the methodology.

1. Include only the standard scope of MSW.

Only MSW as defined in Table A (page 11) is included when calculating a recycling rate using the standard methodology presented in this guide. MSW is generated from residential, commercial, institutional, and industrial sources. Examples of waste from these sources are provided in Table 1, and a detailed description of the standard scope of MSW is provided in Table A.

While definitions of MSW differ from region to region, EPA has defined and characterized MSW in a consistent way for over a decade. The scope of MSW employed in the standard methodology is consistent with EPA's *Characterization of Municipal Solid Waste in the United States,* a study based on data collected since 1960. The definition of MSW contained in this report is based on the historical management of municipal solid waste. Although it is common practice to landfill materials such as municipal sludge, nonhazardous industrial process wastes, and construction and demolition (C&D) debris along with MSW, these materials are not included in the standard scope of MSW or in calculating a standard recycling rate. Such wastes are referred to as Other Solid Waste in this guide. (Refer to the Glossary in Appendix A for complete definitions.)

Defining the scope of MSW in the same way it is defined in EPA's characterization study ensures that recycling rates are comparable from year to year since they are based on historical continuity. This study also provides a source of default values that can be utilized in calculating a recycling rate if necessary. Finally, use of the study's definition of MSW promotes consistency by establishing a common language for recycling discussions.

2. Include only standard recycling activities.

Recycling of MSW is defined as the series of activities by which discarded postconsumer materials are collected, sorted, processed, converted into raw materials, and used in the production of new products. Some examples of recycling activities included are recycling old newspaper into new paper, recycling discarded aluminum cans into new ones, offsite composting of leaves, and mulching old pallets into wood chips. (Refer to the Glossary in Appendix A for a complete definition.)

TABLE 1. SOURCES OF MSW

SOURCES	TYPICAL EXAMPLES OF MSW
Residential (single- and multi-family homes).	Old newspapers, clothing, packaging, cans and bottles, food scraps, and yard trimmings.
Commercial (office buildings, retail and wholesale establishments, and restaurants).	Old corrugated containers (OCC), office papers, yard trimmings, food scraps, disposable tableware, paper napkins, and cans and bottles.
Institutional (schools, libraries, hospitals, and prisons).	Office papers, books, yard trimmings, and cafeteria wastes (food scraps, disposable tableware, paper napkins, and cans and bottles).
Industrial (packaging and administrative, but not process wastes).	OCC, plastic film, wood pallets, office papers, and cafeteria wastes (food scraps, disposable tableware, paper napkins, and cans and bottles).

Preconsumer recycling, such as recycling trimmings from paper converting operations, is not included in calculating a standard recycling rate. Also omitted is the recycling of all non-MSW materials, such as C&D debris and used oil. Source reduction activities, including reuse practices and backyard composting, also are excluded from the standard recycling rate. Combustion for energy recovery, like other types of MSW disposal, is excluded. The scope of MSW recycling is described in detail in Table B (page 13).

The definition of recycling employed by the standard methodology is consistent with the definition used in EPA's *Characterization of Municipal Solid Waste in the United States.* The use of the same definition over time promotes consistency and comparability among recycling rates.

3. Use the standard equation for calculating a recycling rate.

The standard methodology uses the equation shown on page 5 for calculating a recycling rate.

The MSW recycling rate is calculated by dividing the total amount of MSW recycled (including offsite composting) in the measurement year (the previous calendar year) by the total amount of MSW generated. MSW generation is equal to the total amount of MSW recycled plus the total amount of MSW disposed of, in tons. Both MSW generation and recycling totals are adjusted to account for imports and exports of waste and recyclables. Methods for obtaining recycling and waste disposal data are described in Section 4. Also, methods for using waste characterization data to estimate MSW generation (when disposal data are not available or reliable) are provided in Section 5.

4. Account for imports and exports of MSW and recyclables.

MSW and recyclables often move across jurisdictional lines for economic and practical reasons. Current recycling measurement systems do not always account for the exporting and importing of materials resulting from the free movement of waste and recyclables between states or localities.

The standard methodology requires that your recycling rate include only materials generated in your state or locality. This allows for a more accurate account of waste generated and materials recycled within your jurisdiction. For this reason, when calculating the amount of MSW recycled, be sure to add to the total any recyclable materials that were exported from your state or locality, and subtract any recyclables that were imported into your state or locality. Likewise, when calculating the amount of MSW disposed of, any MSW that was exported from your jurisdiction should be added to the total, and any MSW imported should be subtracted. Section 4 of this guide provides suggestions for how to track exports and imports.

5. Obtain data on a calendar year basis.

Some existing measurement systems use calendar year data, while other systems employ fiscal year data. An important aspect of standardization, therefore, is setting a uniform measurement year. Private recyclers and disposal facilities supplying more than one jurisdiction with data will appreciate such uniformity. To be consistent, the standard methodology requires collection of data for the previous calendar year (January to December).

6. Report data in tons.

Another important aspect of standardization is a uniform unit of measurement. Data sources are asked to report quantities in tons and to use conversion factors if the tonnage is not available. Volume-to-weight conversion factors are provided to allow for standard conversions (see Appendix B). Alternatively, respondents can use their own conversion factors provided they are based on actual data and not estimates.

Flexible Elements

Below are the elements of recycling measurement that will differ among jurisdictions. Although the standard methodology does not prescribe a single method for addressing these elements, this guide does provide preferred approaches based on the experience of many state and local governments.

1. When to collect data.

Although the standard methodology requires you to collect data from the previous calendar year, exactly when you choose to collect and compile these data is entirely

Benefits To Using The Survey Forms

1. The survey forms ensure you will get the data needed to calculate an MSW recycling rate.
2. Survey respondents serving more than one state or locality will appreciate receiving a standard form.
3. The survey forms also allow agencies to track recycling and disposal of other solid wastes (e.g., C&D debris).
4. You will have enough data from the survey forms to calculate other performance measures if you choose, such as per capita waste generation and recycling rates, and to track reductions in waste disposal (waste diversion rates).
5. The survey forms are easy to read and include clear, simple instructions.
6. The survey forms have been tested and refined through a peer review process and demonstration projects.

up to you. Section 3 contains a recommended timeline that suggests dates for distributing survey forms and requesting responses. While you can adjust this schedule to meet your needs, keep in mind that companies serving more than one state or locality will appreciate having only one due date to remember.

2. How to obtain the necessary data.

Survey forms are typically used for obtaining the data needed to calculate a recycling rate. Although there are many benefits to all states and localities using the same survey form, this is not always practical. Some state and local governments have developed a form over years of surveying that works well for them, while others have unique information needs that preclude using a standard form. Therefore, the use of a standard form is not a required element of standardization.

Appendix C contains six survey forms (see Table 2 on page 9). You can reproduce these forms directly, modify them to fit your needs, or use your own forms. The first three survey forms seek data from specific points in the recycling chain—collection, processing, and remanufacturing. The remaining three survey forms seek waste disposal information from waste haulers, transfer stations, and disposal facility operators. In each set of three, one or more of the forms can be used depending on where you choose to get your data.

Appendix D contains four recycling rate worksheets (see Table 3 on page 9). The worksheets are designed for state and local governments that have never measured recycling as well as those already collecting data who want to either switch to the standard methodology or recalculate their recycling rate according to the standard method.

3. Who is responsible for collecting the data.

Any entity within a state or locality can collect recycling and waste disposal information from data sources. Typically, the department in charge of recycling takes on the data collection responsibility. However, state or local recycling organizations, trade associations, or other government agencies (such as permitting divisions that are compiling data from annual permit reports) also can collect the necessary data. Alternatively, some states enlist the help of their city or county governments, who survey data sources and then report back. Who is responsible for directly surveying data sources will not affect your ability to calculate a standard recycling rate for MSW.

4. Where to survey for the needed data.

The recycling and waste disposal data needed to calculate a recycling rate can be obtained from numerous sources, including collectors, processors, recycling plants, and disposal facilities. Section 4 explains the different options for surveying these sources. While there are advantages and disadvantages to surveying each of the sources, where you choose to obtain your data is not a required element of the standard measurement methodology.

TABLE 2. SURVEY FORMS AND RESPONDENTS

SURVEY FORM	RESPONDENT TYPE
Form 1	Collectors of Recyclables
Form 2	Processors of Recyclables
Form 3	End Users of Recyclables
Form 4	Collectors of MSW
Form 5	Transfer Stations
Form 6	Waste Disposal Facilities

TABLE 3. RECYCLING RATE WORKSHEETS

WORKSHEET	WHO SHOULD USE	PURPOSE
A Converting to the Standard Recycling Rate.	State and local governments that are already collecting data and have previously calculated a recycling rate.	To recalculate a recycling rate using the standard MSW recycling rate equation.
B1 Determining the Amount of MSW Recycled.	State and local governments that have not measured recycling previously. State and local governments already measuring recycling that want to switch to the standard methodology.	To compile recycling data and calculate the numerator of the equation, total MSW recycled.
B2 Determining Waste Generation.		To compile disposal data and calculate the denominator of the equation, total MSW generated.
B3 Calculating Your MSW Recycling Rate.		To calculate the standard recycling rate.

Using the Scope Tables

Tables A and B should be used in conjunction with each other to help you understand what is included in the standard municipal solid waste (MSW) recycling rate and what is excluded. First, use Table A, Scope of Materials Included in the Standard MSW Recycling Rate, to identify which materials are defined as MSW (Column 2, What Is MSW) and which materials are defined as Other Solid Waste (Column 3, What Is Not MSW). The materials outlined in column 2, What Is MSW, are included in both the recycling and waste generation totals of the standard recycling rate.

After you have determined which materials are included in the standard recycling rate, use Table B, Scope of Activities Included in the Standard MSW Recycling Rate, to further refine the scope based on whether the recycling of the materials defined in Table A meets the standard definition of recycling outlined in Table B. As an example, tires from automobiles are defined as MSW according to Table A, so the disposal of such tires may be included in your waste generation total. If these tires are retreaded, however, they may not be included in your recycling total since retreading is considered reuse rather than recycling according to Table B.

TABLE A. SCOPE OF MATERIALS INCLUDED IN THE STANDARD MSW RECYCLING RATE

MATERIAL[1]	WHAT IS MSW	WHAT IS NOT MSW[2]
Food Scraps	Uneaten food and food preparation wastes from residences and commercial establishments (restaurants, supermarkets, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms).	Food processing waste from agricultural and industrial operations.
Glass Containers	Containers; packaging; and glass found in appliances, furniture, and consumer electronics.	Glass from transportation equipment (automobiles) and construction and demolition (C&D) debris (windows).
Lead-Acid Batteries	Batteries from automobiles, trucks, and motorcycles.	Batteries from aircraft, military vehicles, boats, and heavy-duty trucks and tractors.
Tin/Steel Cans and Other Ferrous Metals	Tin-coated steel cans; strapping; and ferrous metals from appliances (refrigerators), consumer electronics, and furniture.	Ferrous metals from C&D debris and transportation equipment.
Aluminum Cans and Other Nonferrous Metals	Aluminum cans; nonferrous metals from appliances, furniture, and consumer electronics; and other aluminum items (foil and lids from bimetal cans).	Nonferrous metals from industrial applications and C&D debris (aluminum siding, wiring, and piping).
Paper	Old corrugated containers; old magazines; old newspapers; office papers; telephone directories; and other paper products including books, third-class mail, commercial printing, paper towels, and paper plates and cups.	Paper manufacturing waste (mill broke) and converting scrap not recovered for recycling.
Plastic	Containers; packaging; bags and wraps; and plastics found in appliances, furniture, and sporting and recreational equipment.	Plastics from transportation equipment.
Textiles	Fiber from apparel, furniture, linens (sheets and towels), carpets[3] and rugs, and footwear.	Textile waste generated during manufacturing processes (mill scrap) and C&D projects.
Tires	Tires from automobiles and trucks.	Tires from motorcycles[4], buses, and heavy farm and construction equipment.
Wood	Pallets; crates; barrels; and wood found in furniture and consumer electronics.	Wood from C&D debris (lumber and tree stumps[5]) and industrial process waste (shavings and sawdust).
Yard Trimmings	Grass, leaves, brush and branches, and tree stumps.[5]	Yard trimmings from C&D debris.
Other	Household hazardous waste (HHW)[6], oil filters, fluorescent tubes[7], mattresses, and consumer electronics.	Abatement debris, agricultural waste, combustion ash, C&D debris, industrial process waste, medical waste, mining waste, municipal sewage and industrial sludges, natural disaster debris[8], used motor oil, oil and gas waste, and preconsumer waste.

TABLE A. NOTES

[1] Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other MSW if they cannot be otherwise categorized.

[2] These wastes are not considered MSW due to one or more of the following reasons: (1) they are not defined as MSW in EPA's *Characterization of Municipal Solid Waste in the United States,* (2) they have not been historically handled and disposed of as MSW, (3) they are regulated as hazardous waste, and/or (4) they were generated by a preconsumer source. These non-MSW wastes are referred to as Other Solid Waste in this guide and on the survey forms and worksheets.

[3] Carpets are categorized as Textiles when discarded in MSW and are included in the rate calculation. When carpets are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.

[4] Tires from motorcycles are not defined as MSW because they historically have not been characterized as MSW in EPA's *Characterization of Municipal Solid Waste in the United States.*

[5] Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.

[6] HHW includes paints, stains, varnishes, solvents, pesticides, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.

[7] Fluorescent tubes are categorized as Other MSW when found in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are not considered MSW and are excluded from the rate calculation.

[8] Natural disasters include earthquakes, floods, hurricanes, and tornados. Heavy storms are not considered natural disasters.

TABLE B. SCOPE OF ACTIVITIES INCLUDED IN THE STANDARD MSW RECYCLING RATE

RECYCLABLE MATERIAL	WHAT COUNTS AS RECYCLING	WHAT DOES NOT COUNT AS RECYCLING[1]
Food Scraps	Composting of food scraps from grocery stores, restaurants, cafeterias, lunchrooms, and private residences, and the use of food scraps to feed farm animals.	Backyard (onsite) composting of food scraps, and the use of food items for human consumption (food banks).
Glass	Recycling of container and packaging glass (beverage and food containers), and recycling of glass found in furniture, appliances, and consumer electronics into new glass products such as containers, packaging, construction materials (aggregate), or fiberglass (insulation).	Recycling of glass found in transportation equipment and construction and demolition (C&D) debris, recycling of preconsumer glass or glass from industrial processes, and reuse of refillable glass bottles.
Lead-Acid Batteries	Recycling of lead-acid batteries found in cars, trucks, or motorcycles into new plastic and lead products.	Recycling of lead-acid batteries used in large equipment, aircraft, military vehicles, boats, heavy-duty trucks and tractors, and industrial applications.
Metals	Recycling of aluminum and tin/steel cans, and recycling of metals found in appliances and packaging into new metal products.	Reuse of metal containers, packaging, furniture, or consumer electronics, and recycling of metals found in transportation equipment (autobodies) and C&D debris.
Paper	Recycling of paper products (old newspapers and office papers) into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials).	Reuse of paper products, recycling of preconsumer or manufacturing waste (trimmings, mill broke, print overruns, and overissue publications), and combustion of paper for energy recovery.
Plastic	Recycling of plastic products (containers, bags, and wraps), and recycling of plastic from furniture and consumer electronics into new plastic products (fiber fill and plastic lumber).	Reuse of plastic products (storage containers and sporting equipment), recycling of preconsumer plastic waste or industrial process waste, and combustion of plastics for energy recovery.
Textiles	Recycling of textiles into wiper rags, and recycling of apparel and carpet fiber[2] into new products such as linen paper or carpet padding.	Reuse of apparel.
Tires	Recycling of automobile and truck tires into new products containing rubber (trash cans, storage containers, and rubberized asphalt), and use of whole tires for playground and reef construction.	Recycling of tires from motorcycles, buses, and heavy farm and construction equipment, retreading of tires, and combustion of tire chips for energy recovery.
Wood	Recycling of wood products (pallets and crates) into mulch, compost, or similar uses.	Repair and reuse of pallets, combustion of wood for energy recovery, recycling of industrial process waste (wood shavings or sawdust), and recycling of wood from C&D debris.
Yard Trimmings	Offsite recycling of grass, leaves, brush or branches[3], and tree stumps[4] into compost, mulch, or similar uses; and landspreading of leaves[5].	Mulching of tree stumps[4] from C&D debris, backyard (onsite) composting, grasscycling, landspreading of leaves[5], and combustion of yard trimmings for energy recovery.
Other	Household hazardous waste (HHW)[6], oil filters, fluorescent tubes[7], mattresses, circuit boards, and consumer electronics[8].	Recycling of used oil, C&D debris (asphalt, concrete, and natural disaster debris), transportation equipment (autobodies), municipal sewage sludge, and agricultural, industrial, mining, and food processing waste.

TABLE B. NOTES

[1] These activities are not considered recycling due to one or more of the following reasons: (1) they are not defined as recycling in EPA's *Characterization of Municipal Solid Waste in the United States,* (2) they involve the recycling of materials that are not part of MSW, (3) they involve reuse or source reduction, and/or (4) they involve the recycling of preconsumer waste.

[2] Carpeting is categorized as Textiles when discarded in MSW and is included in the rate calculation. When carpets are discarded in C&D debris, they are excluded from the rate calculation.

[3] Includes woody material such as branches, brush, and whole trees such as Christmas trees.

[4] Tree stumps are categorized as Yard Trimmings when discarded in MSW and are included in the rate calculation. When tree stumps are discarded in C&D debris, they are excluded from the rate calculation.

[5] Landspreading of leaves counts as recycling if the manner of the application allows timely biodegradation of the organic plant material. Landspreading of leaves does not count as recycling if the manner of the application precludes the timely biodegradation of the organic plant material.

[6] HHW includes paints, stains, varnishes, solvents, pesticides, antifreeze products, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. Specific examples include oil-based paint, antifreeze, household cleansers, and bug sprays. Used motor oil is excluded.

[7] Fluorescent tubes are categorized as Other MSW when discarded in MSW and are included in the rate calculation. When fluorescent tubes are discarded in C&D debris, they are excluded from the rate calculation.

[8] Composite materials are categorized according to their main constituent; however, they can be designated as a separate category under Other if they cannot be otherwise categorized.

Planning

SECTION 3

Like any other integrated waste management program, a recycling measurement system must be carefully planned, designed, and implemented. The first step in this process is to define program goals and plan the basic elements of the system, including staff and resources needed. The steps described in this section will help you conduct the initial planning that is critical to the success of your overall recycling measurement system.

Step One

Define Your Program Goals.

State and local governments measure recycling for a number of reasons. One of the key reasons to collect recycling and waste generation data is to assist with planning and decision-making. Such data can help solid waste managers:

- Set waste reduction or diversion goals and track progress toward achieving those goals.
- Identify trends in waste generation and recycling that could impact local, state, or regional planning.
- Make decisions or changes in collection crews, route schedules, and equipment needed for waste pickups and recycling collection.
- Assess and choose among waste management options based on the amount and type of waste and recyclable materials.
- Determine the viability and capacity of existing solid waste recycling and disposal facilities, including transfer stations and material recovery facilities (MRFs).

Measurement can also assist with market development by providing a clear understanding of the supply and demand of different recyclable materials in a given area. Specific information on the type and amount of recyclables being generated within a jurisdiction might be useful in a variety of ways, such as:

- Linking buyers and sellers of a particular material.
- Identifying the need for added processing capacity at the local or regional level.
- Indicating that marketing efforts need to be increased for a particular recyclable material.

Planning Steps

1. Define your program goals.
2. Determine if useful data are already being collected.
3. Ascertain your authority to survey and collect data.
4. Determine who will collect recycling measurement data.
5. Decide on reporting requirements.
6. Establish program staff and budget.
7. Establish a timeframe for system development.

- Attracting an established recycling industry to locate a facility in the area.
- Assisting local entrepreneurs in starting small-scale recycling businesses.
- Encouraging local manufacturers to use or to increase their use of locally generated recycled materials in their products.

Collecting recycling measurement data also can help officials establish or expand community collection programs. Reporting the recycling progress being achieved within a particular state or community can help raise public awareness of recycling, encourage participation in collection efforts, and promote buy recycled campaigns. The data might also suggest a need to expand residential or commercial collection programs, particularly if there are large generators of certain recyclable materials in the area.

TIP

Your reasons for measuring recycling will determine the kind of information you collect. (See Section 4, step 3, for further details.)

Step Two

Determine if Useful Data Are Already Being Collected.

Once you have determined your measurement goals, investigate which departments, agencies, or organizations are already collecting data. Sometimes different agencies collect similar data. Identifying and eliminating such redundancies can streamline your recycling measurement efforts.

For instance, in states with a bottle deposit law, the revenue or tax department might have data on the number of bottles returned for redemption. Similarly, the health department might have data on household hazardous waste collections.

TIP

Compile a list of all other agencies, departments, or organizations that are collecting data related to recycling measurement and consider the possibility of combining efforts.

At one point in **New Hampshire,** four entities were maintaining information needed for recycling measurement—the New Hampshire Resource Recovery Association, the Governor's Recycling Program, the Department of Environmental Services (DES), and the University of New Hampshire. Presently, the Governor's Recycling Program compiles recycling data from municipalities, while the DES compiles disposal data reported by permitted solid waste facilities.

Step Three

Ascertain Your Authority to Survey and Collect Data.

Since compiling data often involves soliciting information from private and public sources, establishing your authority to engage in data collection might be required. First, consult with the appropriate counsel within your agency or examine statutes such as solid waste and recycling laws to determine if special authority is required. If so, work within your department, mayor's or governor's office, or legislative body to gain the authority you need. Also, consider contacting states or localities already engaged in recycling measurement for advice. Appendix E lists the states and their recycling agencies.

In lieu of direct authority to collect data, consider contacting solid waste and recycling facility permitting offices. They might already be

compiling some of the data you need. Local or regional solid waste management plans are also a good source of data. Another possibility is to approach your state or local recycling organization or related trade associations about taking on recycling measurement.

Montgomery County, Maryland, receives data on tonnages recycled and disposed of through haulers, who must submit this information every 6 months as a requirement of their permits.

TIP

If you do not currently have authority to collect the data you need, research the reporting requirements solid waste and recycling facilities already comply with to help you determine what types of data you can access through these means.

Step Four

Determine Who Will Collect Recycling Measurement Data.

There are two basic options for collecting data: 1) go directly to recycling and disposal facilities for the information, or 2) work with the appropriate local government units to compile data and report back. Often, a combination of these approaches is used. While there is no prescribed method for who collects and compiles data, there are definite advantages and disadvantages to the different approaches, which are detailed below and in Table 4.

Direct Surveying

In some areas, the private sector and local government agencies report directly to the principal measuring agency. Since the overall costs of recycling measurement increase when many agencies are engaged in data collection, it is often more cost-efficient for the measuring agency to distribute surveys and compile data directly. This approach has the added advantage of reducing the paperwork burden on recycling and disposal facilities. When the measuring agency surveys data sources directly, this can result in more staff costs, but it also reduces the burden on local government agencies and streamlines the reporting process for the private sector.

Counties in **Maryland** compile recycling data and submit annual reports to the Maryland Department of the Environment. The work accomplished at the county level enables the state to use less than a quarter of a staff person's time per year to distribute surveys to counties and compile data.

TABLE 4. DIRECT VS. INDIRECT SURVEYING

MEASURING AGENCY SURVEYS FOR DATA	LOCAL AGENCIES SURVEY AND REPORT BACK
ADVANTAGES	**DISADVANTAGES**
Overall measurement costs are lower.	Overall measurement costs are higher.
Streamlines reporting process for private sector.	Increases burden on local governments.
Reduces burden on local governments.	Reporting process for private sector is less streamlined.
DISADVANTAGES	**ADVANTAGES**
Measuring agency may incur additional staff costs.	Local agencies are more familiar with waste management infrastructure.

Indirect Surveying

City or county governments can survey data sources and report the data to the principal measuring agency. Local governments often are in the best position to collect data directly since they are more familiar with how waste flows in their area and who the key players are. The disadvantages of this approach are that the overall cost of recycling measurement goes up and data collection may overburden local governments. In addition, survey respondents (recycling and disposal facilities) must deal with many requests for similar information from every jurisdiction they service. This problem, however, can be alleviated somewhat by using standard survey forms and reporting deadlines.

Other Options

In addition to the two approaches discussed above, many other options for data collection exist. For example, the measuring agency can collect some data directly, such as waste disposal facility data, while local governments could survey waste haulers for information on waste exports. Or, the measuring agency can compile those data most easily obtained within their agency, such as information on tire and lead-acid battery recycling (in the case of states), and complete this portion of the survey form for the local governments. The measuring agency also could distribute survey forms to processors on behalf of local governments. In this case, respondents can be asked to fill out a separate form for each jurisdiction they service. This approach is useful when local-level recycling rates are also being sought. Local governments can also collect and analyze data on their own if their state program is new or undeveloped.

TIP

Determine which agencies will collect data based on available resources, timing, streamlining, and your knowledge of the waste management infrastructure.

Step Five

Decide on Reporting Requirements.

The reporting requirements of your recycling measurement program can be voluntary or mandatory. Legislation often dictates what your reporting requirements will be. If you can choose the kind of program to implement, available resources will be a chief consideration, but other issues must be weighed as well (see Table 5 on page 19).

Mandatory reporting is generally less expensive and usually leads to a higher response rate, but can result in less accurate data and fewer opportunities to interact with the recycling community. Voluntary reporting, on the other hand, requires additional staff and resources, but generally provides benefits beyond simple data collection such as chances to build positive relationships with survey respondents.

The decision to adopt a voluntary or mandatory program can also be affected by resource availability. States and localities with mandatory indirect surveying and reporting have the lowest program implementation costs (at the measuring agency level). This approach is beneficial for agencies with minimal resources for recycling measurement. The local governments, however, shoulder high implementation costs because they bear the burden of data collection.

Agencies with voluntary indirect data collection incur relatively high costs because such programs require extensive follow-up. The cost burden to local governments, however, is lower than with mandatory data collection because they can gather whatever data their resources allow. If you institute a voluntary program and contact data sources directly, costs can vary depending on the number of reporting entities. In this approach, local governments bear negligible costs.

Officials in two **New York** counties have adopted different reporting systems but have similar data collection success. **Monroe County,** with a mandatory reporting system, enjoys a high response rate but has only limited time to develop close working relationships with the respondents or monitor the accuracy of the information provided. **Onondaga County,** with a voluntary reporting system, has a business recycling specialist who is able to track businesses with high recycling rates, build relationships with them, and encourage them to report.

TABLE 5. REPORTING OPTIONS AND TYPICAL COST AND RESPONSE IMPLICATIONS

TYPE OF DATA SURVEYING AND COLLECTION	MANDATORY (M) OR VOLUNTARY (V)	COST + = MORE EXPENSIVE − = LESS EXPENSIVE	RESPONSE RATE H = HIGHER L = LOWER
Direct	(M)	– Measuring Agency (MA) – Local Governments (LG)	H
Direct	(V)	+ or - (MA) – (LG)	L
Indirect	(M)	– (MA) + (LG)	H
Indirect	(V)	+ (MA) – (LG)	L

Step Six

Establish Program Staff and Budget.

Recycling measurement takes time and resources. Costs are incurred during startup (planning and design) and implementation (operation).

Startup costs include the cost of setting up the data collection system, such as developing survey forms and determining information sources, public relations and outreach, and staff training. Once up and running, the biggest cost element is staff time to operate and maintain the program. Other costs, such as telephone, postage, printing, and travel costs, are minimal in comparison.

Depending on the size and complexity of your program, expect that at least one person will be dedicated (half to full time) to this effort for at least part of the year.

TIP

If staff resources are a problem, consider making reporting mandatory to reduce the time required for developing and maintaining public and private sector relationships.

Step Seven

Establish a Timeframe for System Development.

While this guide will help you get started, organize your program, and make key decisions, adequate startup time is still needed to obtain input and design a program that works best for you.

It is important to establish a timeline for your program during the planning phase. If you have never measured recycling, allow 1 year to get the program up and running. This time is needed to define responsibilities, do the necessary legwork, and solicit feedback from appropriate sources.

Simply switching to the standard approach will take less time, but you should plan for at least 3 to 6 months to make the necessary adjustments and promote the new program. You may find, for example, that you want to modify your survey forms to collect data on

Oregon convened a workgroup to advise program development in January. To work out the details, the group met every 4 weeks at the start of the project and then every 6 to 8 weeks toward the end of the project. Surveys were ready and distributed in December.

recyclable materials counted in the MSW recycling rate but excluded from your own. On the other hand, if you decide to continue with your existing approach, it could require as little as 1 day to make adjustments and recalculate your recycling rate according to the standard method.

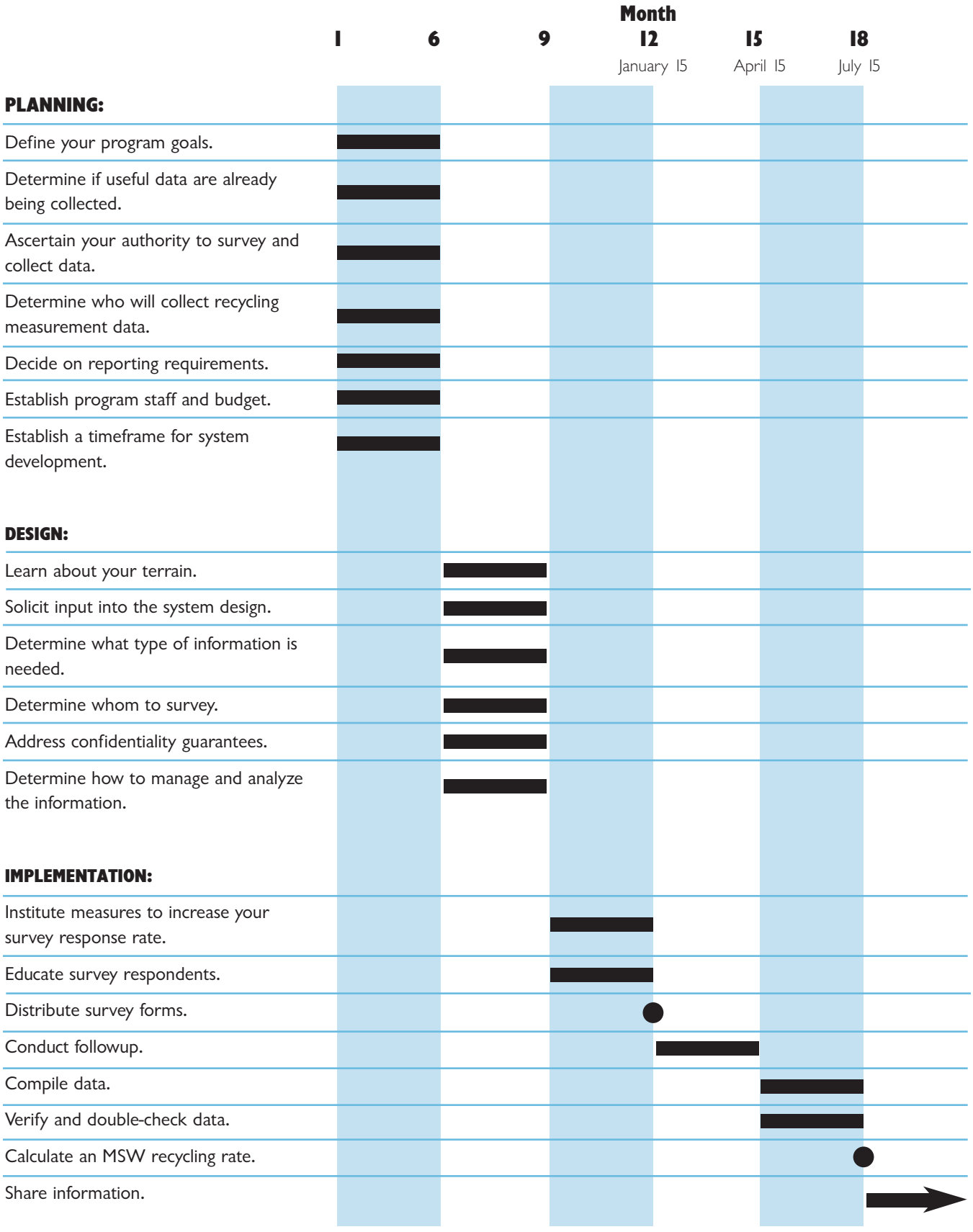
The sample timeline in Table 6 on page 21 illustrates the amount of time needed to complete the planning, design, and implementation phases of a typical recycling measurement system. While the exact steps and allotted times will vary from one jurisdiction to another, the timeline serves as a guide to help you establish a timeframe of your own.

The sample timeline suggests distributing survey forms on January 15 and asking that they be returned by April 15. While not required, adhering to these dates will help to improve the efficiency with which data are collected across the United States. Survey respondents servicing more than one jurisdiction will become accustomed to when they receive survey forms and when they need to return them.

TIP

Allow at least 1 year for planning and designing a new recycling measurement system before sending out survey forms.

TABLE 6. RECYCLING MEASUREMENT TIMELINE



Design

SECTION 4

This section provides an overview of the recycling measurement design process. Designing an effective recycling measurement system entails learning about how MSW and recyclables flow through your region in order to conduct an effective survey. At this stage of the process, you will also make critical decisions about the type of data to compile, where to acquire these data, and how to manage the information collected.

Step One

Learn About Your Terrain.

The more you know about the waste management infrastructure in your state or locality, the easier it will be to design a recycling measurement program that meets your specific needs. MSW and recyclables can flow in many directions through a region. The more complicated the flow, the greater the risk that materials will be counted more than once in your survey (double counting) or missed entirely (leakage). These risks can be avoided by developing a thorough understanding of the major players that handle MSW and recyclables in your area. Many agencies develop a database of the key players in solid waste management and recycling in their area to assist in measuring efforts. At a minimum, make a list of the key players detailed in Table 7 on page 24.

Many information sources can help you better understand the waste management infrastructure in your state or locality and locate key players. These include:

- *Trade associations.* National recycling and solid waste management associations can provide details on their state and local chapters. These chapters usually offer technical assistance and resources that can help you better understand your terrain. They can also identify upcoming conferences that might provide networking opportunities for identifying key players and soliciting information.

Design Steps

1. Learn about your terrain.
2. Solicit input into the system design.
3. Determine what type of information is needed.
4. Determine whom to survey.
5. Address confidentiality guarantees.
6. Determine how to manage and analyze the information.

TABLE 7. IDENTIFYING THE KEY PLAYERS IN WASTE MANAGEMENT IN YOUR STATE OR LOCALITY

RECYCLING	MSW DISPOSAL
■ Collectors and haulers that handle materials in the area.	■ Any additional collectors and haulers, not already identified, that handle MSW.
■ Large generators that self-haul their recyclables (government facilities, corporate office complexes, and grocery stores).	■ Transfer stations.
■ Drop-off and buy-back centers.	■ Disposal facilities (landfills, waste-to-energy facilities, and incinerators).
■ Processors and material recovery facilities.	
■ Recycling mills and end users.	

- *Manufacturers of products containing recycled materials.* Recycling facilities are good sources of information on the overall supply and demand of recyclable materials in your area. The information they provide can help you identify major generators, collectors, and processors.
- *Other government agencies, departments, or permitting agencies.* As mentioned earlier, different government agencies might already be involved in some kind of data collection effort that could be useful to recycling measurement. Additionally, since waste haulers and recycling businesses are often licensed at the local level, you might contact the bigger cities or counties in your area for information on key players.
- *Nonprofit organizations.* Nonprofit organizations operating drop-off centers and collection programs often have many years of experience in recycling. They can be a good source of information about the waste management infrastructure in your area.
- *Standard Industrial Classification (SIC) Codes.* You can use SIC codes to quickly search for major players in the waste and recycling industries. The codes will help you locate waste haulers, recycling companies, manufacturers, and large generators. Use the codes for supermarkets, retail stores, and other types of businesses to find large generators in the area.

Each individual or company identified is a potential source of assistance as you develop your recycling measurement system. Most importantly, each is a possible data source once you begin implementing your measurement system.

Onondaga County, New York, officials conduct site visits to gather information about local generators and recycling businesses. The county has found that the visits provide information on recycling practices that is not readily available through other methods.

Working With Chambers of Commerce

Local governments might find an excellent source of information in their chambers of commerce. Chambers can often help identify recycling businesses, waste management companies, and manufacturers. They might also have information about the types of materials local recyclers handle and the services they provide. Additionally, speaking at chamber meetings or providing articles for chamber newsletters can be an excellent way of providing a large segment of the affected business community with useful recycling information.

TIP

Understanding how MSW and recyclable materials are collected, processed, consolidated, and transported in your region will help you design an effective recycling measurement program.

Step Two

Solicit Input Into the Design of Your System.

To gain support for your system, solicit input from key stakeholders. This can be accomplished through a formal workgroup or advisory council comprised of potential survey respondents and other affected parties. Including government agency, nonprofit organization, recycling industry, and waste industry representatives in the decision-making process will foster a cooperative spirit and the exchange of ideas. Additionally, providing potential respondents with a sense of ownership in the reporting process might result in a higher response rate.

TIP

Build good working relationships with potential respondents before you begin surveying by forming workgroups or advisory councils.

Step Three

Determine What Type of Information Is Needed.

Your information needs for measuring recycling include data related to the amount of material recycled and disposed of in your state or locality, plus any information necessary for meeting your specific measurement goals. In order to perform the recycling rate calculation (see page 5 for the standard equation), you will first need data on MSW generation and recycling for the measurement year, as listed in Table 8 on page 26. MSW generation is equal to the total amount of MSW recycled plus the total amount of MSW disposed of, in tons.

In addition to these data, you also will need the following information from survey respondents:

- Company or agency name, address, phone number, and contact person.
- Type of company or agency, such as hauler, processor, manufacturer, or municipality.
- Whether conversion factors were used.
- Whether data were based on estimates.

The sample survey forms provided in Appendix C are designed to ensure that you obtain the information required to calculate the standard MSW recycling rate. The forms also allow for the collection of ancillary data related to other solid wastes (e.g., C&D debris or used oil) for those wishing to track

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The **Maryland** Department of the Environment (DOE) formed a workgroup that met for 18 months to streamline recycling measurement reporting procedures. Each county is responsible for gathering recycling measurement data. Previously, each sent surveys to the recycling processors operating within their county. Because the processors received multiple information requests, they were less likely to adequately complete each request. As a result, the state agreed to distribute a single survey to every processor. In addition, the state requested that processors supply each county with the necessary information. The new procedure has increased the response rate. DOE sends the survey forms to all counties on January 1 and to processors on January 15. The counties must report by April 1, while processors must report by February 15.

Florida formed a technical advisory committee comprised of state and local officials and recycling industry representatives. One of the main issues the committee addressed was confidentiality. The committee decided that processors would report directly to the state, and their data would be exempted from the state's Freedom of Information Act. Florida's recycling legislation was amended to incorporate these provisions. (See Appendix F for an excerpt of this legislation.)

this information. Some states or localities, for example, might desire additional information to meet legislative requirements, to measure other performance criteria, or for other purposes. Be aware, however, that collecting and compiling additional information requires more time and resources. Lengthy survey forms also can intimidate respondents and, in some cases, affect their willingness to participate in the effort.

Avoid the tendency to request more information than you actually need. For example, if you intend to use data for market development purposes, information on specific commodities, such as newspaper, steel cans, and plastic bottles, is essential. If, however, you are tracking your progress toward mandated recycling goals, then collecting overall MSW and recycling tonnages might be sufficient. Table 9 on page 28 provides some examples of data requirements based on a number of different program goals and purposes. The table illustrates the important link between your recycling measurement goals and the types of data that must be collected in order to meet those goals. To help define your data needs, consider constructing a similar table based on your identified goals.

Minnesota uses data collected annually from counties to evaluate progress toward recycling goals, to assess the availability of recycling opportunities for all state residents, and to promote buy recycled programs. For this reason, the state collects data on individual recyclable commodities at the county level.

Both the **New Jersey** and **Pennsylvania** Departments of Environmental Protection use total recycling tonnages, reported annually by municipalities, to calculate the annual disbursement of recycling grants. Municipalities receive a distribution from this fund for every ton of material recycled.

TIP

Your program goals and needs will help determine the type of information you request.

Step Four:

Determine Whom to Survey.

Once you know your terrain and the types of data you need, you can begin designing the actual survey. At this point you have to decide whom to survey. Possible survey respondents include the following chain of material handlers:

- Generators.
- MSW and recyclables haulers.
- MRFs, processors, recycling plants.
- Transfer stations.
- Disposal facilities.

Illustration 1 depicts the typical process by which recyclables move from the point of generation to final remanufacturing. While the process often differs by commodity and local situation, there are essentially three main steps—collection, processing, and remanufacturing. First, recyclable materials are generated by a consumer or business (generator) and then collected by a private hauler or government entity. Next, the materials are transported by the collector to a processing facility, such as a MRF or paper processor. At the processing facility, the recyclables are sorted, cleaned of contaminants, and

TABLE 8. DATA NEEDED TO CALCULATE AN OVERALL RECYCLING RATE

MSW

- Tonnage of MSW disposed of in your jurisdiction.
- Tonnage of MSW exported from your jurisdiction.
- Tonnage of MSW imported into your jurisdiction.

RECYCLABLES

- Total tonnage of materials recovered from MSW in your jurisdiction.
- Tonnage of glass, metals, paper, plastics, yard trimmings, textiles, and wood recovered from the MSW stream in your jurisdiction.

ILLUSTRATION 1. THE RECYCLING CHAIN

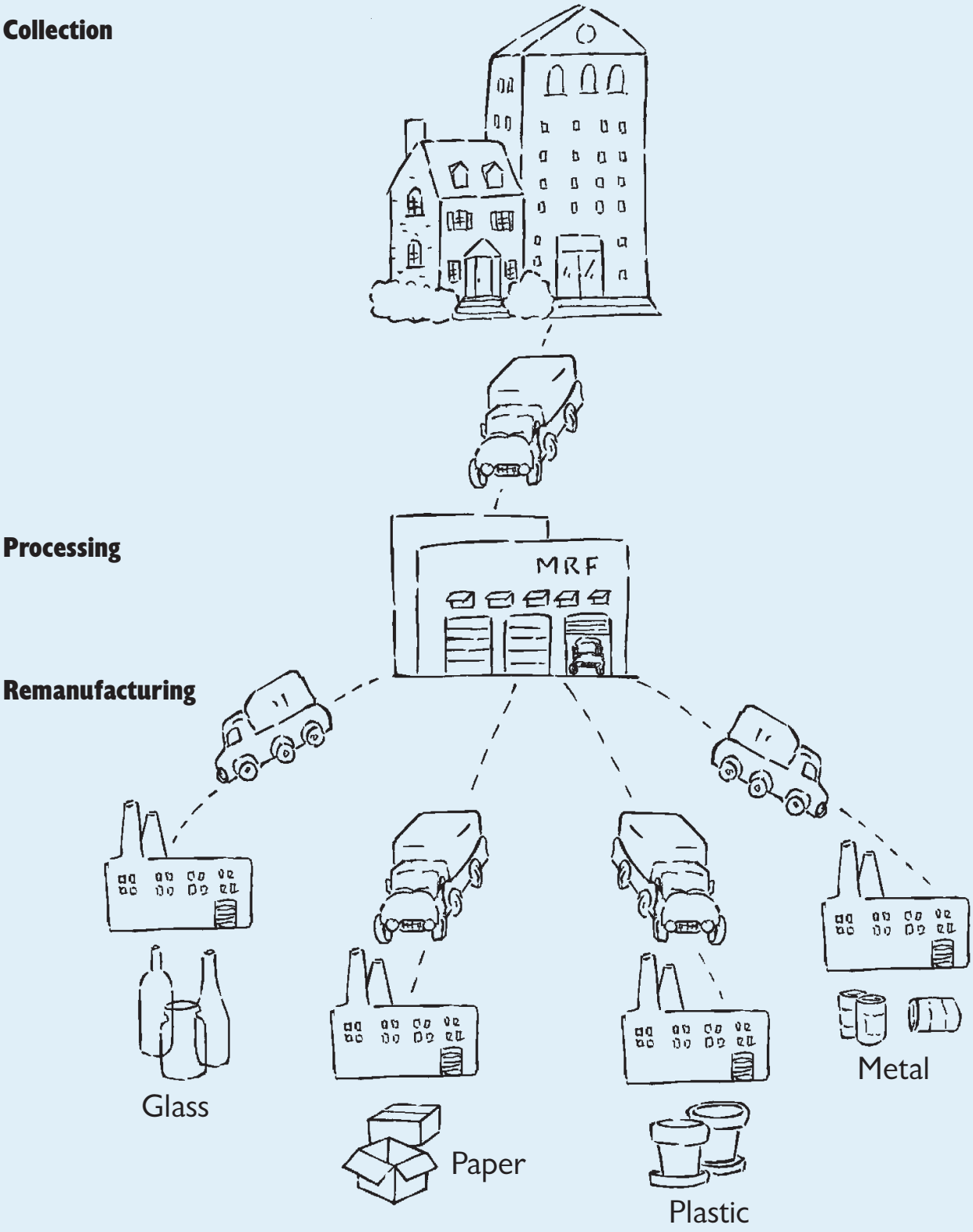

TABLE 9. DATA COLLECTION NEEDS

PURPOSE OF DATA COLLECTION	DATA REQUIREMENTS	DATA CAN BE USED TO...
Market development.	Commodity-specific data for recyclable materials[1]. Total tonnage by commodity for state or local recyclables.	Identify gaps in market availability and strength. Attract new processors and end users. Encourage manufacturers to utilize recyclable commodities in their production processes. Link processors and end users. Support buy recycled campaigns.
Evaluate and reward state or local recycling programs.	Data on broad categories of recyclable materials[2]. Total tonnage for state or local recyclables. Total tonnage of MSW disposed of.	Determine if state or local governments are in compliance with recycling laws. Help allocate grants and/or recognize residents, businesses, or industries that promote recycling.
Set or meet recycling goals.	Total tonnage for state or local recyclables.	Track progress. Identify localities that might need assistance in meeting goals.
Make changes in collection services.	Total tonnage for state or local recyclables and MSW disposed of.	Determine best management strategies.
Assess future landfill and waste-to-energy capacity.	Total tonnage for state or local recyclables. Total tonnage of MSW disposed of.	Predict changes and trends in the amount of waste and recyclables generated.

[1]Commodity-specific data refers to information on specific products in the waste stream (old newspaper), or specific resins or grades (HDPE).

[2]Broad categories data refers to general classifications of recyclables (paper, plastic, glass, metals).

prepared for final recycling. Some commodities may require additional processing beyond sorting and decontamination. Glass and plastic, for example, are often sent to glass beneficiation plants and plastics reclaimers, respectively, where they are processed into mill-ready forms. After all necessary processing has been completed, recyclables are made into new products at a recycling plant or other facility, such as a compost facility or animal bedding plant.

MSW discarded in dumpsters or left at the curb by residents is usually picked up by a public or private MSW hauler. Typically, the waste is then transported to a transfer station to be consolidated with other waste before being sent to a disposal facility, such as a landfill or incinerator. In other cases, waste moves directly from the collection point to a disposal facility.

Sometimes MSW is exported by waste haulers and transfer stations to facilities in a neighboring

TIP

Soliciting the advice of potential respondents about whom to survey can help determine from whom you are likely to get the best response and most accurate data.

jurisdiction. In the same way, landfills and other disposal facilities often accept MSW imported from other states or localities.

Determining whom to survey will depend on:

- Program goals and your specific data needs.
- Resources available for recycling measurement.
- Legislative authority to survey and collect data.
- Likely accuracy of information provided.
- Existing reporting requirements for haulers, processors, and end users.
- Type and number of recycling operations.
- Type and number of disposal facilities.

The approach presented in this guide is designed to streamline data collection, obtain the best possible data, and minimize the chances of double counting. Basically, this system approaches data collection in two ways. First, it involves the collection of recycling data separately from MSW disposal data. Second, residential recycling data are obtained differently than commercial recycling data.

For recycling data, it is most efficient to collect information at only one point in the chain. The specific point in the chain differs for residential and commercial recycling data. For residential recyclables, data is best acquired at the point of collection (the haulers). For commercial recyclables, data is best collected at the point where materials are processed (the processors). By obtaining data from one point in the recycling chain, state and local agencies will minimize the number of survey respondents and the possibility for double counting materials.

For MSW disposal data, information is collected from disposal facilities, transfer stations, and waste haulers. While disposal facilities comprise the primary source of data, transfer stations and waste haulers also can supply important information about MSW imports and exports.

An overview of the approach suggested for each type of data is provided in Table 10. A more detailed discussion of these preferred approaches follows.

TABLE 10. OVERVIEW OF PREFERRED APPROACHES FOR DATA COLLECTION

Material	Preferred Surveying Approach
Residential Recycling Data	
Various recyclables.	Collectors.
Commercial Recycling Data	
Paper.	Processors.
Glass.	Beneficiation plants.
Aluminum cans.	Nonprofits and buy-back centers.
Plastic.	Large generators.
Food scraps and yard trimmings.	Composting facilities.
Miscellaneous items.	Large generators.
Waste Disposal Data	
MSW.	Waste disposal facilities, transfer stations, and waste haulers.

TIP

If you choose to survey more than one point in the chain, ask data sources for information about only the general geographic origin and destination of the materials they manage to help avoid double counting.

Recycling Data

Residential

Municipally operated or contracted programs generally collect residential recyclables. Such programs include curbside and/or drop-off collections. These programs have grown rapidly over the past decade, and accurate data about the types and quantities of materials collected often are readily available. For this reason, residential recycling data are best obtained from the point of collection. In addition, collectors of recyclables know better where materials originated than processors or end users.

Residues

Not all materials recovered through residential collection programs are recycled into new products. Some materials are lost when the materials are prepared for market. These residues are difficult to account for and can vary in amount depending on the specific collection and processing methods used. Therefore, the standardized measurement methodology does not require that these residues be tracked. While accounting for residues results in more accurate data, the time and resource commitment necessary to track residues for all commodities may not be warranted.

Leakage

Some residential recyclables can escape municipal collection programs. For example, nonprofit groups and private recyclers sometimes operate drop-off locations, buy-back centers, and collection routes outside of municipal programs. Thus, materials go directly to the processor or end users without ever entering a municipal collection system. Being aware of community recycling activities will assist agencies in accounting for residential recyclables collected outside of the municipal system.

Examples of recyclables that can escape municipal collection programs, and thereby go undetected by data collection efforts, include:

- Newspaper collected by nonprofit groups during periodic fundraising drives.
- Beverage containers returned to redemption centers in states with deposit legislation (excluding refillable containers).
- Telephone directories collected during special drives often organized by telephone companies and nonprofit organizations.
- Paint collected at household hazardous waste sites for recycling.

Obtaining Residential Recycling Data

1. Obtain data on municipal programs from cities or counties.
2. Contact nonprofit and private recyclers for additional data.
3. Obtain data as close to the point of collection as possible to ensure accuracy.
4. Cross-check collection figures with data from processing facilities and end users, if necessary.

Commercial

Materials from commercial sources constitute a significant portion of the recycling stream. For this reason, it is important to obtain commercial data to get an accurate recycling rate. Materials generated by office buildings, wholesale and retail establishments, schools, airports, and other institutions are often not handled by local governments and do not commonly travel through multimaterial operations such as MRFs. Instead, paper, glass, aluminum cans, and other items from commercial sources are generally handled, processed, and marketed separately from residential recyclables. Because every surveyed material travels along a different path from collection point to final use, designing an approach specific to each material is recommended.

In general, the preferred approach for obtaining data on commercial recyclables is to survey at the processing point. If you are unable to obtain accurate data from the processors in your area, however, consider surveying large generators of recyclables or recycling plants. Examples of large generators include government facilities, corporate office complexes, grocery stores, and warehouse operations. Because these facilities recycle a large quantity of materials, they can be excellent sources of commercial recycling data. In addition, some large generators may have their own processing capabilities, which should not be overlooked when you are locating the processors in your area.

An alternative to surveying processors is to survey recycling plants or other end users. Because recycling plants are generally

larger than processors and service a wider area, there will be fewer plants than processors to survey. However, end users might not be able to determine the place of origin of the materials they purchase. Also, if you are obtaining commercial data from recycling plants, it is important not to include data from residential recycling programs. Survey Form 3, for end users of recyclables, allows residential and commercial data to be reported separately for this reason.

Approaches for gathering commercial data for the most commonly collected categories of recyclables are described on the following pages.

Aluminum Cans

Survey nonprofit recycling facilities and buy-back centers. Restaurants, bars, airports, and large facilities such as shopping malls generate large quantities of aluminum cans, most of which are taken to nonprofit recycling facilities or buy-back centers.

If you are unable to obtain data from these facilities, contact aluminum companies directly. These companies are often involved with the collection, processing, shipping, and remanufacture of aluminum cans; they also frequently lease compaction equipment and trailers to recycling programs. Aluminum companies can assist with identifying large generators of aluminum cans in your area.

Food Scraps and Yard Trimmings

Survey composting facilities. The majority of food and yard waste collected for recycling is sent to public or private composting facilities. Many restaurants, supermarkets, and institutions generate food scraps. Recycled food scraps include both food scraps used as pig feed, as well as leftover food composted by prisons, schools, and other facilities.

Many institutions and businesses that maintain their lawns generate yard trimmings, including grass, leaves, and tree branches. Yard trimmings that are composted or mulched off site should be included in your data. Yard trimmings processed through backyard composting, grasscycling, or other onsite efforts, however, should not, as these are considered source reduction activities.

Contact state or local permitting offices to help identify permitted composting facilities that accept food scraps and yard trimmings from residential or commercial sources. The permit requirements of some localities might mandate that the facilities report the tonnage of material processed. Since not all composting facilities are permitted, identifying all the facilities that process food scraps and yard trimmings might take additional research. Also, a few types of yard trimmings, namely tree trimmings, may be sent to wood waste processing facilities. These facilities should be contacted for data, as wood waste recycling can be included in the recycling rate. Remember, however, to include only wood from trimmings, pallets, and other wood packaging, like crates. Tree stumps are included only if they are recovered from MSW; stumps from C&D projects are excluded.

Glass

Survey beneficiation plants. These large glass processing facilities convert street glass into mill-ready cullet and are the primary markets for glass in many regions. These processing facilities often have commercial glass receipts detailing tonnages received from particular localities. Restaurants and bars, institutions (schools), and large facilities (airports and shopping malls) all generate glass recyclables that may be sent to these processing facilities.

If no beneficiation plants exist in your area, you can collect data from a variety of other sources. In some areas, municipalities pick up glass from commercial establishments as part of their residential recycling collection program. In other areas, nonprofit recycling organizations collect glass. Determine who collects commercial glass in your area and survey these individuals using Survey Form 1. Remember that only container glass and glass from packaging, furniture, consumer electronics, and appliances can be counted in the recycling rate calculation. Glass from transportation equipment and C&D projects is excluded.

If you are unable to obtain accurate data at the collection or processing point, survey large generators, recycled glass plants, or appropriate trade associations. Remember, the further down the recycling chain you survey (the closer to end use) the more difficult it will be to determine where the materials originated and to account for imports or exports.

Again, make certain not to include glass from residential recycling programs with the commercial glass.

Paper

Survey paper processors. Because processors handle paper at its last stage before leaving a particular jurisdiction, they usually have accurate information about which county or municipality generated the paper and can identify what paper has been imported. Processors collect paper from government offices, schools, office buildings, and a wide variety of other institutions. The processors clean and bale these materials, then transport them to local recycling plants or export them.

Keep in mind that only postconsumer waste paper is counted in the MSW recycling rate. Preconsumer paper, such as manufacturing and converting waste and overissues of newspapers and magazines, is not counted (see Table B on page 13). Also, only paper that was originally generated in your jurisdiction is counted. Ask processors to exclude all imports of paper received from outside your area. Use Survey Form 2, for processors of recyclables, which requests that only data on materials generated within a particular jurisdiction be reported.

Plastics

Survey large generators. The majority of commercial plastics recycling is conducted by businesses with multiple locations who generate large quantities of a particular plastic item and self-haul directly to processors or end users. Examples of plastic items commonly recycled by commercial sources include stretch wrap, grocery sacks, and dry cleaning bags. Stretch wrap is the material used by product manufacturers and distributors to bind shipping cartons to pallets. Retail store distribution centers and manufacturing plants generate large amounts of stretch wrap and should be contacted for information on recycling efforts. For information on plastic bag recycling, contact large dry cleaners and grocery store chains.

If you are unable to obtain accurate data from large generators, survey plastics reclaimers or end users. Trade associations may be able to help you locate reclaimers and end users in your area.

Other Miscellaneous Items

Survey large generators. As recycling technology develops, more and more items are recovered from MSW and developed into new products. Many companies have taken the lead and are expanding their recycling programs to include such items as computer parts, microfilm, polystyrene, and other materials. Examples include government agencies (office products), universities and schools (polystyrene and computers), and manufacturing plants (pallets). While some of these materials may be a small percentage of the waste stream, including them will increase the accuracy of your recycling rate and help remind recycling officials that these materials can be part of a new or expanded recycling program.

TIP

Staying abreast of new recycling technology can help you account for additional sources of commercial recycling data.

Waste Disposal Data

In order to determine total MSW generation for the recycling rate calculation, data are needed on the amount of MSW disposed of in your jurisdiction. Because each community's waste stream is different, surveying local disposal facilities can ensure accurate waste disposal data and help you account for imports of waste. Disposal facilities include private and public landfills, waste-to-energy facilities, and incinerators. It is critical to include only MSW.

In addition, be careful to account for imports and exports of waste, and exclude from the data any natural disaster materials and waste defined as Other Solid Waste. (See the Glossary in Appendix A for complete definitions.)

Disposal facilities are good sources of information on MSW imports, while transfer stations and haulers can supply data on the amount of MSW exported from your jurisdiction. Disposal facilities and transfer stations will have an easier time differentiating between MSW and other solid waste because they have the capability to inspect each incoming load and determine how much of the waste is MSW. On the other hand, waste haulers can estimate the percentage of MSW on the basis of customer lists. These points are important to keep in mind as you decide whom to survey.

Other Sources of MSW Disposal Data

Disposal facilities, transfer stations, and waste haulers are the main sources of waste disposal data, but they are not the only sources. Keep in

mind that waste disposal data can be obtained from two additional sources: (1) processing facilities that are preparing recovered materials, such as tires or wood waste, for fuel markets, and (2) large generators that dispose of waste on site or self-haul waste to facilities out of your jurisdiction. While they might not significantly impact your recycling rate, knowing the extent of these activities will help you in your planning efforts.

In several states and localities, disposal facilities are required to report tonnage information in order to hold a permit. In **Minnesota, Texas, Ohio, and New York,** for example, disposal facilities report the quantity of waste handled to fulfill permit requirements. In **Oregon,** landfill operators report tonnage data in conjunction with a per ton disposal fee levied by the state.

Step Five

Address Confidentiality Guarantees.

Understanding and addressing the confidentiality concerns of the recycling and MSW industries is critical to ensuring a high response rate, especially if you are relying on a voluntary reporting system. Confidentiality is an important concern to many haulers and processors who might be reluctant to share proprietary information. Although confidentiality concerns present potential roadblocks, a number of programs have successfully addressed this issue. Some suggestions for ensuring confidentiality include:

- Avoid asking for customer lists on survey forms.
- Obtain a legislative exemption from your state's Freedom of Information Act. (See Appendix F for sample legislation from the state of Florida.)
- Agree not to release proprietary information used to compute a recycling rate.
- Ask survey respondents to mark sensitive information as "confidential."
- Use a third-party (accounting firm or trade association) to aggregate data, while keeping the sources of material confidential.

If necessary, collect recycling information from recycling plants, which tend to be less reluctant than other data sources to share aggregate tonnage information.

Step Six

Determine How to Manage and Analyze the Information.

Information is not useful unless it is meaningful and easy to access. Be sure to invest sufficient time and effort into developing an information management system that allows you to use the information you gather. There are numerous software packages, including databases and spreadsheets, that can help you manage and analyze the data you collect.

Using computers to compile and maintain data improves the efficiency of data analysis and management. They streamline the process and minimize the level of effort required to manage the data. Government agencies use software packages such as Foxpro, Paradox, and Excel. (EPA does not endorse any particular product.) All of these packages can be operated on a PC with standard components—DOS or Windows, a 486 PC, 8 MB RAM, and an 850 MB hard drive. While a database system is more adept at organizing information, it usually has greater design requirements and calls for a substantial data entry effort. Also, a database typically requires that one staff person be dedicated to its operation due to its highly technical nature, whereas several staff members can be trained to operate a spreadsheet. A spreadsheet system manages numerical data more efficiently,

Many state and local agencies use database and spreadsheet systems to compile and manage data. **Florida** uses a spreadsheet and has advised counties to purchase Excel using state grant money. This enables Florida to send each county a disk to use for reporting data. The state of **Washington** uses a combination system of both a database and a spreadsheet. The database is used for data entry purposes, while the spreadsheet is used to perform calculations.

and it allows agencies to merge information from individual disks received from reporting entities onto a master file, thus minimizing the need for data entry. A spreadsheet system, however, does not allow for the easy manipulation of text. Therefore, database programs have emerged as the leading software application for recycling measurement.

An alternative to using only a spreadsheet or a database is to use a combination of both types of software. For example, survey respondents could report data on a spreadsheet, and you could use a computer program to convert the data for importation into a database.

Exports and Imports

The standard measurement methodology requires that exported MSW and recyclables be included in your recycling rate calculation, while imported MSW and recyclables be excluded. When deciding whom to survey, it is important to consider how you will track exports and imports. Tracking exports and imports will provide you with an accurate picture of the total amount of MSW generated and recycled in your jurisdiction. Below are some suggestions for how to accurately account for the movement of materials in and out of your state or locality.

Recyclables

Obtaining residential recycling data from the point of collection minimizes the danger of missing exported materials or counting materials that were imported from outside your jurisdiction.

If you choose to survey processing facilities and end users, be aware that data from these sources are more likely to include materials from outside your jurisdiction (imports). When surveying these facilities, be very clear in your instructions that you are seeking information only on materials that originated in your state or locality. The survey forms included with this guide ask respondents to report only materials from a particular jurisdiction.

The best way to obtain commercial recycling export data is to survey large generators, because they might be collecting, consolidating, or transporting recyclables on their own. These generators often recycle large quantities of office paper and old corrugated containers, yard trimmings, wood packaging (pallets and crates), scrap metal, and miscellaneous items such as microfilm, computers, and furniture.

If you survey only processors, you might miss some materials collected by private haulers and processed outside of your jurisdiction (exports). If you have the resources, consider contacting private recycling haulers to estimate the amount of material exported from your state or locality for processing or remanufacture.

MSW

Determining quantities of exports and imports requires an understanding of the waste flow in your area. If you know the waste management infrastructure in your area, you will have a sense of the amount of exporting and importing taking place. A good place to start in determining the amount of MSW being exported is to survey waste haulers, since they are the first point in the disposal chain. Transfer stations are also good sources of information on waste exports.

For imports, accurate data can be obtained by surveying landfills, incinerators, and waste-to-energy facilities. State and local governments that ask for import data from disposal facilities have found that the facilities are not hesitant to provide this information.

The survey forms included with this guide are designed to make it easy for data sources to report information on MSW imports and exports.

States gather information about exports from a variety of sources. **Minnesota** determined the majority of waste leaving the state was going through transfer stations, so these facilities were surveyed for this information.

Washington knows that only one landfill in the state receives imported waste and that all waste exported from the state is taken to a landfill in Oregon. Officials in **Mecklenburg County, North Carolina,** decided to license waste haulers as a way to track exports. A court ruling in Alabama concluded the state could require reporting of information on the destination of waste, but could not mandate where the haulers disposed of waste.

Estimation

Under the standard methodology, estimation of data on MSW recycling and disposal is acceptable as long as the estimates are based on good, solid knowledge of the sources and flow of MSW in your area, and the estimates are noted. Collecting raw data is the preferred approach for obtaining all data necessary to calculate a recycling rate. In some cases, however, data sources may be unable to provide information on certain materials that cannot be easily measured due to the way they are managed. For example, commercial MSW is often collected in the same vehicles as MSW from multifamily residential buildings due to the use of similar waste containers. Also, MSW and materials classified as Other Solid Waste (C&D debris) are sometimes mixed together during collection and sent to disposal facilities in the same vehicle or container. In these cases, it may be necessary to estimate separate totals for the different types of waste.

In **Arlington County, Virginia,** MSW from multifamily residences (apartments and condominiums) and commercial businesses is aggregated together during collection.

Waste haulers are therefore unable to differentiate between residential and commercial waste. To estimate the amount of MSW from multifamily residences disposed of at their waste-to-energy facility, officials multiply the total multifamily population (obtained from census data) by the average number of pounds of MSW generated per person (obtained from a local study). This number is added to the amount of MSW generated by single-family homes, which is more easily tracked because it is collected separately, to arrive at a total residential MSW figure.

Double Counting

In an attempt to collect comprehensive, accurate data on recycling and waste disposal, many agencies have encountered instances of double counting of data. The best way to avoid double counting is to collect data from only one point in the chain—either collectors, processors, or end users (disposal facilities or recycling plants).

Florida surveys only large processors that handle more than 600 tons of recyclables per year. Since most of the recyclables ultimately pass through these large processors before leaving the state, complete data are captured without having to consider double counting.

Washington's approach of only surveying at the collection point avoids double counting while at the same time produces reliable information on the source of materials, which is useful for tracking recycling at the county level.

In **New Jersey,** the scrap metal industry has developed a mechanism for reporting recycling data to the state that avoids double counting, streamlines data collection, and also ensures confidentiality. The New Jersey chapter of the Institute of Scrap Recycling Industries (a national trade association) sends a survey form that it developed to all its members, employs an accounting firm to aggregate the data, and reports the total to the state directly. The survey form includes the names of the six major scrap processors and end users in the state, through which most of the scrap metal in the state eventually passes. These six companies report the total amount of scrap metal received from sources within New Jersey. Other companies report data only if the metal was sent to a company other than the six major processors and end users.

As a result of this system, data is not counted twice, businesses have a greater incentive to report accurate data since they do not have to reveal proprietary information, and complete data is captured since all the major players are surveyed. In addition, the state's recycling measurement costs are reduced. A disadvantage of this system, however, is that the state is unable to verify the accuracy of the data. In addition to being used in New Jersey, this system was recently codified by the Tennessee legislature.

Implementation

SECTION 5

Now that you have planned and designed your recycling measurement system, you are ready to distribute the survey forms, compile the data, and calculate your annual recycling rate. This section outlines the steps involved in implementing your measurement system after it has been developed.

Step One

Institute Measures to Increase Your Survey Response Rate.

Mailing survey forms to potential respondents does not guarantee they will comply with your information request. A variety of techniques can be employed to increase your survey response rate, and you should pick those that meet your particular needs. Some examples include:

- *Send a cover letter.* Attach a cover letter to the survey forms explaining the what, why, and how of your program. Sample cover letters for three types of respondents are provided in Appendix G.
- *Designate a contact person.* Offer assistance to respondents by providing a contact name and telephone number to call if they have questions. Space is provided on the survey forms in Appendix C for this information.
- *Fill out survey information in advance.* Filling out as much of the information on the survey form for the respondents as possible will help expedite the survey process.
- *Use the media.* The media also can be used to enhance reporting. Special events are another opportunity to showcase positive results.
- *Send survey forms with grant applications.* If applicable, attach survey forms to recycling grant applications. Indicate that recycling grant applications must be submitted with a completed survey form in order to be eligible.

Implementation Steps

1. Institute measures to increase your survey response rate.
2. Educate survey respondents.
3. Distribute survey forms.
4. Maintain frequent communication with survey respondents.
5. Compile data and calculate an MSW recycling rate.
6. Verify and double-check data.
7. Share information.

Minnesota merges its survey mailing list with its survey form so that the respondent information is already filled in. The state also fills in recycling data for certain materials, such as lead-acid batteries, based on statewide figures. If the local government has better data, it can revise the state's estimate.

New York State publishes a recycling bulletin that lists each county's recycling rate. To encourage businesses to report, **Steele County, Minnesota, and Onondaga County, New York,** both publish newspaper columns featuring recycling businesses that report high rates.

Mandatory Program Enforcement

Some mandatory reporting programs carry penalties for noncompliance. In **Monroe County, New York,** for example, potential liabilities are written into the county's recycling law. First, the offenders receive a written warning, which can be followed by a $50 fine if the violation occurs again. Many states and localities, including Monroe County, prefer to contact the company or facility to encourage participation and rely on the penalty as a last resort. In many cases, persistence pays. Letters, phone calls, or site visits often encourage reporting.

Step Two

Educate Survey Respondents.

It is essential to explain to respondents the purpose, requirements, and benefits of your recycling measurement program, as well as any penalties associated with noncompliance. If you have a voluntary reporting system, education is the main tool for ensuring a high response rate. By the same token, educating survey respondents can reduce the amount of enforcement necessary under a mandatory reporting system. Education can be provided through training seminars, technical assistance materials, and frequent communication.

Training can greatly enhance the quality of the data you receive. It also gives you an excellent opportunity to develop relationships with respondents and explain your program. Training sessions can be held around your region, or you can host a workshop in tandem with an annual recycling meeting. You may elect to hold special sessions for different groups of respondents (waste haulers, recyclers, local governments), or divide the sessions into public and private sectors. Whatever you decide, your recycling measurement training seminar should:

- Explain WHY you are engaged in recycling measurement.
- Describe HOW the data you collect will be used.
- Promote the BENEFITS of recycling measurement and respondents' participation.
- Detail the REQUIREMENTS of your program.
- Explain any PENALTIES for noncompliance.
- Seek attendees' INPUT and suggestions on the program.
- Describe any available TECHNICAL ASSISTANCE.
- Distribute and explain the SURVEY FORMS.

Recycling measurement training can be combined with other meetings or training topics. Recycling organizations are usually eager to provide state and local agencies with time for workshops or training sessions during their annual conferences.

Providing technical assistance to respondents also can help ensure that you obtain the necessary data. Technical assistance might include having a staff person available to answer telephone calls or publishing guidebooks or other printed materials. It is crucial that staff are available to answer questions about the recycling measurement program. This person's name and telephone number should be clearly identified on the survey forms, instructions, and all correspondence from your agency. This contact will be the principal liaison with the recycling and waste management community and should be equipped to answer questions about reporting requirements and offer suggestions for collecting data. Publishing an e-mail address or starting a recycling measurement bulletin board on the Internet also helps provide support to respondents.

Technical assistance can help increase the response rate in areas with a voluntary reporting program. In areas without facility permit requirements or other types of mandated reporting, offering

technical assistance with survey forms might encourage routine responses from disposal facilities. In addition, the more these respondents understand about the reporting process, the more accurate and complete their data will be.

Step Three

Distribute Survey Forms.

The recycling measurement season begins when the survey forms are mailed out to respondents. Distribute survey forms at least 6 months before you wish to arrive at a final recycling rate determination. If you survey data sources directly, respondents should be given 4 to 6 weeks to complete the survey forms and return them. If you are not surveying directly but are receiving assistance from county or city governments, allow 3 months for them to fill out the forms. In this case, local agencies will need additional time to distribute surveys and compile data within their boundaries. Regardless of who is responsible for collecting data, you will need approximately 3 months to compile data, verify information, and calculate the recycling rate after all survey forms have been returned.

Table 11 on page 40 outlines the six survey forms included with this guide. Each survey form is intended for a different type of respondent, who can provide information about the amount of MSW recycled or disposed of in your jurisdiction. The table lists the forms, their intended respondents, and examples of respondents who should fill out each form.

A cover page entitled "About This Form" is attached to each form. This cover page explains the purpose of the form, who the form is intended for, and what you should do before mailing the form. This page is for the use of the measuring agency only and should not be sent out with the form. It is important to fill out the relevant information in the "To Be Completed by the Surveyor" section before mailing the form.

While each survey form is specific to the type of respondent, the following common elements are found:

- Each form allows for the reporting of data on MSW as well as other types of solid waste outside the scope of the standard recycling rate. (See Table A on page 11 for a description of Other Solid Waste.)
- Respondents are asked to report data according to the source of the material, whether residential or commercial.
- Respondents are asked to report data in tons. Instructions and standard volume-to-weight conversion factors are provided for converting data if necessary. (See Appendix B.)

In **Onondaga County, New York,** a business recycling specialist on the county's staff offers free services to area recyclers, including technical assistance on waste reduction. Providing these services helps the private sector respondents and assists the county in keeping track of those businesses that are recycling in the area.

In **Minnesota,** the Office of Environmental Assistance (OEA) provides telephone assistance to counties to help them understand what materials should be tabulated in the recycling rate. OEA also created a guidebook to help counties complete the annual survey forms. The guidebook instructs counties on how to collect and report recycling and MSW data, and provides guidance on measuring recycling revenues and expenditures.

In **Florida,** the state runs a 2- to 3-hour session for county recycling coordinators at the Recycle Florida! annual meeting. The meeting gives the state a chance to explain its recycling grant application process and reporting requirements.

The state of **Washington** conducts 2-hour training workshops for its 39 county recycling coordinators. Haulers, collectors, processors, and others responsible for completing survey forms also are invited to participate in the sessions. The state uses this time to go over the reporting forms in detail, explaining each step to survey respondents and answering questions.

TABLE II. SURVEY FORMS

	Survey Form	Respondent Type	Examples of Respondent
RECYCLING	Form 1	Collectors of recyclables.	Private haulers, government agencies with collection crews, and large generators (grocery stores, retail chains, and government facilities) that self-haul directly to a processor or end user.
	Form 2	Processors of recyclables.	Scrap metal, paper, plastic, tire, and yard trimmings processors, glass beneficiation plants, MRFs, buy-back centers, drop-off centers, and transfer stations that recover recyclables from waste on site.
	Form 3	End users of recyclables.	Public and private composting facilities, recycling plants, and disposal facilities that recover recyclables from waste on site.
WASTE DISPOSAL	Form 4	Collectors of MSW and Other Solid Waste.	Private waste haulers, government agencies with collection crews, and large generators (grocery stores, retail chains, and government facilities) that self-haul directly to a disposal facility or transfer station or end user.
	Form 5	Transfer stations.	Public and private transfer stations.
	Form 6	Waste disposal facilities.	Public and private landfills, incinerators, and waste-to-energy facilities.

- Imports and exports of waste are tracked.
- Collectors, processors, and end users of recyclables are asked to report data only on materials that originated in the particular jurisdiction.
- Data can be reported either on broad categories of recyclables or on specific commodities.

These common elements adhere to the standard measurement approach but also allow flexibility in collecting information on recycling and waste disposal outside the scope of the standard approach. Space is provided on the survey forms for collecting this kind of information because some jurisdictions may wish to track these data for planning purposes or may be required under their legislature to do so.

If local governments are consolidating data and reporting to you, the entire set of survey forms should be sent to the agency conducting the survey. Otherwise, the forms can be sent directly by the measuring agency to specific respondents.

Step Four

Maintain Frequent Communication With Survey Respondents.

While respondents are completing the survey forms, it is important to maintain contact with them in order to encourage timely response and quality data. Frequent communication can help to foster positive relationships with the survey community, gain insights into their concerns, and provide an avenue for clarifying reporting requirements. This helps to personalize the recycling measurement program and results in a higher quality of data. Effective communication vehicles include telephone calls, postcards, letters, electronic bulletin boards, e-mail, and site visits. The methods you choose will depend on the size of your survey community and available staff, budget, and timeframe for filling out forms.

The **Oregon** Department of Environmental Quality (DEQ) follows up with postcards and phone calls 2 to 3 weeks after its surveys are distributed. The postcards remind respondents to fill out the survey and mention that technical assistance is available from DEQ. Oregon has found this communication helps to improve data quality.

Relationship Between the Worksheets and the Standard Recycling Rate

$$\text{MSW Recycling Rate (\%) (Worksheet B3)} = \frac{\text{Total MSW Recycled (Worksheet B1)}}{\text{Total MSW Generated (Worksheet B2)}} \times 100$$

Step Five

Compile Data and Calculate an MSW Recycling Rate.

After all respondents have submitted their survey forms, your job is to organize the data into an accessible format, determine the total amount of MSW generated and recycled, and calculate a recycling rate. The worksheets included with this guide in Appendix D have been designed to allow data to be compiled in a concise and organized manner.

Worksheet A

Worksheet A is intended for those measurers that already have calculated a recycling rate and simply want to calculate a revised recycling rate based on the standard equation. The standard recycling rate equation uses standard definitions of MSW and recycling. To use the standard equation, therefore, you must include only those wastes and recycling activities that are included in the definitions of MSW and recycling. Worksheet A helps you accomplish this.

Worksheets B1, B2, and B3

Worksheets B1, B2, and B3 are intended for those measurers that have never calculated a recycling rate and those intending to redesign their measurement systems in order to calculate an MSW recycling rate. These worksheets help you assemble recycling and waste disposal data from the sample survey forms and calculate your recycling rate. The relationship between the worksheets and the standard recycling rate equation is depicted above.

Worksheet B1

Compiled From Survey Forms 1, 2, and 3

The survey forms that correspond to Worksheet B1 are listed above. This worksheet allows for the aggregation of data on the amount of MSW recycled in your jurisdiction, as reported on Forms 1, 2, and 3 by collectors, processors, and end users, respectively. Total MSW recycled is the numerator of the standard recycling rate equation. If you obtained data from more than one point in the recycling chain, Worksheet B1 explains how to analyze the data in order to eliminate possible double counting. In addition, a detailed method for estimating the composition of commingled recyclables is included.

Worksheet B2

Compiled From Survey Forms 4, 5, and 6

This worksheet is used to total data on the amount of MSW disposed of in your jurisdiction, as reported on Forms 4, 5, and 6 by collectors, transfer stations, and disposal facilities, respectively. The worksheet allows you to subtract waste imports and add exports in order to arrive at the total amount of MSW from your state or locality that was disposed of. In addition, space is provided to determine your jurisdiction's total MSW generation by adding together the total amount disposed of and the total amount recycled (from Worksheet B1). Total MSW generation is the denominator of the standard recycling rate equation.

Other features of Worksheet B2 include:

- An optional section for extrapolating waste disposal data if you

Commingled Materials

Since many residential recycling programs today are based on commingled curbside collection, commodity-specific information may not be available. The survey forms included with this guide allow respondents to report data on commingled materials as an individual category, but the data must be broken down into the component materials in order to implement the standard methodology. You can estimate the composition of commingled recyclables in one of two ways: by using national, state, or local recovery data on recyclable materials, or by using sampling data.

The preferred approach for estimating the composition of commingled recyclables is to use local, state, or national recovery data. Although using sampling techniques may generate more accurate data in specific locations, local, state, or national data will provide comparable recycling rates among jurisdictions and is less resource-intensive. Worksheet B1 includes detailed instructions on how to estimate the breakdown of commingled materials using the national recovery data found in EPA's *Characterization of Municipal Solid Waste in the United States: 1996 Update*. This same methodology can be employed using recovery data specific to your area, if available. In both cases, recovery data are used as default numbers to estimate the percentage of each recyclable material in the commingled mix. These percentages are then multiplied by the total tonnage of the mix to arrive at a weight for each material.

Another way to determine the breakdown of the commingled materials stream is to use the sampling technique described below. This method uses actual tonnage data from the processing facility where the commingled materials are separated:

1. Request that the MRF or processing facility process your materials separately on a particular day so that you can conduct sampling.
2. Use a sample size large enough to accurately reflect the types of recyclables generated in your area. This will help to ensure the precision of your sampling methodology.
3. From the sample results, determine the percentage of each recyclable material in the commingled mix.
4. Identify the total tonnage of material from your area.
5. Apply these percentages to the total tons of commingled materials from your jurisdiction to determine each constituent's tonnage.

received less than a 100 percent response rate to your survey.

- A methodology for estimating waste generation using waste characterization data for those who do not conduct annual surveys of disposal facilities.

Appendix H

In some cases, a jurisdiction may have conducted a waste characterization study or survey of disposal facilities in the past but does not have accurate information from a current survey. Appendix H contains an optional equation for adjusting waste generation information obtained in the past. The equation enables you to adjust the past data to account for changes in population and economic conditions. This method may be used to estimate waste generation for the current measurement year.

Worksheet B3

Combines Information Obtained on Worksheets B1 and B2

Worksheet B3 is used to combine the information obtained in Worksheets B1 and B2 to calculate a recycling rate. This worksheet contains the standard recycling rate equation.

Using Waste Characterization Data

The preferred approach for determining MSW generation is to obtain data from surveys of waste haulers, transfer stations, and/or disposal facilities. If you do not have the resources or legislative authority to conduct surveys, an alternative is to use data from waste characterization studies. These studies determine a per capita annual waste generation rate that, when multiplied by the current year's population, yields an estimate of total waste generation. A methodology for estimating waste generation in this way is outlined in Worksheet B2.

Step Six

Verify and Double-Check Data.

If time and resources permit, it is a good idea to verify the accuracy of the data you received before you calculate a recycling rate. This step can be performed at the same time you are compiling data from the survey forms. Options for verifying data accuracy include:

- ✔ Compare current data with data from the previous year. If large discrepancies are noticed, follow up by contacting survey respondents.
- ✔ Use data from secondary sources to cross-check data from primary sources.
- ✔ Compare totals for specific recyclable commodities with data from state or local waste characterization studies.

In addition to verifying the accuracy of data, it is important to double-check your data compilations after completing Worksheets B1 and B2. Examine the data closely and answer the following questions:

- Was all exported waste counted?
- Was all imported waste excluded?
- Was only MSW counted? (Was any Other Solid Waste inadvertently included?)
- Were all recyclables counted only once? Was any of the same MSW reported by more than one survey respondent?
- Were all data reported in tons?
- Were the EPA standard volume-to-weight conversion factors used by survey respondents?
- Were any data omitted due to leakage?

Depending on the amount of data you collect and the number of survey respondents, verifying and double-checking can be resource-intensive. This step is important, however, for ensuring that your recycling rate is as accurate as possible and will help give you confidence in your recycling measurement efforts.

Oregon surveys processors and end users directly, while counties survey collectors and then report to the state. Data from processors and end users are used to verify data reported by collectors.

Washington conducts an informal telephone survey of end users in the state in order to check the accuracy of data reported by collectors.

Oregon uses a computer program that, for each county and each commodity, multiplies the population by a projected per capita generation rate to arrive at a projected recycling total. The program then compares this total with the total reported by the respective county to verify the data.

To double-check its data, **Ohio** compares the national waste generation rate of 0.80 tons per person per year to the average for each of the reporting solid waste management districts (SWMD). If there is a large discrepancy which cannot be accounted for by the rural or urban nature of the SWMD, other factors, such as open dumping of waste, unreported recycling, or undetected waste exports, are investigated.

Step Seven

Share Information.

After you have calculated your MSW recycling rate, it is important to share the results of your recycling measurement efforts. Not only is it professional and courteous to share the final results with survey respondents, but there are also tangible benefits to providing such feedback. Communication on the status of state or local recycling efforts helps officials assess their recycling programs and their progress in meeting recycling goals. It also can identify potential areas of improvement and help communities learn about recycling activities beyond their immediate jurisdiction, which could prove useful in areas such as market development. Information sharing also provides opportunities to share new ideas about recycling measurement.

Sharing the results of your measurement effort with the public is also beneficial. If you would like your recycling rate to be higher, use the results to educate citizens and businesses about the importance of recycling. If, on the other hand, your measurement results indicate that recycling is high in your area, build on that momentum by recognizing people's efforts and encouraging additional opportunities for waste reduction.

Florida, a state that collects data directly from sources, keeps in close touch with local governments throughout the year via phone, e-mail, meetings, and conferences. Through these vehicles, the state updates local officials on measurement results, state policy decisions, funding, and other news.

Enhancement

SECTION 6

After you have developed a recycling measurement system and calculated a recycling rate, you may want to think about ways to improve and enhance your program for subsequent data collection efforts. Some options for enhancing your recycling measurement program include:

- Expanding or changing your program.
- Modifying the survey forms.
- Measuring source reduction.
- Using electronic reporting.

You might consider implementing one or more of these kinds of enhancements as your measurement system evolves.

Option One

Expand or Change Data Collection Efforts.

Consider expanding data collection efforts by adding more types of MSW materials to the rate calculation. (See Table A, page 11.) You can expand a basic program over the course of 1 or 2 years to include more of these materials not currently being tracked. Data on categories of waste not considered to be MSW (see Table A, page 11) also can be obtained, but remember that these do not count when calculating the standard recycling rate. A separate recycling rate could be computed, however, for these other types of solid waste.

Another potential enhancement is to alter who is surveyed, using some of the techniques presented earlier in this guide as a way to streamline, reduce double counting, increase response rates, or improve data accuracy.

Option Two

Refine and Modify the Survey Forms.

You can choose to modify the forms included with this guide to assist with special data collection needs, meet legislative requirements, or simply gather information about the way waste and recyclables are generated and managed in an area. Some states and localities might wish to modify the forms to request qualitative information from respondents. Even though such information is not necessary to calculate a recycling rate, it can be very useful to a state or local agency. This information might help you consider implementing changes in the way you collect MSW or recyclables, provide the momentum for adding services or materials to a recycling program, or help you assess and possibly modify resource allocations for various waste

management system components. Examples of questions you may want to ask on survey forms are:

- Is curbside collection of recyclables offered to single-family homes? If so, estimate how many homes are serviced.
- Is there a program for collecting recyclables from multifamily dwelling units? If so, estimate how many homes are serviced.
- Can you provide or estimate the population served by your recycling program?
- Is there a program to promote source reduction?
- Is a pay-as-you-throw system used for collecting solid waste disposal fees from residents?
- How much money was spent last year on educating the public about recycling?
- Have recyclable materials been banned from landfills or the solid waste collection system? If so, which materials?
- Is yard trimmings collection for leaves, grass, and brush offered? If so, estimate the population served by the yard trimmings collection program.
- Are drop-off opportunities for household hazardous waste offered?

Option Three

Consider Measuring Source Reduction.

Some states and localities are attempting to measure source reduction activities to help assess overall waste reduction progress. The survey forms can be modified to request information on such activities, as long as these data are kept separate from the recycling figures. EPA developed the *Source Reduction Program Potential Manual* in 1997 to assist communities in determining the impacts of various source reduction activities on the waste stream. The manual examines the diversion potential of six source reduction programs, including grasscycling, home composting, textiles reuse, office paper reduction, wooden pallet reuse, and paper towel reduction.

While you might not have the desire or resources to attempt to measure source reduction, some data on source reduction is readily available and could be useful to your planning efforts. Examples of source reduction activities that you might consider measuring, along with sources of data, are provided in Table 12.

Option Four

Take Advantage of Electronic Reporting.

To speed survey response time and ease the burden of compiling data, consider offering respondents an electronic reporting format. Information can be provided and transferred electronically through computer disks or the Internet.

TABLE 12. EXAMPLES OF SOURCE REDUCTION ACTIVITIES

Category	Material	Application	Sources of Data
Paper Products	Office paper.	Duplexing.	Government agencies and private businesses.
Rubber	Tires.	Retread tires.	Tire dealers. National Tire Dealers & Retreaders Association.
Textiles	Clothing.	Used clothing.	Local thrift stores. Salvation Army and Goodwill Industries. Council for Textile Recycling.
Wood	Pallets.	Refurbished pallets.	International Association of Pallet Recyclers.
Yard Trimmings	Grass clippings, leaves.	Backyard compost. Grasscycling.	Local government recycling programs. The Composting Council.

Electronic Reporting

Many states and localities are experimenting with or are now using electronic reporting. In **Maryland,** the state sends computer disks to counties who report in a WordPerfect file. State officials read the county reports and then compile the information using a dBase IV database program.

In May 1996, **Pennsylvania** began Internet training sessions. The goal of these sessions is to allow counties to report via e-mail. Several training sessions were held around the state and were open to all counties and cities. In addition, the state provided free modems to training session participants. The training covered basic Internet facts and how to set up a homepage. Once local governments become accustomed to the Internet, the state will develop a reporting procedure.

Washington considered developing a version of its database to be distributed on disk, but is opting instead to design something for the Internet in time to collect 1997 data. One possibility is to include a form on the state's homepage. Local officials would be able to download the form, enter the data, and send the information back electronically to be downloaded into a database.

Florida is also jumping on the Internet, but only after spending several years getting counties accustomed to submitting data on computer disks. As of September 1, 1996, Florida counties are required to gain Internet access and an e-mail address as a condition for receiving grant monies. The state is considering developing a form for their Web site, similar to what the state of Washington is proposing, so that counties can download the file, fill in their data, and return the information via computer disk, hard copy, or e-mail.

Before beginning, first determine if respondents are comfortable with an electronic format. Electronic reporting also can be offered as an option, as a way to gradually introduce it to respondents. If you choose to offer electronic reporting as an option, make sure people can still respond by completing and mailing in survey forms if they are not equipped or inclined to do otherwise.

Many state and local governments are finding that the benefits of recycling measurement are worth the time and effort required to plan and design an effective system. By following the suggestions in this guide, you can devise and implement a successful recycling measurement program that is right for you. Not only can such a program advance the status of recycling in your area, but it also can reflect well on your organization overall!

Glossary

APPENDIX A

Note: Definitions marked with a "1" were developed specifically to be used in the context of this guide, the survey forms, and the worksheets.

Abatement Debris: refers to waste resulting from remediation activities. (U.S. EPA, 1994d)

Agricultural Waste: refers to solid waste that is generated by the rearing of animals or the production and harvest of crops or trees. (Sullivan, 1993)

Aluminum Cans: refers to containers and packaging such as beverage cans or food and other nonfood cans. Examples of recycling include processing cans into new aluminum products (containers or foil). (U.S. EPA, 1995d)

Backyard Composting: refers to the diversion of food scraps and yard trimmings from the municipal waste stream through the onsite controlled decomposition of organic matter by micro-organisms (mainly bacteria and fungi) into a humus-like product. Backyard composting is *excluded* from recycling activities. Rather, it is considered source reduction because the composted materials never enter the municipal solid waste stream. (U.S. EPA, 1991a)

Broad Categories[1]: refers to general classifications of recyclable materials (glass, paper, plastic, metals).

Broker: refers to an individual or group of individuals who act as an agent or intermediary between the sellers and buyers of recyclable materials. (U.S. EPA, 1989)

Brush and Branches[1]: refers to the natural woody material collected from yard trimmings. Whole trees, such as Christmas trees, are included. *Excludes* leaves and grass. Examples of recycling include processing brush and branches into compost additive or mulch.

Bulky Waste[1]: refers to those items that are large enough to warrant special collection services separate from regular residential curbside collection. Examples include major appliances and furniture.

Buy-Back Center: refers to a facility where individuals or groups of individuals exchange recyclables for payment. (U.S. EPA, 1989)

Collector[1]: refers to public or private haulers that collect nonhazardous waste and recyclable materials from residential, commercial, institutional, and industrial sources. **Also see Hauler.**

Combustion Ash: refers to the residual substance produced during the burning, combustion, or oxidation of waste material. (U.S. EPA, 1994d)

Commercial Waste: refers to waste generated by businesses, such as office buildings; retail and wholesale establishments; and restaurants. Examples include old corrugated containers, food scraps, office papers, disposable tableware, paper napkins, and yard trimmings. (U.S. EPA, 1996b)

Commingled Recyclables: refers to a mixture of several recyclable materials in one container. (U.S. EPA, 1989)

Composting Facilities: refers to an offsite facility where the organic component of municipal solid scraps is biologically decomposed under controlled conditions; an aerobic process in which organic materials are ground or shredded and then decomposed to humus in windrow piles or in mechanical digesters, drums, or similar enclosures. (U.S. EPA, 1991a, 1994a)

Computer Paper/Printout: refers to a type of paper used in manifold business forms and produced in rolls and/or fan folded. It is used with computers and word processors to print data, information, letters, advertising, etc. (U.S. EPA, 1994b)

Construction and Demolition (C&D) Debris: refers to waste that is generated during the construction, remodeling, repair, or demolition of buildings, bridges, pavements, and other structures. C&D debris includes concrete, asphalt, lumber, steel girders, steel rods, wiring, dry wall, carpets, window glass, metal and plastic

piping, tree stumps, soil, and other miscellaneous items related to the activities listed above. This category also includes natural disaster debris. (U.S. EPA, 1989, 1994d)

Consumer Price Index: refers to an index measuring the change in the cost of typical wage-earner purchases of goods and services expressed as a percentage of the cost of these same goods and services in some base period. (Mish et al., 1988)

Contaminated Soil: refers to the introduction of micro-organisms, chemicals, toxic substances, wastes, or wastewater into soil in concentrations that make the soil unfit for its intended use. (U.S. EPA, 1994d)

Crumb Rubber: refers to ground rubber pieces the size of sand or silt used in rubber or plastic products, or processed further into reclaimed rubber or asphalt products. (U.S. EPA, 1991c)

Disposal Facilities: refers to repositories for solid waste including landfills and combustors intended for permanent containment or destruction of waste materials. *Excludes* transfer stations and composting facilities. (U.S. EPA, 1991b and National Recycling Coalition, 1995)

Drop-Off Center: refers to a method of collection whereby recyclable or compostable materials are taken by individuals to a collection site and placed in designated containers. (U.S. EPA, 1989)

End User[1]: refers to facilities that purchase or secure recovered materials for the purpose of recycling. Examples include recycling plants and composting facilities. *Excludes* waste disposal facilities.

Exports[1]: refers to municipal solid waste and recyclables that are transported outside the state or locality where they originated.

Ferrous Metals: refers to magnetic metals derived from iron (steel). (U.S. EPA, 1995d) Products made from ferrous metals include major and small appliances, furniture, and containers and packaging (steel drums and barrels). Examples of recycling include processing tin/steel cans, strapping, and ferrous metals from appliances into new products. (U.S. EPA, 1995d)

Food Processing Waste[1]: refers to food residues produced during agricultural and industrial operations.

Food Scraps[1]: refers to uneaten food and food preparation wastes from residences and commercial establishments (grocery stores, restaurants, and produce stands), institutional sources (school cafeterias), and industrial sources (employee lunchrooms). *Excludes* food processing waste from agricultural and industrial operations. Examples of recycling include composting and using food scraps to feed pigs, but *excludes* source reduction activities such as backyard (onsite) composting and use of food items for human consumption (food banks).

Generators[1]: refers to producers of municipal solid waste such as residences, institutions, commercial businesses, and industry.

Glass Beneficiation Plant: refers to a glass processing facility where recovered glass cullet is cleaned of contaminants and processed into a form that is ready to be manufactured into a new product (mill-ready). (U.S. EPA, 1995c)

Glass Containers: refers to containers and packaging such as beer and soft drink bottles, wine and liquor bottles, and bottles and jars for food, cosmetics, and other products. For the purpose of recycling, container glass is generally separated into color categories (clear, green, and amber or brown). Examples of recycling include processing glass into new containers, construction materials (aggregate), or fiberglass (insulation). (U.S. EPA, 1995d)

Grass: refers to lawn clippings. *Excludes* leaves, brush, and branches. (Mish et al., 1988)

Grasscycling[1]: refers to the source reduction activity whereby grass clippings are left on the lawn after mowing.

Gross Sales Receipts[1]: taxable transactions, or the total dollar value of goods sold in a state that are subject to state sales tax. The specific goods subjected to sales tax vary from state to state.

Hauler: refers to a waste collection company that provides complete refuse removal services. Many will also collect recyclables. Includes both private and public entities. **Also see Collector.** (U.S. EPA, 1994d)

HDPE (High Density Polyethylene): refers to a plastic product in which the ethylene molecules are linked in long chains with few side branches. Examples of products made from HDPE include milk jugs, detergent bottles, margarine tubs, and garbage containers. (U.S. EPA, 1995c)

Household Hazardous Waste (HHW): refers to hazardous products that are used and disposed of by residential—rather than industrial—consumers. These products include some paints, stains, varnishes, solvents, and pesticides, and other materials or products containing volatile chemicals that catch fire, react, explode under certain circumstances, or that are corrosive or toxic. HHW is derived from municipal solid waste (MSW) with the exception of used oil which is *excluded* from the category of MSW. Examples of recycling include processing HHW components into new products after they have been diverted from the waste stream. Diversion from the waste stream only does not constitute recycling (i.e., through collection or drop-off programs). (U.S. EPA, 1992, 1993b)

Imports[1]: refers to municipal solid waste and recyclables that have been transported to a state or locality for processing or final disposition, but that did not originate in that state or locality.

Incinerator: refers to a furnace for burning solid waste under controlled conditions. (U.S. EPA, 1994d)

Industrial Process Waste: refers to residues produced during manufacturing operations. (Sullivan, 1993)

Industrial Sludge: refers to the semiliquid residue remaining from the treatment of industrial water and wastewater. (U.S. EPA, 1989)

Industrial Waste: refers to nonhazardous wastes discarded at industrial sites from packaging and administrative sources. Examples include corrugated boxes, plastic film, wood pallets, lunchroom wastes, and office paper. *Excludes* industrial process wastes from manufacturing operations. (U.S. EPA, 1996b)

Institutional Waste: refers to waste generated at institutions, such as schools, libraries, hospitals, and prisons. Examples include cafeteria and restroom trashcan wastes, office papers, classroom wastes, and yard trimmings. (U.S. EPA, 1996b)

Large Appliances: see Major Appliances.

Large Generator[1]: refers to commercial businesses, institutions, or industries that generate sufficient quantities of municipal solid waste and recyclables to warrant self-management of these materials. Examples of large generators include supermarkets, restaurants, hardware stores, shopping malls, warehouses, amusement parks, convention centers, and office and apartment complexes.

LDPE (Low Density Polyethylene): refers to a plastic material in which the ethylene molecules are linked in a random fashion with the main chains of the polymer having long and short side branches. LDPE is used for both rigid containers and plastic film applications. (U.S. EPA, 1995c)

Lead-Acid Batteries: refers to batteries used in automobiles, trucks, and motorcycles. They contain plastic, lead (a toxic metal), and sulfuric acid. *Excludes* lead-acid batteries from large equipment, heavy-duty trucks and tractors, aircraft, military vehicles, and boats. (U.S. EPA, 1993a, 1996b)

Leakage[1]: refers to cases in which residential recyclables are collected outside of a municipal collection system. As a result, these materials are often undetected during the course of normal data collection efforts.

Leaves: refers to the foliage of a plant. *Excludes* brush, branches, and grass. (Mish et al., 1988)

Major (Large) Appliances: refers to many different types, sizes, and styles of ovens, microwave ovens, air-conditioners, refrigerators, freezers, washers, dryers, dishwashers, water heaters, dehumidifiers, or trash compactors manufactured for household, commercial, or recreational use. Steel is the predominant material used in the manufacture of large appliances. Other materials found in appliances (in varying amounts) include, copper, brass, aluminum, glass, rubber, and paperboard. **Also see White Goods and Bulky Waste.** (Sullivan, 1993 and U.S. EPA, 1995d)

Material Recovery Facility (MRF): refers to a facility where recyclables are sorted into specif-

ic categories and processed, or transported to processors, for remanufacturing. (U.S. EPA, 1994d)

Medical Waste: refers to any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals, excluding hazardous waste identified or listed under 40 CFR Part 261 or any household waste as defined in 40 CFR Subsection 261.4 (b)(1). (U.S. EPA, 1994d)

Mill-Ready Cullet: refers to crushed and whole contaminant-free scrap container glass that complies with the proper Institute of Scrap Recycling Industries, Inc. glass specifications. (Institute of Scrap Recycling Industries, Inc., 1996)

Mining Waste: refers to residues resulting from the extraction of raw materials from the earth. (Sullivan, 1993)

Minor Appliances: see Small Appliances.

Mixed Glass[1]: refers to recovered container glass that is not sorted into specific categories (color and grade).

Mixed Metals[1]: refers to recovered metal that is not sorted into specific categories (aluminum cans, tin/steel cans, other ferrous, and other nonferrous).

Mixed Municipal Solid Waste[1]: refers to municipal solid waste that is not sorted into specific categories (plastics, glass, and yard trimmings).

Mixed Paper[1]: refers to recovered paper that is not sorted into specific categories (old magazines, old newspapers, and old corrugated containers).

Mixed Plastic[1]: refers to recovered plastic that is not sorted into specific categories (HDPE, LDPE, and PETE).

Mulching[1]: refers to the process by which the volume of organic waste is reduced through shredding or grinding.

Municipal Sludge: refers to the semiliquid residue remaining from the treatment of municipal water and wastewater. (U.S. EPA, 1989)

Municipal Solid Waste (MSW): refers to wastes such as durable goods, nondurable goods, containers and packaging, food scraps, yard trimmings, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources, such as appliances, automobile tires, old newspapers, clothing, disposable tableware, office and classroom paper, wood pallets, and cafeteria wastes. *Excludes* solid wastes from other sources, such as construction and demolition debris, autobodies, municipal sludges, combustion ash, and industrial process wastes that might also be disposed of in municipal waste landfills or incinerators. (U.S. EPA, 1996b)

Natural Disaster Debris[1]: refers to wastes resulting from earthquakes, floods, hurricanes, tornados, and other natural disasters. *Excludes* wastes resulting from heavy storms. Natural disaster debris is classified as construction and demolition debris.

Nonferrous Metals: refers to nonmagnetic metals such as aluminum, lead, and copper. Products made from nonferrous metals include containers and packaging such as beverage cans, food and other nonfood cans; nonferrous metals found in appliances, furniture, electronic equipment; and nonpackaging aluminum products (foil, closures, and lids from bimetal cans). *Excludes* lead-acid batteries and nonferrous metals from industrial applications and construction and demolition debris. (U.S. EPA, 1996b)

Nonhazardous Industrial Process Waste: refers to waste that is neither municipal solid waste nor considered a hazardous waste under Subtitle C of the Resource Conservation and Recovery Act, such as certain types of manufacturing wastes and wastewaters. (U.S. EPA, 1996a)

Office Paper[1]: refers to high-grade papers such as copier paper, computer printout, and stationery. These papers are almost entirely made of uncoated chemical pulp, although some amounts of groundwood are used. It should be noted that this category of paper also is generated at locations other than offices, such as homes and institutions (schools).

Oil and Gas Waste: refers to gas and oil drilling muds, oil production brines, and other wastes associated with the exploration, development,

or production of crude oil or natural gas. (U.S. EPA, 1995a)

Old Corrugated Containers (OCC): refers to corrugated containers made from unbleached, unwaxed paper with a ruffled (corrugated) inner liner. (U.S. EPA, 1993a)

Old Magazines: refers to dry, coated magazines, catalogues, and similar printed materials. (Institute of Scrap Recycling Industries, Inc., 1996)

Old Newspaper: refers to periodicals printed on newsprint. Includes groundwood inserts (advertisements). Examples of recycling include processing old newspapers into new paper products (newspaper, paperboard, boxboard, or animal bedding). (U.S. EPA, 1996b)

Other Ferrous Metals: refers to ferrous metals from strapping, furniture, and metal found in tires and consumer electronics. *Excludes* the large quantities of metals found in construction materials or transportation products, such as automobiles, locomotives, and ships. (U.S. EPA, 1996b)

Other Glass: refers to glass from furniture, appliances, and consumer electronics. *Excludes* glass from transportation products and construction and demolition debris. Examples of recycling include processing glass into new glass products such as containers, construction materials (aggregate), or fiberglass (insulation). (U.S. EPA, 1996b)

Other Nonferrous Metals: refers to nonferrous metals (lead, copper, and zinc) from appliances, consumer electronics, and nonpackaging aluminum products (foil, closures, and aluminum lids from bimetal cans). *Excludes* nonferrous metals from industrial applications and construction and demolition debris. (U.S. EPA, 1996b)

Other Paper: refers to paper from books, third class mail, other commercial printing, paper towels, paper plates and cups, other nonpackaging paper (posters, photographic papers, cards, and games), milk cartons, folding boxes (cereal boxes), bags, wrapping papers, and other paper and paperboard products. (U.S. EPA, 1996b)

Other Plastic: refers to plastic from appliances, furniture, trash bags, cups, eating utensils, sporting and recreational equipment, and other nonpackaging plastic products. (U.S. EPA, 1996b)

Other Recyclables[1]: refers to household hazardous waste, oil filters, fluorescent tubes, mattresses, consumer electronics, circuit boards, and other miscellaneous recyclable items found in municipal solid waste that cannot be otherwise categorized.

Other Solid Waste: refers to nonhazardous solid wastes, other than municipal solid waste, covered under Subtitle D of the Resource Conservation and Recovery Act, such as municipal sludge, industrial nonhazardous waste, construction and demolition waste, agricultural waste, oil and gas waste, and mining waste. (U.S. EPA, 1996b)

Other Wood: refers to wood from furniture, cabinets from consumer electronics, and other nonpackaging wood products. *Excludes* wood recovered from construction and demolition activities (lumber and tree stumps) and industrial process waste (shavings and sawdust). Examples of recycling include processing wood into mulch, compost additive, or animal bedding. (U.S. EPA, 1996b)

Overissue Publications (Overissues)[1]: refers to printed publications, such as newspapers and magazines, that are defined as unsold inventory by the publisher. Overissues are not considered postconsumer waste.

Pallet: refers to a portable platform made of wood or plastic lumber used for storing or moving cargo or freight. (National Wooden Pallet and Container Association)

Paper: refers to paper products and materials such as old newspapers, old magazines, office papers, telephone directories, old corrugated containers, bags, and some paperboard packaging. Examples of recycling include processing paper into new paper products (tissue, paperboard, hydromulch, animal bedding, or insulation materials). (U.S. EPA, 1996b)

Paper Processor[1]: refers to an intermediate operating facility where recovered paper products and materials are sorted, cleaned of contami-

nants, and prepared for final recycling. Examples include paper stock dealers and paper packers.

PETE (Polyethylene Terephthalate): refers to a thermoplastic material used to manufacture plastic soft drink containers and rigid containers. PETE has a high melting point, is clear in its natural state, and has a relatively high density. (U.S. EPA, 1995c)

Plastic: refers to plastic containers and packaging made from various resins, including PETE, HDPE, PVC, LDPE, PP, and PS. *Excludes* plastics in transportation (automobiles) and construction products (PVC piping). (U.S. EPA, 1996b)

Plastic Processor[1]: refers to an intermediate operating facility where recovered plastic products and materials are sorted, cleaned of contaminants, and prepared for final recycling. Examples include plastics handlers and plastics reclaimers.

Plastics Handler: refers to companies that prepare recyclable plastics by sorting, baling, shredding, granulating, and/or storing plastics until a sufficient quantity is on hand. (American Plastics Council, 1996)

Plastics Reclaimer: refers to companies that further process plastics after the handling stage by performing at least one of the following functions: washing/cleaning, pelletizing, or producing a new product. (American Plastics Council, 1996)

Postconsumer Materials/Waste: refers to recovered materials that have been used as a consumer item and are diverted from municipal solid waste for the purpose of collection, recycling, and disposition (aluminum beverage cans, plastic bottles, old newspapers, and yard trimmings). *Excludes* materials from industrial processes that have not reached the consumer, such as glass broken in the manufacturing process or overissues of newspapers and magazines. (U.S. EPA, 1994d, 1995c)

PP (Polypropylene): refers to a plastic polymer formed by linking propylene molecules. PP has good resistance to heat and is used in flexible and rigid packaging, film, and textiles. (U.S. EPA, 1995c)

Preconsumer Materials/Waste: refers to materials generated in manufacturing and converting processes, such as manufacturing scrap and trimmings/cuttings. Also includes print overruns, overissue publications (newspapers and magazines), and obsolete inventories. (U.S. EPA, 1995c)

Print Overruns: refers to a quantity of paper that is printed beyond the quantity specified. (Walden-Mott, 1981)

Processors[1]: refers to intermediate operators that handle recyclable materials from collectors and generators for the purpose of preparing materials for recycling (material recovery facilities, scrap metal yards, paper dealers, and glass beneficiation plants). Processors act as intermediaries between collectors and end users of recovered materials.

PS (Polystyrene): refers to a plastic polymer formed by linking styrene molecules. PS is used to make a variety of products including plastic cutlery and food containers. It is often used in its foamed state. (U.S. EPA, 1995c)

PVC (Polyvinyl Chloride): refers to the family of plastic copolymers, also known as vinyl. PVC is used to make products such as pipes, bottles, upholstery, and automotive parts. (U.S. EPA, 1995c)

Recovery: refers to the diversion of materials from the municipal solid waste stream for the purpose of recycling or composting. *Excludes* reuse and source reduction activities such as yard trimmings diverted to backyard (onsite) composting, the repair of wood pallets, and the refilling of beverage containers. (U.S. EPA 1996b)

Recyclables: refers to those materials recovered from the solid waste stream and transported to a processor or end user for recycling. (National Recycling Coalition, 1995)

Recycling: refers to the series of activities by which discarded materials are collected, sorted, processed, and converted into raw materials and used in the production of new products. *Excludes* the use of these materials as a fuel substitute or for energy production. (National Recycling Coalition, 1995)

Recycling Plant[1]: refers to a facility where recovered materials are remanufactured into new products.

Redemption Program[1]: refers to a program where consumers are monetarily compensated for the collection of recyclable materials, generally through pre-paid deposits or taxes on beverage containers. In some states or localities, legislation has been passed to implement redemption programs to assist in the prevention of roadside litter (bottle bills).

Residential Waste: refers to waste generated by single- and multi-family homes including old newspapers, clothing, disposable tableware, food packaging, cans and bottles, food scraps, and yard trimmings. *Excludes* food scraps and yard trimmings that are diverted to backyard (onsite) composting. (U.S. EPA, 1996b)

Residues: refers to the materials remaining after processing, incineration, composting, or recycling have been completed. Residues are usually disposed of in landfills. (U.S. EPA, 1989)

Respondent[1]: refers to the state, locality, or individual that completes a recycling measurement survey form.

Reuse: refers to the use of a product or component of municipal solid waste in its original form more than once. Examples include refilling glass or plastic bottles, repairing wood pallets, using corrugated or plastic containers for storage, and returning milk crates. (U.S. EPA, 1994d)

Scrap Metal Processor[1]: refers to an intermediate operating facility where recovered metal is sorted, cleaned of contaminants, and prepared for final recycling. Examples include scrap metal yards and scrap metal dealers.

Small (Minor) Appliances: refers to many different types, sizes, and styles of electric fans, coffee makers, electric irons, food mixers, etc. Aluminum and plastic are the predominant materials used in small appliances. (U.S. EPA, 1995d)

Source Reduction: refers to the design, manufacture, purchase, or use of materials, such as products and packaging, to reduce the amount or toxicity of materials before they enter the municipal solid waste management system, such as redesigning products or packaging to reduce the quantity of materials or the toxicity of the materials used; reusing products or packaging already manufactured; and lengthening the life of products to postpone disposal. Examples include donating food to food banks, diverting food scraps and yard trimmings through backyard (onsite) composting, and reusing plastic pallets. Also referred to as waste prevention. (U.S. EPA 1996b)

Surveyor[1]: refers to the state, locality, or individual responsible for the collection of recycling measurement data through the use of survey forms.

Telephone Directories[1]: refers to telephone directories printed on paper with high groundwood content. Other directories, such as zip code and area code directories, are included in this category when they are printed on the same type of paper.

Textiles: refers to fibers from discarded apparel, furniture, linens (sheets and towels), and carpets. Examples of recycling include converting apparel and linens into wiper rags and processing textiles into new products (linen paper or carpet padding). (U.S. EPA, 1996b)

Tin/Steel Cans: refers to tin-coated steel containers such as cans used for food packaging. (U.S. EPA, 1993a)

Tire Processor[1]: refers to an intermediate operating facility where recovered tires are processed in preparation for recycling.

Tires: refers to passenger car and light- and heavy-duty truck tires. *Excludes* high-speed industrial tires (from airplanes), bus tires, motorcycle tires, and special service tires, such as military, agricultural, off-road, and slow-speed industrial tires (from construction vehicles). Examples of recycling include processing car and truck tires into new rubber products (trash cans, storage containers, and rubberized asphalt), and the use of whole tires for playground and reef construction. (U.S. EPA, 1994b)

Transfer Station: refers to a facility where solid waste is transferred from collection vehicles to larger trucks or rail cars for longer distance transport. (U.S. Congress, 1989)

Tree Stumps: refers to the portion of a tree remaining after it has been cut. Tree stumps are categorized as yard trimmings when found in municipal solid waste. Otherwise, tree stumps are generally found in, and categorized as, construction and demolition debris. (Mish et al., 1988)

Unit-Based Pricing/Pay-As-You-Throw: refers to a system under which residents pay for municipal solid waste management services per unit of waste (by weight or volume) collected rather than through a fixed fee. (U.S. EPA, 1994c)

Used Oil[1]: refers to spent motor oil from passenger cars and trucks that is collected at specified locations for recycling. Used oil is *excluded* from the category of municipal solid waste.

Waste Characterization Studies: refers to the identification and measurement (by weight or volume) of specific categories of municipal solid waste materials (glass, plastic, and metals) for the purpose of projecting landfill capacity, determining best management practices and developing cost-effective recycling programs. (U.S. EPA, 1996b)

Waste Generation: refers to the amount (weight or volume) of materials and products that enter the waste stream before recycling, composting, landfilling, or combustion takes place. (U.S. EPA 1996b)

Waste Stream: refers to the total flow of solid waste from homes, businesses, institutions, and manufacturing plants that must be recycled, incinerated, or disposed of in landfills; or any segment thereof, such as the "residential waste stream" or the "recyclable waste stream." (U.S. EPA, 1989)

Waste-To-Energy Facility/Combustor: refers to a facility where recovered municipal solid waste is converted into a usable form of energy, usually through combustion. (U.S. EPA, 1995b)

White Goods: refers to major appliances such as refrigerators, stoves, air conditioners, and washing machines. **Also see Major Appliances and Bulky Waste.** (U.S. EPA, 1989)

White Ledger: refers to printed or unprinted sheets of white sulphite or sulphate ledger, bond, writing paper, and all other papers which have a similar fiber and filler content. (Institute of Scrap Recycling Industries, Inc., 1994)

Wood Packaging: refers to wood products such as pallets, crates, and barrels. *Excludes* wood from furniture and other nonpackaging wood products. Examples of recycling include processing wood into new products (mulch and compost). (U.S. EPA, 1996b)

Yard Trimmings: refers to grass, leaves, tree branches and brush, and tree stumps from residential, institutional, and commercial sources. Examples of recycling include processing yard trimmings into compost, mulch, or other similar uses, and landspreading leaves (when the depth of the application allows for degradation of the organic plant material). (U.S. EPA, 1996b)

Yard Trimmings Processor[1]: refers to an intermediate operating facility where recovered yard trimmings are sorted, cleaned of contaminants, and prepared for final recycling.

GLOSSARY REFERENCES

American Plastics Council. 1996. Letter communicating definitions. October.

Institute of Scrap Recycling Industries, Inc. 1996. Scrap Specifications Circular 1996: Guidelines for Nonferrous Scrap, Ferrous Scrap, Glass Cullet, Paper Stock, Plastic Scrap. Institute of Scrap Recycling Industries, Washington, DC.

Mish et al., eds. 1988. Webster's Ninth New Collegiate Dictionary. Springfield, MA: Merriam-Webster, Inc.

National Recycling Coalition. 1995. Definitions Approved By the National Recycling Coalition Board of Directors.

National Wooden Pallet and Container Association (NWPCA). An Introduction to Wood Pallets. NWPCA, Arlington, VA.

Sullivan, T.F.P. 1993. Environmental Regulatory Glossary, Sixth Edition. Rockville, MD: Government Institutes, Inc.

U.S. Congress. 1989. Facing America's Trash: What Next for Municipal Solid Waste. OTA-O-424. Washington, DC.

U.S. EPA. 1989. Decision-Makers Guide to Solid Waste Management. EPA530-SW-89-072. Washington, DC.

U.S. EPA. 1991a. Environmental Fact Sheet: Yard Waste Composting. EPA530-SW-91-009. Washington, DC.

U.S. EPA. 1991b. Solid Waste Disposal Facility Criteria; Final Rule. Fed. Reg. Part II: 40 CFR Parts 257 and 258.56(196):50,978-51,119. October 9.

U.S. EPA. 1991c. Summary of Markets for Scrap Tires. EPA530-90-074B. Washington, DC.

U.S. EPA. 1992. The Consumer's Handbook for Reducing Solid Waste. EPA530-K-92-003. Washington, DC.

U.S. EPA. 1993a. Business Guide for Reducing Solid Waste. EPA530-K-92-004. Washington, DC.

U.S. EPA. 1993b. Household Hazardous Waste: A Manual for One-Day Community Collection Programs. EPA530-R-92-026. Washington, DC.

U.S. EPA. 1994a. Composting Yard Trimmings and Municipal Solid Waste. EPA530-R-94-003. Washington, DC.

U.S. EPA. 1994b. Comprehensive Guideline for Procurement of Products Containing Recovered Materials and Issuance of a Draft Recovered Materials Advisory Notice: Proposed Rule and Notice. Fed. Reg. 59(76):18,852-18,887. April 20.

U.S. EPA. 1994c. Pay-As-You-Throw: Lessons Learned About Unit Pricing. EPA530-R-94-004. Washington, DC.

U.S. EPA. 1994d. Terms of the Environment: Glossary, Abbreviations, and Acronyms. EPA175-B-94-015. Washington, DC.

U.S. EPA. 1995a. Crude Oil and Natural Gas Exploration and Production Wastes: Exemption from RCRA Subtitle C Regulation. EPA530-K-95-003. Washington, DC.

U.S. EPA. 1995b. Decision-Makers' Guide to Solid Waste Management, Volume II. EPA530-R-95-023. Washington, DC.

U.S. EPA. 1995c. Manufacturing from Recyclables: 24 Case Studies of Successful Recycling Enterprises. EPA530-R-95-001. Washington, DC.

U.S. EPA. 1995d. Methodology for Characterization of Municipal Solid Waste in the United States: 1994 Update. Report prepared by Franklin Associates, LTD. Washington, DC.

U.S. EPA. 1996a. Building a New State/EPA Industrial Solid Waste Initiative. Washington, DC.

U.S. EPA. 1996b. Characterization of Municipal Solid Waste in The United States: 1996 Update. EPA530-R-97-015. Washington, DC.

Walden-Mott Corporation. 1981. Walden's Handbook for Paper Salespeople & Buyers of Printing Paper, Second Edition. Oradell, NJ: Walden-Mott Corporation.

Standard Volume-to-Weight Conversion Factors

APPENDIX B

Category	Recyclable Materials (u/c = uncompacted/ compacted & baled)	Volume	Estimated Weight (in pounds)
FOOD SCRAPS[A]	Food scraps, solid and liquid fats	55-gal drum	412
GLASS	Bottles[B]:		
	Whole bottles	1 yd^3	500-700
	Semicrushed	1 yd^3	1,000-1,800
	Crushed (mechanically)	1 yd^3	1,800-2,700
	Uncrushed to manually broken	55-gal drum	300
	Refillable Whole Bottles[C]:		
	Refillable beer bottles	1 case = 24 bottles	10-14
	Refillable soft drink bottles	1 case = 24 bottles	12-22
	8 oz glass container	1 case = 24 bottles	12
LEAD-ACID BATTERIES	Car[D]	1 battery	39.4 lb
	Truck[E]	1 battery	53.3 lb lead and plastic
	Motorcycle[E]	1 battery	9.5 lb lead and plastic
METALS	Aluminum Cans[F]:		
	Whole	1 yd^3	50-75
	Compacted (manually)	1 yd^3	250-430
	Uncompacted	1 full grocery bag 1 case = 24 cans	1.5 0.9
	Ferrous (tin coated steel cans)[G]:		
	Whole	1 yd^3	150
	Flattened	1 yd^3	850
	Whole	1 case = 6 cans	22
	Major Appliances[E]:		
	Air conditioners (room)	1 unit	64.2
	Dishwashers	1 unit	92
	Dryers (clothes)	1 unit	130

Category	Recyclable Materials (u/c = uncompacted/ compacted & baled)	Volume	Estimated Weight (in pounds)
METALS (cont'd)	Freezers	1 unit	193
	Microwave ovens	1 unit	50
	Ranges	1 unit	181.1
	Refrigerators	1 unit	267
	Washers (clothes)	1 unit	177
	Water heaters	1 unit	131
PAPER	Newspaper[F]:		
	Uncompacted	1 yd^3	360-505
	Compacted/baled	1 yd^3	720-1,000
	12 in. stack	—	35
	Old Corrugated Containers[F]:		
	Uncompacted	1 yd^3	50-150 (300)[H]
	Compacted	1 yd^3	300-500
	Baled	1 yd^3	700-1,100
	Computer Paper[F]:		
	Uncompacted (stacked)	1 yd^3	655
	Compacted/baled	1 yd^3	1,310
	1 case	2,800 sheets	42
	White Ledger[F]:		
	Stacked (u/c)	1 yd^3	375-465/755-925
	Crumpled (u/c)	1 yd^3	110-205/325
	Ream of 20# bond; 8-1/2 in. x 11 in.	1 ream = 500 sheets	5
	Ream of 20# bond; 8-1/2 in. x 14 in.	1 ream = 500 sheets	6.4
	White ledger pads	1 case = 72 pads	38
	Tab Cards[F]:		
	Uncompacted	1 yd^3	605
	Compacted/baled	1 yd^3	1,215-1,350
	Miscellaneous Paper:		
	Yellow legal pads[F]	1 case = 72 pads	38
	Colored message pads[F]	1 carton = 144 pads	22
	Telephone directories[I]	1 yd^3	250
	Mixed Ledger/Office Paper[F]:		
	Flat (u/c)	1 yd^3	380/755
	Crumpled (u/c)	1 yd^3	110-205/610

Category	Recyclable Materials (u/c = uncompacted/ compacted & baled)	Volume	Estimated Weight (in pounds)
PLASTIC[J]	PET (Soda Bottles):		
	Whole bottles (uncompacted)	1 yd^3	30-40
	Whole bottles (compacted)	1 yd^3	515
	Whole bottles (uncompacted)	gaylord	40-53
	Baled	30 in. x 62 in.	500-550
	Granulated	semiload	30,000
	Granulated	gaylord	700-750
	8 bottles (2 L size)	16 L	1
	HDPE (Dairy):		
	Whole (uncompacted)	1 yd^3	24
	Whole (compacted)	1 yd^3	270
	Baled	32 in. x 60 in.	400-500
	HDPE (Mixed):		
	Baled	32 in. x 60 in.	900
	Granulated	gaylord	800-1,000
	Granulated	semiload	42,000
	Other Plastic:		
	Uncompacted	1 yd^3	50
	Compacted/baled	1 yd^3	400-700
	Mixed PET and HDPE (Dairy):		
	Whole (uncompacted)	1 yd^3	32
	Film:		
	Baled	semiload	44,000
	Baled	30 in. x 42 in. x 48 in.	1,100
TEXTILES[I]	Mixed textiles	1 yd^3	175
TIRES	Car Tires:		
	Whole tire[E]	1 tire	21
	Crumb rubber[K]	1 tire	12
	Truck Tires:		
	Whole tire[E]	1 tire	70
	Crumb rubber[K]	1 tire	60
WOOD	Wood chips[L]	1 yd^3	625
	Pallets[F]	—	30-100 (40 avg.)

Category	Recyclable Materials (u/c = uncompacted/ compacted & baled)	Volume	Estimated Weight (in pounds)
YARD TRIMMINGS[F]	Grass Clippings:		
	Uncompacted	1 yd^3	350-450
	Compacted	1 yd^3	550-1,500
	Leaves:		
	Uncompacted	1 yd^3	200-250
	Compacted	1 yd^3	300-450
	Vacuumed	1 yd^3	350
FURNISHINGS[E]	Foam rubber mattress	1 mattress	55
MUNICIPAL SOLID WASTE[M]	Residential waste (uncompacted at curb)	1 yd^3	150-300
	Commercial-industrial waste (uncompacted)	1 yd^3	300-600
	MSW (compacted in truck)	1 yd^3	500-1,000
	MSW (landfill density)	1 yd^3	750-1,250

Conversion Table Sources:

[A] Information obtained from Washington State.

[B] Draft National Recycling Coalition Measurement Standards and Reporting Guidelines presented to NRC membership. October 31, 1989.

[C] Personal communication with a representative from Allwaste. November 6, 1995.

[D] Battery Council International. 1995. 1994 National Recycling Rate Study.

[E] U.S. EPA. 1995. Methodology for Characterization of Municipal Solid Waste in the United States: 1994 Update. EPA530-R-96-001. Washington, DC.

[F] U.S. EPA. 1993. Business Guide for Reducing Solid Waste. EPA530-K-92-004. Washington, DC.

[G] Personal communication with a representative from the Steel Recycling Institute. November 1, 1995.

[H] Information obtained from New Jersey and New York States.

[I] Information obtained from Massachusetts State.

[J] Personal communication with a representative from the American Plastics Council. November 2, 1995.

[K] Personal communication with a representative from the Scrap Tire Management Council. November 6, 1995.

[L] Information obtained from Northeast Forest Products, Martin Mulch Company, and the Solid Waste Association of North America.

[M] Solid Waste Association of North America, Manager of Landfill Operations Training and Certification Course. January 1989. Revised June 1991 and October 1994.

Survey Forms

APPENDIX C

Introduction to the Survey Forms

The survey forms contained in this appendix are designed to help you obtain the municipal solid waste (MSW) recycling and disposal data necessary for calculating a standard recycling rate. The forms may be used by states or localities that are measuring recycling for the first time and want to use the standard methodology outlined in this guide or those that wish to redesign their current recycling measurement system according to the standard methodology.

There are six survey forms in total, each uniquely tailored for a specific point in the waste management system. Forms 1-3 allow for the collection of data on the amount of MSW recycled in your state or locality and address collectors, processors, and end users of recyclables, respectively. Forms 4-6 allow for the collection of data on the amount of MSW disposed of in your state or locality and address waste collectors, transfer stations, and disposal facilities, respectively. In addition to MSW, each survey form also allows data to be collected on materials not considered to be MSW (referred to as "other solid waste" and "other recyclables").

As discussed in Section 4, determining who to survey is a critical step in the design of your recycling measurement system, and you are allowed flexibility in selecting which points in the chain to survey. In order to obtain data on both MSW recycling and disposal, you will want to use two of the survey forms at a minimum, one from each group. You may choose, however, to use more than two or even all six of the survey forms, depending on your particular surveying approach. Table 13 describes each of the survey forms, including the purpose and who should complete the form.

TABLE 13. SURVEY FORMS

SURVEY FORM	TITLE	WHO SHOULD COMPLETE THE FORM	PURPOSE
Form 1	Collectors of Recyclables	Private recycling haulers Government agencies with collection crews or contracts Large generators that self-haul directly to a processor or end user	To collect data on the amount of MSW recyclables and other recyclables collected from residential and commercial sources in your state or locality during the current measurement year.
Form 2	Processors of Recyclables	Material recovery facilities (MRFs) Buy-back centers Drop-off centers Scrap metal processors Paper processors Glass beneficiation plants Plastic processors Tire processors Yard trimmings processors Transfer stations that recover recyclables from waste on site	To collect data on the amount of MSW recyclables and other recyclables from residential and commercial sources in your state or locality processed during the current measurement year by MRFs, buy-back centers, and other processors.
Form 3	End Users of Recyclables	Public and private composting facilities Recycling plants Disposal facilities that recover recyclables from waste on site	To collect data on the amount of MSW recyclables and other recyclables from residential and commercial sources in your state or locality accepted during the current measurement year by recycling mills and composting facilities.
Form 4	Collectors of MSW and Other Solid Waste	Private waste haulers Government agencies with collection crews or contracts Large generators that self-haul directly to a processor or end user	To collect data on the amount of MSW and other types of solid waste collected from residential and commercial sources in your state or locality during the current measurement year.
Form 5	Transfer Stations	Public and private transfer stations	To collect data on the amount of MSW and other types of solid waste from residential and commercial sources in your state or locality processed during the current measurement year by transfer stations.
Form 6	Waste Disposal Facilities	Public and private landfills Public and private incinerators Public and private waste-to-energy facilities	To collect data on the amount of MSW and other types of solid waste from residential and commercial sources in your state or locality accepted during the current measurement year by disposal facilities.

1 About This Form

Collectors of Recyclables

Use this form to collect information on the amount of recyclables collected from residential and commercial sources in your state or locality during the previous year.

Who Should Fill Out This Form:

- Private Recycling Haulers.
- Government Agencies with Collection Crews or Collection Contracts.
- Large Generators (e.g., Grocery Stores, Retail Chains, Government Facilities) that Self-Haul Directly to a Processor or End User.

Important Tips:

1. Send a cover letter with the survey form explaining the purpose of the form and how to fill it out. Remember to specify which sections of the form you want respondents to complete and which sections are optional. Use the sample cover letters provided as guides for developing your own.
2. Send the glossary and standard volume-to-weight conversion factors to all respondents.
3. Before mailing the form and cover letter to respondents, write in the name of your state or locality, reporting period, due date, and return address in the spaces provided at the top of the form.
4. Fill in the name of your state or locality throughout the form where indicated.

Collectors of Recyclables

To Be Completed by the Surveyor:
State or Locality:
Reporting Period: _____ to _____
Return This Form to:
Return This Form by: _____/_____/_____
Direct All Questions to: Name _____ Telephone ( ) _____

Respondent Information (please type or print clearly):

Name of Company or Government Agency:

Address: Street _____

City _____ Zip _____

Telephone: ( ) _____ FAX: ( ) _____

Name of Contact: Title:

Are You a: ☐ Private Hauler ☐ Large Generator
☐ Government Agency With a Collection Crew or a Collection Contract

Certification

I certify that, to the best of my knowledge, the information reported in this form is accurate and truthful.

_____	_____	_____
Name and Title	Signature	Date

I. Instructions

- ✔ Refer to the attached glossary for clarification of the terms used in this form.
- ✔ Report all quantities in tons (1 ton=2,000 pounds). Use the attached volume-to-weight conversion factors to convert your data from cubic yards (or other unit of measure) to tons. If you used these conversion factors to convert your data, indicate "yes" in the appropriate column. If you used other conversion factors, please identify the source in the comments section.
- ✔ Estimate the breakdown of residential and commercial materials to the best of your ability.
- ✔ Report any recyclables that were generated as a result of a natural disaster in Part 2B as construction and demolition (C&D) debris.
- ✔ Report only quantities collected during the reporting period stated above.

2. Recyclables Collection Data

2A. Municipal solid waste (MSW) recyclables collected from residential and commercial sources **in** _____ (state or locality) during the stated reporting period. Refer to the Scope of MSW Recycling table for specific examples of what to include as recycling.

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Commingled Materials (describe in Comments section below)					
Food Waste					
Glass Containers:					
Clear					
Amber					
Green					
Mixed Glass					
Other Glass					
Subtotal Glass					
Lead-Acid Batteries					
Metals:					
Aluminum Cans					
Tin/Steel Cans					
Major Appliances					
Other Ferrous					
Other Nonferrous					
Mixed Metals					
Subtotal Metals					

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Paper:					
Old Magazines					
Old Newspaper					
Old Corrugated Containers					
Office Papers					
Telephone Directories					
Mixed Paper					
Other Paper					
Subtotal Paper					
Plastic:					
PETE					
HDPE					
PVC					
LDPE					
PP					
PS					
Mixed Plastic					
Other Plastic					
Subtotal Plastic					
Textiles					
Tires					
Wood:					
Wood Packaging					
Other Wood					
Subtotal Wood					
Yard Trimmings:					
Brush and Branches					
Grass					
Leaves					
Tree Stumps					
Mixed Yard Trimmings					
Subtotal Yard Trimmings					

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Other Recyclables:					
_____					
_____					
_____					
Subtotal Other Recyclables					
TOTAL (tons)					

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates/Comments: _____

_____

_____

2B. Other types of recyclables collected from sources **in** _____ (state or locality) during the stated reporting period.

RECYCLABLE MATERIAL	Were EPA Conversion Factors Used?	AMOUNT RECEIVED (tons)
Agricultural Waste		
Automobile Bodies		
Combustion Ash		
Construction and Demolition Debris:		
Asphalt		
Concrete		
Metals		
Natural disaster debris		
Wood		
Other C&D		
Industrial Process Waste		
Municipal Sewage Sludge		
Preconsumer Waste		
Used Oil		
Other _____		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

2 About This Form

Processors of Recyclables

Use this form to collect information on the amount of recyclables from residential and commercial sources in your state or locality processed during the previous year by material recovery facilities and other processors.

Who Should Fill Out This Form:

- Scrap Metal Processors.
- Paper Processors.
- Glass Beneficiation Plants.
- Plastic Processors.
- Tire Processors.
- Material Recovery Facilities.
- Yard Trimmings Processors.
- Buy-Back Centers.
- Drop-Off Centers.
- Transfer Stations That Recover Recyclables From Waste On Site.

Important Tips:

1. Send a cover letter with the survey form explaining the purpose of the form and how to fill it out. Remember to specify which sections of the form you want respondents to complete and which sections are optional. Use the sample cover letters provided as guides for developing your own.
2. Send the glossary and standard volume-to-weight conversion factors to all respondents.
3. Before mailing the form and cover letter to respondents, write in the name of your state or locality, reporting period, due date, and return address in the spaces provided at the top of the form.
4. Fill in the name of your state or locality throughout the form where indicated.

Processors of Recyclables

To Be Completed by the Surveyor:

State or Locality:

Reporting Period: _____ to _____

Return This Form to:

Return This Form by: _____/_____/_____

Direct All Questions to: Name _____ Telephone ( ) _____

Respondent Information (please type or print clearly):

Name of Company or Government Agency:

Address: Street _____

City _____ Zip _____

Telephone: ( ) _____ FAX: ( ) _____

Name of Contact: Title:

Are You a:

- ☐ Scrap Metal Processor
- ☐ Glass Beneficiation Plant
- ☐ Material Recovery Facility
- ☐ Tire Processor
- ☐ Paper Processor
- ☐ Plastic Processor
- ☐ Buy-Back Center
- ☐ Yard Trimmings Processor
- ☐ Drop-Off Center
- ☐ Other _____

Certification

I certify that, to the best of my knowledge, the information reported in this form is accurate and truthful.

_____ Name and Title

_____ Signature

_____ Date

I. Instructions

- ✔ Refer to the attached glossary for clarification of the terms used in this form.
- ✔ Report all quantities in tons (1 ton=2,000 pounds). Use the attached volume-to-weight conversion factors to convert your data from cubic yards (or other unit of measure) to tons. If you used these conversion factors to convert your data, indicate "yes" in the appropriate column. If you used other conversion factors, please identify the source in the comments section.
- ✔ Estimate the breakdown of residential and commercial materials to the best of your ability.
- ✔ Report any recyclables that were generated as a result of a natural disaster in Part 2B as construction and demolition (C&D) debris.
- ✔ Report only quantities received during the reporting period stated above.

2. Recyclables Processing Data

2A. Municipal solid waste (MSW) recyclables received from residential and commercial sources **in** _____ (state or locality) during the stated reporting period. Refer to the Scope of MSW Recycling table for specific examples of what to include as recycling.

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Commingled Materials (describe in Comments section below)					
Food Waste					
Glass Containers:					
Clear					
Amber					
Green					
Mixed Glass					
Other Glass					
Subtotal Glass					
Lead-Acid Batteries					
Metals:					
Aluminum Cans					
Tin/Steel Cans					
Major Appliances					
Other Ferrous					
Other Nonferrous					
Mixed Metals					
Subtotal Metals					

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Paper:					
Old Magazines					
Old Newspaper					
Old Corrugated Containers					
Office Papers					
Telephone Directories					
Mixed Paper					
Other Paper					
Subtotal Paper					
Plastic:					
PETE					
HDPE					
PVC					
LDPE					
PP					
PS					
Mixed Plastic					
Other Plastic					
Subtotal Plastic					
Textiles					
Tires					
Wood:					
Wood Packaging					
Other Wood					
Subtotal Wood					
Yard Trimmings:					
Brush and Branches					
Grass					
Leaves					
Tree Stumps					
Mixed Yard Trimmings					
Subtotal Yard Trimmings					

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Other Recyclables:					
_____					
_____					
_____					
Subtotal Other Recyclables					
TOTAL (tons)					

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates/Comments: _____

_____

_____

2B. Other types of recyclables received from sources **in** _____ (state or locality) during the stated reporting period.

RECYCLABLE MATERIAL	Were EPA Conversion Factors Used?	AMOUNT PROCESSED (tons)
Agricultural Waste		
Automobile Bodies		
Combustion Ash		
Construction and Demolition Debris:		
Asphalt		
Concrete		
Metals		
Natural Disaster Debris		
Wood		
Other C&D		
Industrial Process Waste		
Municipal Sewage Sludge		
Preconsumer Waste		
Used Oil		
Other _____		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

3 About This Form

End Users of Recyclables

Use this form to collect information on the amount of recyclables from residential and commercial sources in your state or locality accepted during the previous year by recycling mills and composting facilities.

Who Should Fill Out This Form:

- Public and Private Composting Facilities.
- Recycling Plants and Other End Users.
- Disposal Facilities That Recover Recyclables From Waste On Site.

Important Tips:

1. Send a cover letter with the survey form explaining the purpose of the form and how to fill it out. Remember to specify which sections of the form you want respondents to complete and which sections are optional. Use the sample cover letters provided as guides for developing your own.
2. Send the glossary and standard volume-to-weight conversion factors to all respondents.
3. Before mailing the form and cover letter to respondents, write in the name of your state or locality, reporting period, due date, and return address in the spaces provided at the top of the form.
4. Fill in the name of your state or locality throughout the form where indicated.

End Users of Recyclables

To Be Completed by the Surveyor:
State or Locality:
Reporting Period: _____ to _____
Return This Form to:
Return This Form by: _____/_____/_____
Direct All Questions to: Name _____ Telephone ( ) _____

Respondent Information (please type or print clearly):

Name of Company or Government Agency:

Address: Street _____

City _____ Zip _____

Telephone: ( ) _____ FAX: ( ) _____

Name of Contact: Title:

Are You a: ☐ Composting Facility ☐ Recycling Plant ☐ Disposal Facility
☐ Other _____

Certification

I certify that, to the best of my knowledge, the information reported in this form is accurate and truthful.

_____ _____ _____
Name and Title Signature Date

1. Instructions

- ✔ Refer to the attached glossary for clarification of the terms used in this form.
- ✔ Report all quantities in tons (1 ton=2,000 pounds). Use the attached volume-to-weight conversion factors to convert your data from cubic yards (or other unit of measure) to tons. If you used these conversion factors to convert your data, indicate "yes" in the appropriate column. If you used other conversion factors, please identify the source in the comments section.
- ✔ Estimate the breakdown of residential and commercial materials to the best of your ability.
- ✔ Report any recyclables that were generated as a result of a natural disaster in Part 2B as construction and demolition (C&D) debris.
- ✔ Report only quantities received during the reporting period stated above.

2. Recycling Data

2A. Municipal solid waste (MSW) recyclables received from residential and commercial sources

in _____ during the stated reporting period. Refer to the Scope of
state or locality

MSW Recycling table for specific examples of what to include as recycling.

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Commingled Materials (describe in Comments section below)					
Food Waste					
Glass Containers:					
Clear					
Amber					
Green					
Mixed Glass					
Other Glass					
Subtotal Glass					
Lead-Acid Batteries					
Metals:					
Aluminum Cans					
Tin/Steel Cans					
Major Appliances					
Other Ferrous					
Other Nonferrous					
Mixed Metals					
Subtotal Metals					

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Paper:					
Old Magazines					
Old Newspaper					
Old Corrugated Containers					
Office Papers					
Telephone Directories					
Mixed Paper					
Other Paper					
Subtotal Paper					
Plastic:					
PETE					
HDPE					
PVC					
LDPE					
PP					
PS					
Mixed Plastic					
Other Plastic					
Subtotal Plastic					
Textiles					
Tires					
Wood:					
Wood Packaging					
Other Wood					
Subtotal Wood					
Yard Trimmings:					
Brush and Branches					
Grass					
Leaves					
Tree Stumps					
Mixed Yard Trimmings					
Subtotal Yard Trimmings					

2A. RECYCLABLE MATERIAL	Source of Recyclable Material				TOTAL (tons)
	Residential (tons)	Were EPA Conversion Factors Used?	Commercial (tons)	Were EPA Conversion Factors Used?	
Other Recyclables:					
_____					
_____					
_____					
Subtotal Other Recyclables					
TOTAL (tons)					

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates/Comments: _____

_____

_____

2B. Other types of recyclables received from sources **in** _____ (state or locality) during the stated reporting period.

RECYCLABLE MATERIAL	Were EPA Conversion Factors Used?	AMOUNT RECEIVED (tons)
Agricultural Waste		
Automobile Bodies		
Combustion Ash		
Construction and Demolition Debris:		
Asphalt		
Concrete		
Metals		
Natural Disaster Debris		
Wood		
Other C&D		
Industrial Process Waste		
Municipal Sewage Sludge		
Preconsumer Waste		
Used Oil		
Other _____		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

4 About This Form

Collectors of Municipal Solid Waste (MSW) and Other Solid Waste

Use this form to collect information on the amount of MSW and other types of solid waste collected from residential and commercial sources in your state or locality during the previous year.

Who Should Fill Out This Form:

- Private Waste Haulers.
- Government Agencies with Collection Crews or Collection Contracts.
- Large Generators (e.g., Grocery Stores, Retail Chains, Government Facilities) that Self-Haul Directly to a Processor or End User.

Important Tips:

1. Send a cover letter with the survey form explaining the purpose of the form and how to fill it out. Remember to specify which sections of the form you want respondents to complete and which sections are optional. Use the sample cover letters provided as guides for developing your own.
2. Send the glossary and standard volume-to-weight conversion factors to all respondents.
3. Before mailing the form and cover letter to respondents, write in the name of your state or locality, reporting period, due date, and return address in the spaces provided at the top of the form.
4. Fill in the name of your state or locality throughout the form where indicated.

Collectors of Municipal Solid Waste (MSW) and Other Solid Waste

To Be Completed by the Surveyor:

State or Locality:

Reporting Period: _____ to _____

Return This Form to:

Return This Form by: _____/_____/_____

Direct All Questions to: Name _____ Telephone ( ) _____

Respondent Information (please type or print clearly):

Name of Company or Government Agency:

Address: Street _____

City _____ Zip _____

Telephone: ( ) _____ FAX: ( ) _____

Name of Contact: Title:

Are You a: ☐ Private Hauler ☐ Large Generator
☐ Government Agency With a Collection Crew or a Collection Contract

Certification

I certify that, to the best of my knowledge, the information reported in this form is accurate and truthful.

_____ _____ _____
Name and Title Signature Date

I. Instructions

- ✔ Refer to the attached glossary for clarification of the terms used in this form.
- ✔ Report all quantities in tons (1 ton=2,000 pounds). Use the attached volume-to-weight conversion factors to convert your data from cubic yards (or other unit of measure) to tons. If you used these conversion factors to convert your data, indicate "yes" in the appropriate column. If you used other conversion factors, please identify the source in the comments section.
- ✔ Estimate the breakdown of residential and commercial materials to the best of your ability.
- ✔ Report any wastes that were generated as a result of a natural disaster in Part 2C and 2D as Other Solid Waste.
- ✔ Report only quantities collected during the reporting period stated above.

2. Waste Data

2A. Municipal solid waste (MSW) collected from residential and commercial sources

in _____ during the stated reporting period and hauled to transfer
state or locality

stations or disposal facilities (e.g., landfills, incinerators, and waste-to-energy facilities).

Refer to the attached Scope of MSW table for examples of what to include as MSW.

TYPE OF MSW	Amount Hauled to a Transfer Station or Disposal Facility in _____ state or locality	Were EPA Conversion Factors Used?	Amount Exported to a Transfer Station or Disposal Facility Outside of _____ state or locality	Were EPA Conversion Factors Used?	TOTAL (tons)
Residential					
Commercial					
TOTAL (tons)					

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

_____

_____

_____

_____

2B. MSW collected from residential and commercial sources **outside of** _____ (state or locality) during the stated reporting period but hauled to a transfer station or disposal facility **in** _____ (state or locality).

IMPORTS

TYPE OF MSW	Were EPA Conversion Factors Used?	TOTAL (tons)
Residential		
Commercial		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

2C. Other types of solid waste collected from sources **in** _____ (state or locality) during the stated reporting period. Refer to the attached Scope of MSW table for examples of what to include as Other Solid Waste.

OTHER SOLID WASTE	Amount Hauled to a Transfer Station or Disposal Facility in _____ (state or locality)	Were EPA Conversion Factors Used?	Amount Exported to a Transfer Station or Disposal Facility Outside of _____ (state or locality)	Were EPA Conversion Factors Used?	TOTAL (tons)
Agricultural Waste					
Combustion Ash					
Construction and Demolition Debris					
Food Processing Waste					
Industrial Process Waste					
Medical Waste					
Municipal Sewage Sludge					
Natural Disaster Debris					
Other _____					
TOTAL (tons)					

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

2D. Other solid waste collected from sources **outside of** _____ (state or locality) during the stated reporting period but hauled to a transfer station or disposal facility **in** _____ (state or locality).

IMPORTS

OTHER SOLID WASTE	Were EPA Conversion Factors Used?	TOTAL (tons)
Agricultural Waste		
Combustion Ash		
Construction and Demolition Debris		
Food Processing Waste		
Industrial Process Waste		
Medical Waste		
Municipal Sewage Sludge		
Natural Disaster Debris		
Other _____		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

_____

_____

_____

_____

5 About This Form

Transfer Stations

Use this form to collect information on the amount of municipal solid waste (MSW) and other types of solid waste from residential and commercial sources in your state or locality processed during the previous year by transfer stations.

Who Should Fill Out This Form:

- Public and Private Transfer Stations

Important Tips:

1. Send a cover letter with the survey form explaining the purpose of the form and how to fill it out. Remember to specify which sections of the form you want respondents to complete and which sections are optional. Use the sample cover letters provided as guides for developing your own.
2. Send the glossary and standard volume-to-weight conversion factors to all respondents.
3. Before mailing the form and cover letter to respondents, write in the name of your state or locality, reporting period, due date, and return address in the spaces provided at the top of the form.
4. Fill in the name of your state or locality throughout the form where indicated.

Transfer Stations

To Be Completed by the Surveyor:
State or Locality:
Reporting Period: _____ to _____
Return This Form to:
Return This Form by: _____/_____/_____
Direct All Questions to: Name _____ Telephone ( ) _____

Respondent Information (please type or print clearly):

Name of Company or Government Agency:
Address: Street _____ City _____ Zip _____
Telephone: ( ) _____ FAX: ( ) _____
Name of Contact: Title:

Certification

I certify that, to the best of my knowledge, the information reported in this form is accurate and truthful.

Name and Title	Signature	Date

I. Instructions

- ✔ Refer to the attached glossary for clarification of the terms used in this form.
- ✔ Report all quantities in tons (1 ton=2,000 pounds). Use the attached volume-to-weight conversion factors to convert your data from cubic yards (or other unit of measure) to tons. If you used these conversion factors to convert your data, indicate "yes" in the appropriate column. If you used other conversion factors, please identify the source in the comments section.
- ✔ Estimate the breakdown of residential and commercial materials to the best of your ability.
- ✔ Report any wastes that were generated as a result of a natural disaster in Part 2C and 2D as Other Solid Waste.
- ✔ Report only quantities received during the reporting period stated above.

2. Waste Data

2A. Municipal solid waste (MSW) received from residential and commercial sources

in _____ during the stated reporting period and hauled to disposal
state or locality

facilities (e.g., landfills, incinerators, and waste-to-energy facilities).

Refer to the attached Scope of MSW table for examples of what to include as MSW.

TYPE OF MSW	Amount Hauled to a Disposal Facility in _____ state or locality	Were EPA Conversion Factors Used?	Amount Exported to a Disposal Facility Outside of _____ state or locality	Were EPA Conversion Factors Used?	TOTAL (tons)
Residential					
Commercial					
TOTAL (tons)					

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

_____

_____

_____

2B. MSW received from residential and commercial sources **outside of** _____ (state or locality) during the stated reporting period but hauled to a disposal facility **in** _____ (state or locality).

IMPORTS

TYPE OF MSW	Were EPA Conversion Factors Used?	TOTAL (tons)
Residential		
Commercial		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e. guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

2C. Other types of solid waste received from sources **in** _____ (state or locality) during the stated reporting period. Refer to the attached Scope of MSW table for examples of what to include as Other Solid Waste.

OTHER SOLID WASTE	Amount Hauled to a Disposal Facility in _____ (state or locality)	Were EPA Conversion Factors Used?	Amount Exported to a Disposal Facility Outside of _____ (state or locality)	Were EPA Conversion Factors Used?	TOTAL (tons)
Agricultural Waste					
Combustion Ash					
Construction and Demolition Debris					
Food Processing Waste					
Industrial Process Waste					
Medical Waste					
Municipal Sewage Sludge					
Natural Disaster Debris					
Other _____					
TOTAL (tons)					

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

2D. Other solid waste received from sources **outside of** _____ (state or locality) during the stated reporting period but hauled to a disposal facility **in** _____ (state or locality).

IMPORTS

OTHER SOLID WASTE	Were EPA Conversion Factors Used?	TOTAL (tons)
Agricultural Waste		
Combustion Ash		
Construction and Demolition Debris		
Food Processing Waste		
Industrial Process Waste		
Medical Waste		
Municipal Sewage Sludge		
Natural Disaster Debris		
Other _____		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

_____

6 About This Form

Waste Disposal Facilities

Use this form to collect information on the amount of municipal solid waste (MSW) and other types of solid waste from residential and commercial sources in your state or locality accepted during the previous year by disposal facilities.

Who Should Fill Out This Form:

- Public and Private Landfills
- Public and Private Incinerators
- Public and Private Waste-to-Energy Facilities

Important Tips:

1. Send a cover letter with the survey form explaining the purpose of the form and how to fill it out. Remember to specify which sections of the form you want respondents to complete and which sections are optional. Use the sample cover letters provided as guides for developing your own.
2. Send the glossary and standard volume-to-weight conversion factors to all respondents.
3. Before mailing the form and cover letter to respondents, write in the name of your state or locality, reporting period, due date, and return address in the spaces provided at the top of the form.
4. Fill in the name of your state or locality throughout the form where indicated.

Waste Disposal Facilities

To Be Completed by the Surveyor:
State or Locality:
Reporting Period: _____ to _____
Return This Form to:
Return This Form by: _____/_____/_____
Direct All Questions to: Name _____ Telephone ( ) _____

Respondent Information (please type or print clearly):

Name of Company or Government Agency:
Address: Street _____ City _____ Zip _____
Telephone: ( ) _____ FAX: ( ) _____
Name of Contact: Title:
Are You a: ☐ Landfill ☐ Incinerator ☐ Waste-to-Energy Facility ☐ Other _____

Certification

I certify that, to the best of my knowledge, the information reported in this form is accurate and truthful.

_____	_____	_____
Name and Title	Signature	Date

1. Instructions

- ✔ Refer to the attached glossary for clarification of the terms used in this form.
- ✔ Report all quantities in tons (1 ton=2,000 pounds). Use the attached volume-to-weight conversion factors to convert your data from cubic yards (or other unit of measure) to tons. If you used these conversion factors to convert your data, indicate "yes" in the appropriate column. If you used other conversion factors, please identify the source in the comments section.
- ✔ Estimate the breakdown of residential and commercial materials to the best of your ability.
- ✔ Report any wastes that were generated as a result of a natural disaster in Part 2C and 2D as Other Solid Waste.
- ✔ Report only quantities received during the reporting period stated above.

2. Waste Disposal Data

2A. Municipal solid waste (MSW) received from residential and commercial sources

in _____ during the stated reporting period.
state or locality

TYPE OF MSW	Were EPA Conversion Factors Used?	AMOUNT RECEIVED (tons)
Residential		
Commercial		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

_____

_____

_____

2B. MSW received from residential and commercial sources **outside of** _____ (state or locality) during the stated reporting period.

TYPE OF MSW	Were EPA Conversion Factors Used?	AMOUNT RECEIVED (tons)
Residential		
Commercial		
TOTAL (tons)		

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

_____

2C. Other types of solid waste received during the stated reporting period.

OTHER SOLID WASTE	SOURCE			
	Inside _____ (state or locality)	Were EPA Conversion Factors Used?	Outside of _____ (state or locality)	Were EPA Conversion Factors Used?
Agricultural Waste (tons)				
Combustion Ash (tons)				
Construction and Demolition Debris (tons)				
Food Processing Waste (tons)				
Industrial Process Waste (tons)				
Medical Waste (tons)				
Municipal Sewage Sludge (tons)				
Natural Disaster Debris (tons)				
Other _____ (tons)				
TOTAL (tons)				

Are any of the reported quantities estimates, i.e., guesses?
If they are estimates, explain how they were determined below.

Explanation of estimates: _____

_____

_____

_____

Recycling Rate Worksheets

APPENDIX D

Introduction to the Worksheets

Worksheet A

Use this worksheet if you have already calculated a recycling rate for your state or locality and simply want to calculate a revised recycling rate based on the standard equation. Worksheet A helps you translate your current data on recycling and disposal so that the data match the standard definitions of municipal solid waste (MSW) and recycling outlined in this guide.

Worksheets B1, B2, and B3

These three worksheets are intended both for those states and localities that are measuring recycling for the first time and want to use the standard methodology outlined in this guide and for those that wish to redesign their current recycling measurement system according to the standard methodology. These worksheets allow you to compile data reported on the survey forms and calculate an MSW recycling rate.

Worksheet B1 is used to aggregate data on MSW recycling, as reported by respondents on Survey Forms 1, 2, and 3. The worksheet allows you to determine the total amount of MSW recycled in your jurisdiction during the current measurement year, which is the numerator of the standard recycling rate equation.

Worksheet B2 is used to aggregate data on MSW disposal, as reported by respondents on Survey Forms 4, 5, and 6. The worksheet allows you to determine the total amount of MSW disposed of in your jurisdiction during the current measurement year, which when added to the total amount of MSW recycled (from Worksheet B1) is the total amount of MSW generated, or the denominator of the standard recycling rate equation. Worksheet B2 also can be used to estimate the total amount of MSW generated if actual disposal data are not available or reliable.

Worksheet B3

This worksheet is used to combine the totals obtained in Worksheets B1 and B2 to calculate a standard recycling rate.

A Converting to the Standard Recycling Rate

Use this worksheet to calculate a recycling rate based on the standard equation. The standard recycling rate incorporates standard definitions of municipal solid waste (MSW) and recycling in addition to the following universal equation:

$$\text{Municipal Solid Waste Recycling Rate (\%)} = \frac{\text{Total MSW Recycled}}{\text{Total MSW Generated (MSW Recycled + MSW Disposed Of)}} \times 100$$

This worksheet will help you subtract from your current recycling rate those waste management activities and waste materials that are outside the scope of the standard recycling rate. In addition, those waste materials and recycling activities not included in your current rate, but included in the standard rate and for which you have data, can be added using this worksheet.

How You Will Use The Information Obtained:

- After converting to the standard recycling rate, you will be able to make consistent comparisons of your recycling efforts and the efforts of others.

Who Should Use This Worksheet:

- State and local governments that currently have a recycling measurement system in place and have previously calculated a recycling rate.

What You Will Need:

- A list of the types of solid waste and recyclables included in your current recycling rate.
- Your definitions of the following terms:
  - Municipal Solid Waste
  - Recyclable materials (e.g., yard trimmings, tires, ferrous metal)
  - Recycling
- Standard definitions of the above terms from the Glossary (found on page 49 of the Guide).
- Scope of Materials Included in the Standard MSW Recycling Rate table (Table A, found on page 11 of the Guide).
- Scope of Activities Included in the Standard MSW Recycling Rate table (Table B, found on page 13 of the Guide).

Important Tips:

- ✔ In order to be consistent with the standard recycling rate, only solid waste defined as municipal solid waste in the attached Scope of MSW table can be included when calculating the amount of waste disposed of and recycled.
- ✔ Only MSW recycled according to the waste management activities outlined in the attached Scope of MSW Recycling table can be included when calculating the amount of waste recycled.

Converting to the Standard Recycling Rate

I. Calculating Waste Disposal

1A. Using the Scope of MSW table and the definition of MSW found in the Glossary, determine if there are any waste materials not included in your current recycling rate. Add those waste materials ***for which you have current disposal data*** and that are defined as MSW in the standard recycling rate. Enter the amount disposed of for these wastes below. Remember, add materials only if you already have current disposal data available.

ADDITIONAL MSW	AMOUNT DISPOSED OF (tons)
TOTAL ADDITIONAL MSW (tons)	

1B. Only MSW can be included in the standard recycling rate. The wastes listed in the table below are excluded from the definition of MSW in the standard recycling rate. Using your most recent data on waste disposal, fill in the annual amount disposed of for each excluded waste included in your current recycling rate. Refer to the Glossary and Scope of MSW table for further clarification of the terms used here. If you are unable to disaggregate these excluded wastes from your current data, use Worksheet B2, Part 3, to estimate the total amount of MSW generated.

1B. MATERIALS EXCLUDED FROM MSW	ANNUAL AMOUNT DISPOSED OF (tons)
Abatement Debris	
Agricultural Waste	
Asphalt	
Batteries From Aircraft, Military Vehicles, Boats, Heavy-Duty Trucks, and Tractors	
Combustion Ash	
Concrete	
Construction and Demolition Debris (C&D)	
Contaminated Soil	
Ferrous Metals From Transportation Equipment and C&D projects	
Food Processing Waste	
Glass From Transportation Equipment and C&D Projects	
Industrial Sludges	

1B. MATERIALS EXCLUDED FROM MSW	**ANNUAL AMOUNT DISPOSED OF (tons)**
Mining Waste	
Municipal Sludges	
Natural Disaster Debris	
Nonferrous Metals From Industrial or Construction Sources	
Oil and Gas Waste	
Plastics From Transportation Equipment	
Preconsumer Waste	
Used Oil	
Wood From C&D Activities	
TOTAL EXCLUDED WASTES (tons)	

1C. Total MSW Disposed Of

Total Waste Disposed Of (based on your most recent data)	+	Total Additional MSW *(from 1A)*	–	Total Excluded Wastes *(from 1B)*	=	**Total MSW Disposed Of (tons)**
_____		_____		_____		_____

2. Calculating Recycling

2A. Using the Scope of MSW Recycling table, determine if there are recycling activities that can be added to your current recycling rate. ***If you have current data for a recycling activity listed in the table,*** and it is not included in your current rate, specify the type and amount of material recycled below. Remember, add materials only if you already have current recycling data available.

2A. RECYCLABLE MATERIAL	**TOTAL (tons)**
Commingled Materials	
Food Waste	
Glass Containers:	
Clear	
Amber	
Green	
Mixed Glass	
Other Glass	
Subtotal Glass	
Lead-Acid Batteries	

2A. RECYCLABLE MATERIAL	TOTAL (tons)
Metals:	
Aluminum Cans	
Tin/Steel Cans	
Major Appliances	
Other Ferrous	
Other Nonferrous	
Mixed Metals	
Subtotal Metals	
Paper:	
Old Magazines	
Old Newspaper	
Old Corrugated Containers	
Office Papers	
Telephone Directories	
Mixed Paper	
Other Paper	
Subtotal Paper	
Plastic:	
PETE	
HDPE	
PVC	
LDPE	
PP	
PS	
Mixed Plastic	
Other Plastic	
Subtotal Plastic	
Textiles	
Tires	
Wood:	
Wood Packaging	
Other Wood	
Subtotal Wood	

2A. RECYCLABLE MATERIAL	TOTAL (tons)
Yard Trimmings:	
Brush and Branches	
Grass	
Leaves	
Tree Stumps	
Mixed Yard Trimmings	
Subtotal Yard Trimmings	
Other Recyclables:	
_____	
_____	
Subtotal Other Recyclables	
TOTAL (tons)	

2B. The waste management activities listed in the table below are excluded from the standard recycling rate. For each excluded activity included in your current recycling rate, fill in the annual amount of waste recovered in your state or locality according to that method. Use your most recent data. Refer to the Glossary and Scope of MSW Recycling table for further clarification of the terms used here.

ACTIVITIES EXCLUDED FROM THE STANDARD RECYCLING RATE	AMOUNT RECOVERED (TONS)
Alternative Daily Landfill Cover	
Backyard Composting of Yard Trimmings and Food Waste	
Combustion	
Grasscycling	
Mulching of Tree Stumps From C&D Debris	
Recycling of Materials Excluded From MSW (from 1B)	
Reuse (see Scope of MSW Recycling table)	
Source Reduction	
TOTAL (tons)	

2C. Total MSW Recycled

_____	+	_____	–	_____	=	_____	
Total Waste Recycled (based on your most recent data)		Total Additional Recycling *(from 2A)*		Total Excluded Amount *(from 2B)*		**Total MSW Recycled (tons)**	

3. Calculating a Standard Recycling Rate

3A. MSW Recycling Rate (%)

$$\left[\frac{\text{Total MSW Recycled } \textit{(from 2C)}}{\text{Total MSW Recycled } \textit{(from 2C)} + \text{Total MSW Disposed Of } \textit{(from 1C)}}\right] \times 100 = \frac{}{\textbf{MSW Recycling Rate (\%)}}$$

B1 Determining the Amount of Municipal Solid Waste (MSW) Recycled

Use this worksheet to compile recycling data reported on the survey forms. The total amount of MSW recycled in your state or locality is the numerator of the recycling rate equation.

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place and are calculating a recycling rate for the first time.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.

What You Will Need:

- Completed Survey Forms 1 (Collectors), 2 (Processors), and 3 (End Users).

How You Will Use The Information Obtained:

- Recycling data will be used in conjunction with the waste generation data obtained in Worksheet B2 to calculate a recycling rate in Worksheet B3.

Important Tips:

- ✔ Before you begin, group all the survey forms together according to number.
- ✔ If you received incomplete information on any part of a survey form, follow up with the respondent in order to complete the data.
- ✔ If you received data from more than one type of respondent (e.g., collectors and processors), use the tables in Parts 1 and 2 to:
  - ✔ Verify the data received from one source by cross-checking it with data received from another source.
  - ✔ Identify redundant data and instances of possible double counting.
- ✔ If you received data on Commingled Materials from respondents, use the procedure provided to estimate the weight of each component material.
- ✔ Check to make sure that the data reported on the survey forms is in tons before you begin to complete this worksheet. If it is not in tons, use the standard volume-to-weight conversion factors to convert the data into tons.

I. Residential Recycling Data

1A. For each recyclable material, total the data reported by each collector in the Residential column of Form 1, Part 2A. Do the same for the data reported by processors (Form 2, Part 2A) and then end users (Form 3, Part 2A).

To avoid double counting of data, for those materials where you received data from more than one type of survey respondent, circle the data that you believe is the most complete and accurate. Draw a line through the other data (you will not use it again). For example, if you received data on residential glass recycling from both collectors and processors, circle the data that you believe is the least likely to result in double counting. Remember to circle only one survey respondent for each material. If you surveyed only one type of respondent, simply fill out the corresponding column below.

1A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Food Waste				
Glass Containers:				
Clear				
Amber				
Green				
Mixed Glass				
Other Glass				
Subtotal Glass				
Lead-Acid Batteries				
Metals:				
Aluminum Cans				
Tin/Steel Cans				
Major Appliances				
Other Ferrous				
Other Nonferrous				
Mixed Metals				
Subtotal Metals				
Paper:				
Old Magazines				
Old Newspaper				
Old Corrugated Containers				
Office Papers				
Telephone Directories				
Mixed Paper				
Other Paper				
Subtotal Paper				

1A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Plastic:				
PETE				
HDPE				
PVC				
LDPE				
PP				
PS				
Mixed Plastic				
Other Plastic				
Subtotal Plastic				
Textiles				
Tires				
Wood:				
Wood Packaging				
Other Wood				
Subtotal Wood				
Yard Trimmings:				
Brush and Branches				
Grass				
Leaves				
Tree Stumps				
Mixed Yard Trimmings				
Subtotal Yard Trimmings				
Other Recyclables:				
_____				
_____				
_____				
Subtotal Other Recyclables				
TOTAL (tons)				

1B. If you received data from survey respondents on Commingled Materials for residential programs, use the following method to estimate the weight of each recyclable material that makes up the commingled category. Tons for each material should be entered separately into the corresponding category in the table in Part 1A. You will need to complete this exercise for each different type of commingled mix reported on the survey forms.

Step 1:

Based on the comments received on the survey forms, list the individual recyclable materials that make up Commingled Materials in Column 1 of the blank table titled Actual Data.

Step 2:

Using the national recovery data in the reference table below as default data, estimate the percentage of each material in the commingled mix, and then enter the percentages in Column 2 of the blank table. For example, if your mix consists of aluminum cans and steel cans, you would have a total of 2,670 tons of materials (1,120 + 1,550) according to the reference table. This is equal to a mix consisting of 42% aluminum cans and 58% steel cans by weight. To arrive at these percentages, divide the tons of each material by the total tons for the mix (e.g., 1,120/2,670 x 100 = 42%).

Step 3:

Apply the percentages calculated in Step 2 to the total commingled tons reported on the survey forms to arrive at a weight for each recyclable material. For example, if you determined in Step 2 that the commingled mix is 42% aluminum cans by weight according to the reference table, and the total for commingled materials reported on the survey forms is 10,000 tons, then the actual amount of aluminum cans is 4,200 tons (42% x 10,000).

Step 4:

Enter the tons from Step 3 in Column 3 of the blank table. Finally, add these amounts to the corresponding material totals in the table in Part 1A.

Reference Data:

Recovery of Products in Municipal Solid Waste, 1995 [1]

Product	Amount Recovered (in thousands of tons)
Aluminum Cans	990
Corrugated Boxes	18,480
Glass	3,140
Magazines	670
Newspaper	6,960
Office Paper	3,010
Plastic Bottles	490
Steel Cans	1,500
Telephone Directories	60
Third Class Mail	710

[1] U.S. EPA. 1997. Characterization of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC. (Please use the latest available version.)

1B.

Example:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)*
Aluminum Cans	19%	190 tons
Steel Cans	27%	270 tons
Glass Bottles	54%	540 tons

*Assume a total of 1,000 tons of Commingled Materials.

Actual Data:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)

2. Commercial Recycling Data

2A. For each recyclable material, total the data reported by each collector in the Commercial column of Form 1, Part 2A. Do the same for the data reported by processors (Form 2, Part 2A) and then end users (Form 3, Part 2A).

To avoid double counting, for those materials where you received data from more than one type of survey respondent, circle the data that you believe is the most complete and accurate. Draw a line through the other data. If you surveyed only one type of respondent, simply fill out the corresponding column below.

2A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Food Waste				
Glass Containers:				
Clear				
Amber				
Green				
Mixed Glass				
Other Glass				
Subtotal Glass				
Lead-Acid Batteries				
Metals:				
Aluminum Cans				
Tin/Steel Cans				
Major Appliances				
Other Ferrous				
Other Nonferrous				
Mixed Metals				
Subtotal Metals				
Paper:				
Old Magazines				
Old Newspaper				
Old Corrugated Containers				
Office Papers				
Telephone Directories				
Mixed Paper				
Other Paper				
Subtotal Paper				

2A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Plastic:				
PETE				
HDPE				
PVC				
LDPE				
PP				
PS				
Mixed Plastic				
Other Plastic				
Subtotal Plastic				
Textiles				
Tires				
Wood:				
Wood Packaging				
Other Wood				
Subtotal Wood				
Yard Trimmings:				
Brush and Branches				
Grass				
Leaves				
Tree Stumps				
Mixed Yard Trimmings				
Subtotal Yard Trimmings				
Other Recyclables:				
_____				
_____				
_____				
Subtotal Other Recyclables				
TOTAL (tons)				

2B. If you received data from survey respondents on Commingled Materials for commercial programs, use the following method to estimate the weight of each recyclable material that makes up the commingled category. Tons for each material should be entered separately into the corresponding category in the table in Part 2A. You will need to complete this exercise for each different type of commingled mix reported on the survey forms.

Step 1:

Based on the comments received on the survey forms, list the individual recyclable materials that make up Commingled Materials in Column 1 of the blank table titled Actual Data.

Step 2:

Using the national recovery data in the reference table below as default data, estimate the percentage of each material in the commingled mix, and then enter the percentages in Column 2 of the blank table. For example, if your mix consists of aluminum cans and steel cans, you would have a total of 2,670 tons of materials (1,120 + 1,550) according to the reference table. This is equal to a mix consisting of 42% aluminum cans and 58% steel cans by weight. To arrive at these percentages, divide the tons of each material by the total tons for the mix (e.g., 1,120/2,670 x 100 = 42%).

Step 3:

Apply the percentages calculated in Step 2 to the total commingled tons reported on the survey forms to arrive at a weight for each recyclable material. For example, if you determined in Step 2 that the commingled mix is 42% aluminum cans by weight according to the reference table, and the total for commingled materials reported on the survey forms is 10,000 tons, then the actual amount of aluminum cans is 4,200 tons (42% x 10,000).

Step 4:

Enter the tons from Step 3 in Column 3 of the blank table. Finally, add these amounts to the corresponding material totals in the table in Part 2A.

Reference Data:

Recovery of Products in Municipal Solid Waste, 1995 [1]

Product	Amount Recovered (in thousands of tons)
Aluminum Cans	990
Corrugated Boxes	18,480
Glass	3,140
Magazines	670
Newspaper	6,960
Office Paper	3,010
Plastic Bottles	490
Steel Cans	1,500
Telephone Directories	60
Third Class Mail	710

[1] U.S. EPA. 1997. Characterization of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC. (Please use the latest available version.)

2B.

Example:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)*
Aluminum Cans	19%	190 tons
Steel Cans	27%	270 tons
Glass Bottles	54%	540 tons

*Assume a total of 1,000 tons of Commingled Materials.

Actual Data:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)

3. Total Recycling Data

3A. If you used the double counting exercise, in the table below enter the circled data from Parts 1 and 2 for each residential and commercial recyclable material. If you did not use the double counting exercise, simply enter below the available data from Parts 1 and 2. Then, add those numbers to arrive at the total amount recycled for each material. Finally, add the totals in the last column to arrive at the total amount of MSW recycled in your state or locality.

3A. Recyclable Material	Source of Recyclable Material		
	Residential (tons) +	Commercial (tons) =	Total (tons)
Food Waste			
Glass Containers:			
Clear			
Amber			
Green			
Mixed Glass			
Other Glass			
Subtotal Glass			
Lead-Acid Batteries			
Metals:			
Aluminum Cans			
Tin/Steel Cans			
Major Appliances			
Other Ferrous			
Other Nonferrous			
Mixed Metals			
Subtotal Metals			
Paper:			
Old Magazines			
Old Newspaper			
Old Corrugated Containers			
Office Papers			
Telephone Directories			
Mixed Paper			
Other paper			
Subtotal Paper			
Plastic:			
PETE			
HDPE			
PVC			
LDPE			

3A. Recyclable Material	Source of Recyclable Material: Residential (tons) +	Commercial (tons) =	Total (tons)
Plastic (continued)			
PP			
PS			
Mixed Plastic			
Other Plastic			
Subtotal Plastic			
Textiles			
Tires			
Wood:			
Wood Packaging			
Other Wood			
Subtotal Wood			
Yard Trimmings:			
Brush and Branches			
Grass			
Leaves			
Tree Stumps			
Mixed Yard Trimmings			
Subtotal Yard Trimmings			
Other Recyclables:			
_____			
_____			
_____			
Subtotal Other Recyclables			
TOTAL (tons)			_____ **This is the numerator of the recycling rate equation (for Worksheet B3).**

B2 Determining Waste Generation

Use this worksheet to determine total municipal solid waste (MSW) generation for your state or locality. Waste generation is equal to the total amount of MSW recycled plus the total amount of MSW disposed of, in tons. It is the denominator of the recycling rate equation.

This worksheet can be used for compiling waste disposal data reported on the standard survey forms (Parts 1 and 2), or for estimating waste generation if actual disposal data are not available or reliable (Part 3).

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.
- State and local governments using Worksheet A to convert to the standard recycling rate (Part 3 only).

What You Will Need:

- Completed Survey Forms 4 (Collectors), 5 (Transfer Stations), and 6 (Disposal Facilities).
- Population data for the current measurement year (Parts 2 and 3 only).
- Your state or local waste characterization study, if available (Part 3 only).

How You Will Use The Information Obtained:

- The waste generation figure calculated in this worksheet will be used in conjunction with the recycling data obtained in Worksheet B1 to calculate a recycling rate in Worksheet B3.

Important Tips:

- ✔ Before you begin, group all the survey forms together according to number.
- ✔ If you received incomplete information on any part of a survey form, follow up with the respondent in order to complete the data.
- ✔ This worksheet contains three sections. Read the description of each to determine which are applicable to your particular situation. In most cases, only one or two of the sections will be need to be completed.
- ✔ Check to make sure that the data reported on the survey forms is in tons before you begin to complete this worksheet. If it is not in tons, use the standard volume-to-weight conversion factors to convert the data into tons.

Determining Waste Generation

I. Compiling Waste Disposal Data

Complete this section if you have current survey data on waste disposal.

1A. In-State Disposal

For each type of survey respondent (i.e., collectors, transfer stations, disposal facilities), total the amount of residential MSW from sources within your state or locality that remained within your area (e.g., not hauled to a transfer station or disposal facility outside your state or locality). This data can be found on Forms 4, 5, and 6, Part 2A, first column. If you used more than one type of survey form to collect data, be sure to not double count any data, i.e., MSW sent by a surveyed transfer station to a surveyed disposal facility. If you used only one type of survey form (e.g., Survey Form 5, Transfer Stations), simply fill out the corresponding column below.

Repeat the above procedure for commercial MSW.

MSW REMAINING INSIDE THE STATE OR LOCALITY	Survey Respondent			TOTAL (tons)
	Collectors	Transfer Stations	Disposal Facilities	
Residential (tons)				
Commercial (tons)				

1B. Exports

For each type of survey respondent, total the amount of residential MSW from sources within your state or locality that was exported from your area (e.g., hauled by a collector or transfer station to a disposal facility outside your state or locality). This data can be found on Forms 4 and 5, Part 2A, second column. Be sure to not double count any data, i.e., MSW sent by a surveyed collector to a surveyed transfer station.

Repeat the above procedure for commercial MSW.

MSW EXPORTS	Survey Respondent		TOTAL (tons)
	Collectors	Transfer Stations	
Residential (tons)			
Commercial (tons)			
TOTAL (tons)			

1C. Imports

For each type of survey respondent, total the amount of residential MSW from sources outside your state or locality that was imported into the area (e.g., hauled by a collector to a transfer station or disposal facility inside your state or locality). This data can be found on Forms 4, 5 and 6, Part 2B. Be sure to not double count any data, i.e., MSW sent by a surveyed collector to a surveyed disposal facility.

Repeat the above procedure for commercial MSW.

MSW IMPORTS	Survey Respondent		TOTAL (tons)
	Collectors	Transfer Stations	
Residential (tons)			
Commercial (tons)			
TOTAL (tons)			

1D. Total Residential MSW Disposed Of

_____ + _____ − _____ = _____

MSW Remaining Inside the State or Locality *(from 1A)* | MSW Exports *(from 1B)* | MSW Imports *(from 1C)* | **Total Residential MSW Disposed Of (tons)**

1E. Total Commercial MSW Disposed Of

_____ + _____ − _____ = _____

MSW Remaining Inside the State or Locality *(from 1A)* | MSW Exports *(from 1B)* | MSW Imports *(from 1C)* | **Total Commercial MSW Disposed Of (tons)**

1F. Total MSW Disposed Of

_____ + _____ = _____

Total Residential MSW *(from 1D)* | Total Commercial MSW *(from 1E)* | **Total MSW Disposed Of (tons)**

1G. Total MSW Generated

_____ + _____ = _____

Total MSW Disposed Of *(from 1F)* | Total MSW Recycled *(from Worksheet B1, Part 3)* | **Total MSW Generated (tons) This is the denominator of the recycling rate equation (for Worksheet B3).**

2. Extrapolating Waste Generation Data (optional)

Complete this section if you received less than a 100 percent response rate to your survey. In this section you will use the partial data received to extrapolate total MSW generation. In other words, it will allow you to calculate a total even though you have data from only a portion of your state or locality.

2A. Estimate the population represented by the data received in your latest survey:

_____
Estimated Population

2B. Complete Part 1 using the data received in your latest survey.

2C. Per Capita Waste Generation:

_____	÷	_____	=	_____
Total MSW Generated *(from 1G)*		Estimated Population *(from 2A)*		**Per Capita Waste Generation**

2D. Extrapolated MSW Generation:

_____	x	_____	=	_____
Per Capita Waste Generation *(from 2C)*		Current Measurement Year Total Population		**Extrapolated MSW Generation (tons) This is the denominator of the recycling rate equation (for Worksheet B3).**

3. Using Waste Characterization Data to Determine Waste Generation

Complete this section if you do not have the resources or authority to conduct annual surveys, or if you are not confident in the data generated by your latest survey. This section will allow you to estimate the total amount of MSW generated in your state or locality using either national default data or a waste characterization study, if available.

3A. If you have a state or local waste characterization study, use Worksheet A to determine if the scope of waste in your study is consistent with the scope of MSW used here. If inconsistencies exist, proceed to Part B to estimate MSW generation. Alternatively, you may complete Worksheet A to arrive at a recycling rate that has the same scope as the standard recycling rate. If inconsistencies do not exist, then calculate estimated waste generation using the following method:

1) **Per Capita Waste Generation:**

Total Annual MSW Generated *(from study)*	÷	Total Population *(year of study)*	=	**Per Capita Waste Generation**
_____		_____		_____

2) **Estimated Waste Generation:**

Per Capita Waste Generation	x	Current Measurement Year Total Population	=	**Estimated MSW Generation (tons) This is the denominator of the recycling rate equation. (for Worksheet B3).**
_____		_____		_____

3B. If you do not have a waste characterization study, or your study does not define MSW in the same way as the standard definition used here, calculate estimated waste generation using the following equation:

1) **Estimated Waste Generation:**

Current Measurement Year Total Population	x	**0.78 tons/person/year***	=	**Estimated Waste Generation (tons) This is the denominator of the recycling rate equation. (for Worksheet B3).**
_____				_____

*U.S. EPA. 1997. Characterization Study of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC.

WORKSHEET

B3 Calculating Your Municipal Solid Waste (MSW) Recycling Rate

Use this worksheet to determine your state or locality's MSW recycling rate for the current measurement year.

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place and are establishing a recycling rate for the first time.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.

What You Will Need:

- Total MSW recycled from Worksheet B1.
- Total MSW generated from Worksheet B2.

I. Calculating Your Municipal Solid Waste Recycling Rate

Calculate your state or local MSW recycling rate according to the following equation:

Total MSW Recycled *(from Worksheet B1, Part 3)*	÷	Total MSW Generated *(from Worksheet B2, Part 1G, 2D, 3A, or 3B)*	x 100 =	**Municipal Solid Waste Recycling Rate (%)**
_____		_____		_____

Resources

APPENDIX E

STATE ENVIRONMENTAL AGENCIES

ALABAMA

Alabama Department of Environmental Management
Land Division - Recycling Office
1751 Congressman Dickinson Drive
P.O. Box 301463
Montgomery, AL 36130-1463
334 270-5651

ALASKA

Alaska Department of Environmental Conservation
Pollution Prevention Office
3601 C Street, Suite 1334
Anchorage, AK 99503
907 269-7500

ARIZONA

Arizona Department of Environmental Quality
Solid Waste Unit
3033 North Central Avenue, Fifth Floor
Phoenix, AZ 85012
602 207-4123

ARKANSAS

Arkansas Department of Pollution Control and Ecology
Recycling Division
8101 National Drive
P.O. Box 8913
Little Rock, AR 72219-8913
501 682-0744

CALIFORNIA

California Integrated Waste Management Board
Waste Prevention and Education Division
Residential and Business Education Section/Waste Prevention Program Development Section
8800 Cal Center Drive
Sacramento, CA 95826
800 553-2962 (Hotline)
916 255-INFO (Information exchange)

COLORADO

Governor's Office of Energy Conservation
1675 Broadway, Suite 1300
Denver, CO 80202-4613
303 620-4292

CONNECTICUT

Connecticut Department of Environmental Protection
Waste Management Bureau
Office of Recycling and Source Reduction
79 Elm Street
Hartford, CT 06106-5127
860 424-3365

DELAWARE

Department of Natural Resources and Environmental Control
Division of Air and Waste Management
P.O. Box 455
Dover, DE 19903-0455
302 739-4764

DISTRICT OF COLUMBIA

Department of Public Works
Office of Recycling
65 K Street, NE., Lower Level
Washington, DC 20002
202 727-5856

FLORIDA

Florida Department of Environmental Protection
Division of Waste Management
Bureau of Solid and Hazardous Waste
Waste Reduction Section
2600 Blair Stone Road
Tallahassee, FL 32301
904 488-0300

GEORGIA

Department of Natural Resources
Pollution Prevention Assistance Division
7 Martin Luther King Jr. Drive, Suite 450
Atlanta, GA 30334
404 651-5124

HAWAII

Department of Health
Office of Solid Waste Management
919 Ala Moana Boulevard, Third Floor
Honolulu, HI 96814
808 586-4240

IDAHO

Department of Environmental Quality
1410 North Hilton
Boise, ID 83706
208 334-5860

ILLINOIS

Illinois Department of Commerce and Community Affairs
Office of Recycling and Waste Reduction
325 West Adams Street, Room 300
Springfield, IL 62704-1892
217 785-2800

INDIANA

Department of Environmental Management
Office of Pollution Prevention and Technical Assistance
Indiana Government Center North
100 North Senate Avenue
P.O. Box 6015
Indianapolis, IN 46206-6015
312 232-8172
800 451-6027 (Hotline)

IOWA

Department of Natural Resources
Waste Management Assistance Division
Waste Reduction Assistance Program (WRAP)
The Wallace Building
900 East Grand Avenue
Des Moines, IA 50319
515 281-8927

KANSAS

Department of Health and Environment
700 SW. Harrison Street, Suite 1300
Topeka, KS 66603
913 296-7483

KENTUCKY

Resources Management Branch
Division of Waste Management
Resource Conservation Section
14 Rilley Road
Frankfort, KY 40601
502 564-6716

LOUISIANA

Department of Environmental Quality
Solid Waste Recycling Section
P.O. Box 82178-2178
Baton Rouge, LA 70804
504 765-0249

MAINE
Maine Waste Management Agency
Office of State Planning
State House Station 154
Augusta, ME 04333
207 287-5300

MARYLAND
Department of the Environment
Division of Recycling
2500 Broening Highway
Baltimore, MD 21224
410 631-3315

MASSACHUSETTS
Department of Environmental Protection
Division of Solid Waste Management
1 Winter Street, Fourth Floor
Boston, MA 02108
617 556-1079
800 462-0444

MICHIGAN
Departments of Commerce and Natural Resources
Environmental Services Division
Office of Waste Reduction Services
P.O. Box 30004
Lansing, MI 48909-7504
517 373-3866
800 NO-2-WASTE (Hotline)

MINNESOTA
Office of Environmental Assistance
520 Lafayette Road North, Second Floor
St. Paul, MN 55155-4100
612 296-3417
800 657-3843 (Hotline)

MISSISSIPPI
Department of Environmental Quality
Office of Pollution Control
Waste Reduction/Waste Minimization Program
P.O. Box 10385
Jackson, MS 39289
601 961-5241

MISSOURI
Division of Environmental Quality
Solid Waste Management Program
P.O. Box 176
Jefferson City, MO 65102-0176
314 751-5401

MONTANA
Montana Department of Health and Environmental Sciences
Solid Waste Program
P.O. Box 200901
Helena, MT 59620-0901
406 444-1430

NEBRASKA
Department of Environmental Quality
Air and Waste Management Division
Integrated Waste Management Section
P.O. Box 98922
Lincoln, NE 68509-9822
402 471-4210

NEVADA
Nevada Division of Environmental Protection (NDEP)
Solid Waste Branch
333 West Nye Lane
Carson City, NV 89710
702 687-4670

NEW HAMPSHIRE

Governor's Recycling Program
2 ½ Beacon Street
Concord, NH 03301
603 271-1098

NEW JERSEY

Department of Environmental Protection and Energy
Division of Solid Waste Management
Office of Recycling and Planning
Bureau of Source Reduction and Market Development
840 Bear Tavern Road (CN414)
Trenton, NJ 08625-0414
609 984-3438

NEW MEXICO

New Mexico Environmental Department
Solid Waste Bureau
Harold Runnels Building
P.O. Box 26110
Santa Fe, NM 87503
505 827-0197

NEW YORK

Department of Environmental Conservation
Division of Solid and Hazardous Materials
Bureau of Waste Reduction and Recycling
50 Wolf Road, Room 228
Albany, NY 12233-4015
518 457-7337

NORTH CAROLINA

Environmental Health and Natural Resources
Office of Waste Reduction
3825 Barrett Drive
Raleigh, NC 27609
919 571-4100

NORTH DAKOTA

Division of Waste Management
North Dakota State Department of Health and Consolidated Laboratories
1200 Missouri Avenue
Bismarck, ND 58502-5520
701 328-5166

OHIO

Department of Natural Resources
Recycling and Litter Prevention Division
1889 Fountain Square Court, Building F2
Columbus, OH 43224
614 265-6376

Ohio Environmental Protection Agency
Division of Solid and Infectious Waste Management
Pollution Prevention
1800 WaterMark Drive
P.O. Box 163669
Columbus, OH 43216-3669
614 644-2802

OKLAHOMA

Department of Environmental Quality
Public Information and Education
100 NE. 10th Street
Oklahoma City, OK 73117-1212
405 271-7353

OREGON

Department of Environmental Quality
Waste Management and Cleanup Division
811 SW. Sixth Avenue
Portland, OR 97204
503 229-6046

PENNSYLVANIA

Department of Environmental Resources
Waste Minimization and Planning
Source Reduction Section
P.O. Box 8472
Harrisburg, PA 17105-8472
717 787-7382

RHODE ISLAND

Department of Environmental Management
Office of Environmental Coordination
83 Park Street, Third Floor
Providence, RI 02903
401 277-3434

SOUTH CAROLINA

South Carolina Department of Health and Environmental Control
Office of Solid Waste Reduction and Recycling
2600 Bull Street
Columbia, SC 29201
803 734-5000
800 768-7348 (Hotline)

SOUTH DAKOTA

Department of Environment and Natural Resources
Office of Waste Prevention and Recycling
523 East Capitol Avenue
Pierre, SD 57501
605 773-5559

TENNESSEE

Department of Environment and Conservation
Bureau of Resource Management
Division of Solid Waste Assistance
14th Floor, L & C Tower
401 Church Street
Nashville, TN 37243-0455
615 532-0072

TEXAS

Texas Natural Resource Conservation Commission (TNRCC)
P.O. Box 13087
Austin, TX 78711-3087
512 239-1000

UTAH

Department of Environmental Quality
Pollution Prevention Program
P.O. Box 144810
Salt Lake City, UT 84114-4810
801 536-4400

VERMONT

Department of Environmental Conservation
Pollution Prevention and Education Division
103 South Main Street
Waterbury, VT 05671-0402
802 241-3444

VIRGINIA

Department of Environmental Quality
Office of Litter Prevention and Recycling
P.O. Box 10009
Richmond, VA 23240-0009
804 762-4451

WASHINGTON

Department of Ecology
Solid Waste Services Program
P.O. Box 47600
Olympia, WA 98504-7600
360 407-6093
800 RECYCLE or 800 LITTERS

WEST VIRGINIA

Department of Conservation, Education, and Litter Control

Division of Natural Resources

1900 Kanawah Boulevard

East Charleston, WV 25305

304 558-3370

WISCONSIN

Department of Natural Resources SW/3

Bureau of Solid Waste and Hazardous Waste Management

P.O. Box 7921

Madison, WI 53707

608 266-0520

WYOMING

Department of Environmental Quality

Solid and Hazardous Waste Division

Herschler Building, Fourth Floor

122 West 25th Street

Cheyenne, WY 82002

307 777-7752

Sample Language for Freedom of Information Act Exemption

APPENDIX F

Excerpt From Florida Statute Section 403.7046, "Regulation of Recovered Materials"

(1) After January 1, 1994, any person who handles, purchases, receives, recovers, sells, or is an end use of recovered materials shall annually certify to the department on forms provided by the department. The department may by rule exempt from this requirement generators of recovered materials, persons who handle or sell recovered materials as an activity which is incidental to the normal primary business activities of that person, or persons who handle, purchase, receive, recover, sell, or are end users of recovered materials in small quantities as defined by the department. The department shall adopt rules for the certification of and reporting by such persons and shall establish criteria for revocation of such certification. Prior to the adoption of such rules, the department shall appoint a technical advisory committee of no more than nine persons, including at a minimum, representatives of the Florida Association of Counties, the Florida League of Cities, the Florida Recyclers Association, and the Florida Chapter of the National Solid Waste Management Association, to aid in the development of such rules. Such rules shall be designed to elicit, at a minimum, the amount and types of recovered materials handled by registrants, and the amount and disposal site, or name of person with whom such disposal was arranged, or any solid waste generated by such facility. Such rules may provide for the department to conduct periodic inspections. The department may charge a fee of up to $50 for each registration, which shall be deposited into the Solid Waste Management Trust Fund for implementation of the program.

(2) Information reported pursuant to the requirements of this section or any rule adopted pursuant to this section which, if disclosed, would reveal a trade secret, as defined in s. 812.081(1)(c), is confidential and exempt from the provisions of s. 119.07(1). This exemption is subject to the Open Government Sunset Review Act in accordance with s. 119.14. For reporting or information purposes, however, the department may provide this information in such form that the names of the persons reporting such information and the specific information reported is not revealed.

(3) Except as otherwise provided in this section or pursuant to a special act in effect on or before January 1, 1993, a local government may not require a commercial establishment that generates source-separated recovered materials to sell or otherwise convey its recovered materials to the local government or to a facility designated by the local government, nor may the local government restrict such a generator's right to sell or otherwise convey such recovered materials to any properly certified recovered materials dealer who has satisfied the requirements of this section. A local government may not enact any ordinance that prevents such a dealer from entering into a contract with a commercial establishment to purchase, collect, transport, process, or receive source-separated recovered materials.

(a) The local government may require that the recovered materials generated at the commercial establishment be source separated at the premises of the commercial establishment.

(b) Prior to engaging in business within the jurisdiction of the local government, a recovered materials dealer must provide the local government with a copy of the certification provided for this section. In addition, the local government may establish a registration process whereby a recovered materials dealer must register with the local government prior to engaging in business with the jurisdiction of the local government.

Sample Cover Letters

{Date}

{Name}

{Address}

Dear **{Private Recycling Hauler}**:

The {name of department/agency} would appreciate your assistance in calculating the official 199_ recycling rate. As you know, {name of state or locality} has set a recycling goal of {percentage} percent by 199_. To measure our progress toward achieving this goal, we are collecting data on the amount of municipal solid waste (MSW) recycled in the {state, city, or county}. In addition, these data will help us expand markets for recyclable materials, better allocate resources, make effective solid waste management decisions, and gauge our disposal capacity.

By completing the enclosed Recycling Measurement Survey Form, you will provide us with valuable information. This information will be combined with data from other collectors, processors, and end users of recyclable materials to calculate a recycling rate and to help us plan for the future of solid waste management in {name of state or locality}. Supplying these data to us also provides important benefits to you. By knowing the amount of recyclables collected in the {state, city, or county} we can determine where additional mills or processors might be needed to develop markets for specific materials. This could mean more business opportunities and better markets for you in the future.

To assist us in our recycling measurement efforts, please fill out the enclosed survey form and return it to us by {date of deadline}. Before completing the survey, please take time to read all of the instructions carefully. It is essential that you provide us with the most complete and accurate information available. To ensure confidentiality, please mark any sensitive or proprietary information as "confidential." Please understand that we will not release any confidential information used to calculate our recycling rate.

If you have any questions regarding the Recycling Measurement Survey Form, please contact {name of contact person} at {phone number}. This person is available to provide you with any technical assistance you may need and can also be reached at the following electronic mail address {address}. The results of this survey can be obtained by contacting {name of person} after {date}.

Measuring recycling in our {state, city, or county} is an important endeavor. We hope that you will fill out the survey form carefully and return it to us by the date above.

Thank you for your time and assistance.

Sincerely,

{Name of Recycling Measurement Official}

{Date}

{Name}

{Address}

Dear **{Name of County or City Recycling Coordinator}**:

The {name of department/agency} would appreciate your assistance in calculating the official 199_ recycling rate. As you know, {name of state or locality} has set a recycling goal of {percentage} percent by 199_. To measure our progress toward achieving this goal, we are collecting data on the amount of municipal solid waste (MSW) recycled in the {state, city, or county}. In addition, these data will help us expand markets for recyclable materials, better allocate resources, make effective solid waste management decisions, and gauge our disposal capacity.

By completing the enclosed Recycling Measurement Survey Form, you will provide us with valuable information. This information will be combined with data from other {cities or counties} to calculate a recycling rate and to help us plan for the future of solid waste management in {name of state or locality}. Supplying these data to us also provides important benefits to you. You can use these data to supplement your local solid waste planning efforts, public education and outreach, and local market development.

To assist us in our recycling measurement efforts, please fill out the enclosed survey form and return it to us by {date of deadline}. Before completing the survey, please take time to read all of the instructions carefully. It is essential that you provide us with the most complete and accurate information available.

If you have any questions regarding the Recycling Measurement Survey Form, please contact {name of contact person} at {phone number}. This person is available to provide you with any technical assistance you may need and can also be reached at the following electronic mail address {address}. In addition, we are conducting a training seminar on the reporting requirements on {date} at {location}. Additional information about the training session will be mailed to you shortly. Technical assistance materials including {name(s) of guidebook, documents, etc.} are also available. For more information about the recycling measurement program, contact {contact person} at the number above. The results of this survey can be obtained by contacting {name of person} after {date}.

Measuring recycling in our {state, city, or county} is an important endeavor. We hope that you will fill out the survey form carefully and return it to us by the date above.

Thank you for your time and assistance.

Sincerely,

{Name of Recycling Measurement Official}

{Date}

{Name}

{Address}

Dear **{Waste Disposal Facility}**:

The {name of department/agency} would appreciate your assistance in calculating the official 199_ recycling rate. As you know, {name of state or locality} has set a recycling goal of {percentage} percent by 199_. To measure our progress toward achieving this goal, we are collecting data on the amount of municipal solid waste (MSW) recycled and disposed of in the {state, city, or county}. In addition, these data will help us expand markets for recyclable materials, better allocate resources, make effective solid waste management decisions, and gauge our disposal capacity.

By completing the enclosed Waste Disposal Survey Form, you will provide us with valuable information. This information will be combined with data from other landfills, incinerators, waste-to-energy facilities, transfer stations, and waste haulers to determine the amount of waste generated in the area and calculate a recycling rate. Supplying these data to us voluntarily can prevent us from having to mandate reporting in the future.

To assist us in our waste disposal measurement efforts, please fill out the enclosed survey form and return it to us by {date of deadline}. Before completing the survey, please take time to read all of the instructions carefully. It is essential that you provide us with the most complete and accurate information available. To ensure confidentiality, please mark any sensitive or proprietary information as "confidential." Please understand that we will not release any confidential information used to calculate our recycling rate.

If you have any questions regarding the Waste Disposal Survey Form, please contact {name of contact person} at {phone number}. This person is available to provide you with any technical assistance you may need and can also be reached at the following electronic mail address {address}. The results of this survey can be obtained by contacting {name of person} after {date}.

Measuring recycling in our {state, city, or county} is an important endeavor. We hope that you will fill out the survey form carefully and return it to us by the date above.

Thank you for your time and assistance.

Sincerely,

{Name of Recycling Measurement Official}

Adjusting Waste Generation

APPENDIX H

Adjusting Waste Generation

Use this methodology if you have waste generation data from a survey conducted in a previous year, but do not have data from the current measurement year. You will adjust the previous data for changes in population and economic conditions. This methodology is based on a regression analysis that tested the predictive power of several variables on waste generation in California. Results showed that population, employment, and taxable transactions were the strongest predictors of waste generation. Please note that because the methodology was developed by the State of California using California data, this may affect its accuracy when used in other states. For more information about the methodology, please contact the California Integrated Waste Management Board at 916 255-2341.

You Will Need:

- ✔ Population data for both the current measurement and reference years (P)
- ✔ Employment data for both the current measurement and reference years (E)
- ✔ Taxable sales receipts for both the current measurement and reference years (TSR) (Your state's economic development office might be a source of county-specific data.)
- ✔ Consumer Price Index for the current measurement year (CPI)
- ✔ Residential waste generation tonnage for the reference year (R)
- ✔ Commercial waste generation tonnage for the reference year (C)

Definitions:

m = Current measurement year

ry = Reference year

Reference year = Year of the most recent survey

Adjusted taxable transactions (T) = Taxable sales receipts corrected for inflation

A. Use Worksheet A to determine if your scope of MSW is consistent with the definition used here. If there are inconsistencies, use Worksheet A to adjust your scope.

B. Adjusted Taxable Transactions (current measurement year):

$$\frac{\quad}{CPI_{ry}} \div \frac{\quad}{CPI_{m}} \times \frac{\quad}{TSR_{m}} = \frac{\quad}{\textbf{Adjusted Taxable Transactions (T) (current measurement year)}}$$

C. Commercial Adjustment Factor (CAF):

$$\left[\left(\frac{\_\_\_\_\_}{E_m} \div \frac{\_\_\_\_\_}{E_{ry}}\right) + \left(\frac{\_\_\_\_\_}{TSR_m} \div \frac{\_\_\_\_\_}{T_{ry}}\right)\right] \div 2 = \frac{\_\_\_\_\_}{\textbf{Commercial Adjustment Factor (CAF)}}$$

D. Residential Adjustment Factor (RAF):

$$\left[\left(\frac{\_\_\_\_\_}{P_m} \div \frac{\_\_\_\_\_}{P_{ry}}\right) + \frac{\_\_\_\_\_}{CAF_m}\right] \div 2 = \frac{\_\_\_\_\_}{\textbf{Residential Adjustment Factor (RAF)}}$$

E. Adjusted Waste Generation (current measurement year):

$$\left(\frac{\_\_\_\_\_}{R} \times \frac{\_\_\_\_\_}{RAF}\right) + \left(\frac{\_\_\_\_\_}{C} \times \frac{\_\_\_\_\_}{CAF}\right) =$$

Adjusted Waste Generation (current measurement year) (tons)
This is the denominator of the recycling rate equation. (for Worksheet B3).

A Converting to the Standard Recycling Rate

Use this worksheet to calculate a recycling rate based on the standard equation. The standard recycling rate incorporates standard definitions of municipal solid waste (MSW) and recycling in addition to the following universal equation:

$$\text{Municipal Solid Waste Recycling Rate (\%)} = \frac{\text{Total MSW Recycled}}{\text{Total MSW Generated (MSW Recycled + MSW Disposed Of)}} \times 100$$

This worksheet will help you subtract from your current recycling rate those waste management activities and waste materials that are outside the scope of the standard recycling rate. In addition, those waste materials and recycling activities not included in your current rate, but included in the standard rate and for which you have data, can be added using this worksheet.

How You Will Use The Information Obtained:

- After converting to the standard recycling rate, you will be able to make consistent comparisons of your recycling efforts and the efforts of others.

Who Should Use This Worksheet:

- State and local governments that currently have a recycling measurement system in place and have previously calculated a recycling rate.

What You Will Need:

- A list of the types of solid waste and recyclables included in your current recycling rate.
- Your definitions of the following terms:
  - Municipal Solid Waste
  - Recyclable materials (e.g., yard trimmings, tires, ferrous metal)
  - Recycling
- Standard definitions of the above terms from the Glossary (found on page 49 of the Guide).
- Scope of Materials Included in the Standard MSW Recycling Rate table (Table A, found on page 11 of the Guide).
- Scope of Activities Included in the Standard MSW Recycling Rate table (Table B, found on page 13 of the Guide).

Important Tips:

- ✔ In order to be consistent with the standard recycling rate, only solid waste defined as municipal solid waste in the attached Scope of MSW table can be included when calculating the amount of waste disposed of and recycled.
- ✔ Only MSW recycled according to the waste management activities outlined in the attached Scope of MSW Recycling table can be included when calculating the amount of waste recycled.

Converting to the Standard Recycling Rate

I. Calculating Waste Disposal

1A. Using the Scope of MSW table and the definition of MSW found in the Glossary, determine if there are any waste materials not included in your current recycling rate. Add those waste materials ***for which you have current disposal data*** and that are defined as MSW in the standard recycling rate. Enter the amount disposed of for these wastes below. Remember, add materials only if you already have current disposal data available.

ADDITIONAL MSW	AMOUNT DISPOSED OF (tons)
TOTAL ADDITIONAL MSW (tons)	

1B. Only MSW can be included in the standard recycling rate. The wastes listed in the table below are excluded from the definition of MSW in the standard recycling rate. Using your most recent data on waste disposal, fill in the annual amount disposed of for each excluded waste included in your current recycling rate. Refer to the Glossary and Scope of MSW table for further clarification of the terms used here. If you are unable to disaggregate these excluded wastes from your current data, use Worksheet B2, Part 3, to estimate the total amount of MSW generated.

1B. MATERIALS EXCLUDED FROM MSW	ANNUAL AMOUNT DISPOSED OF (tons)
Abatement Debris	
Agricultural Waste	
Asphalt	
Batteries From Aircraft, Military Vehicles, Boats, Heavy-Duty Trucks, and Tractors	
Combustion Ash	
Concrete	
Construction and Demolition Debris (C&D)	
Contaminated Soil	
Ferrous Metals From Transportation Equipment and C&D projects	
Food Processing Waste	
Glass From Transportation Equipment and C&D Projects	
Industrial Sludges	

1B. MATERIALS EXCLUDED FROM MSW	**ANNUAL AMOUNT DISPOSED OF (tons)**
Mining Waste	
Municipal Sludges	
Natural Disaster Debris	
Nonferrous Metals From Industrial or Construction Sources	
Oil and Gas Waste	
Plastics From Transportation Equipment	
Preconsumer Waste	
Used Oil	
Wood From C&D Activities	
TOTAL EXCLUDED WASTES (tons)	

1C. Total MSW Disposed Of

Total Waste Disposed Of (based on your most recent data)	+	Total Additional MSW *(from 1A)*	–	Total Excluded Wastes *(from 1B)*	=	**Total MSW Disposed Of (tons)**
_____		_____		_____		_____

2. Calculating Recycling

2A. Using the Scope of MSW Recycling table, determine if there are recycling activities that can be added to your current recycling rate. ***If you have current data for a recycling activity listed in the table,*** and it is not included in your current rate, specify the type and amount of material recycled below. Remember, add materials only if you already have current recycling data available.

2A. RECYCLABLE MATERIAL	**TOTAL (tons)**
Commingled Materials	
Food Waste	
Glass Containers:	
Clear	
Amber	
Green	
Mixed Glass	
Other Glass	
Subtotal Glass	
Lead-Acid Batteries	

2A. RECYCLABLE MATERIAL	TOTAL (tons)
Metals:	
Aluminum Cans	
Tin/Steel Cans	
Major Appliances	
Other Ferrous	
Other Nonferrous	
Mixed Metals	
Subtotal Metals	
Paper:	
Old Magazines	
Old Newspaper	
Old Corrugated Containers	
Office Papers	
Telephone Directories	
Mixed Paper	
Other Paper	
Subtotal Paper	
Plastic:	
PETE	
HDPE	
PVC	
LDPE	
PP	
PS	
Mixed Plastic	
Other Plastic	
Subtotal Plastic	
Textiles	
Tires	
Wood:	
Wood Packaging	
Other Wood	
Subtotal Wood	

2A. RECYCLABLE MATERIAL	TOTAL (tons)
Yard Trimmings:	
Brush and Branches	
Grass	
Leaves	
Tree Stumps	
Mixed Yard Trimmings	
Subtotal Yard Trimmings	
Other Recyclables:	
_____	
_____	
Subtotal Other Recyclables	
TOTAL (tons)	

2B. The waste management activities listed in the table below are excluded from the standard recycling rate. For each excluded activity included in your current recycling rate, fill in the annual amount of waste recovered in your state or locality according to that method. Use your most recent data. Refer to the Glossary and Scope of MSW Recycling table for further clarification of the terms used here.

ACTIVITIES EXCLUDED FROM THE STANDARD RECYCLING RATE	AMOUNT RECOVERED (TONS)
Alternative Daily Landfill Cover	
Backyard Composting of Yard Trimmings and Food Waste	
Combustion	
Grasscycling	
Mulching of Tree Stumps From C&D Debris	
Recycling of Materials Excluded From MSW (from 1B)	
Reuse (see Scope of MSW Recycling table)	
Source Reduction	
TOTAL (tons)	

2C. Total MSW Recycled

_____	+	_____	–	_____	=	_____	
Total Waste Recycled (based on your most recent data)		Total Additional Recycling *(from 2A)*		Total Excluded Amount *(from 2B)*		**Total MSW Recycled (tons)**	

3. Calculating a Standard Recycling Rate

3A. MSW Recycling Rate (%)

$$\left[\frac{\text{Total MSW Recycled } \textit{(from 2C)}}{\text{Total MSW Recycled } \textit{(from 2C)} + \text{Total MSW Disposed Of } \textit{(from 1C)}}\right] \times 100 = \frac{}{\textbf{MSW Recycling Rate (\%)}}$$

B1 Determining the Amount of Municipal Solid Waste (MSW) Recycled

Use this worksheet to compile recycling data reported on the survey forms. The total amount of MSW recycled in your state or locality is the numerator of the recycling rate equation.

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place and are calculating a recycling rate for the first time.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.

What You Will Need:

- Completed Survey Forms 1 (Collectors), 2 (Processors), and 3 (End Users).

How You Will Use The Information Obtained:

- Recycling data will be used in conjunction with the waste generation data obtained in Worksheet B2 to calculate a recycling rate in Worksheet B3.

Important Tips:

- ✔ Before you begin, group all the survey forms together according to number.
- ✔ If you received incomplete information on any part of a survey form, follow up with the respondent in order to complete the data.
- ✔ If you received data from more than one type of respondent (e.g., collectors and processors), use the tables in Parts 1 and 2 to:
  - ✔ Verify the data received from one source by cross-checking it with data received from another source.
  - ✔ Identify redundant data and instances of possible double counting.
- ✔ If you received data on Commingled Materials from respondents, use the procedure provided to estimate the weight of each component material.
- ✔ Check to make sure that the data reported on the survey forms is in tons before you begin to complete this worksheet. If it is not in tons, use the standard volume-to-weight conversion factors to convert the data into tons.

I. Residential Recycling Data

1A. For each recyclable material, total the data reported by each collector in the Residential column of Form 1, Part 2A. Do the same for the data reported by processors (Form 2, Part 2A) and then end users (Form 3, Part 2A).

To avoid double counting of data, for those materials where you received data from more than one type of survey respondent, circle the data that you believe is the most complete and accurate. Draw a line through the other data (you will not use it again). For example, if you received data on residential glass recycling from both collectors and processors, circle the data that you believe is the least likely to result in double counting. Remember to circle only one survey respondent for each material. If you surveyed only one type of respondent, simply fill out the corresponding column below.

1A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Food Waste				
Glass Containers:				
Clear				
Amber				
Green				
Mixed Glass				
Other Glass				
Subtotal Glass				
Lead-Acid Batteries				
Metals:				
Aluminum Cans				
Tin/Steel Cans				
Major Appliances				
Other Ferrous				
Other Nonferrous				
Mixed Metals				
Subtotal Metals				
Paper:				
Old Magazines				
Old Newspaper				
Old Corrugated Containers				
Office Papers				
Telephone Directories				
Mixed Paper				
Other Paper				
Subtotal Paper				

1A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Plastic:				
PETE				
HDPE				
PVC				
LDPE				
PP				
PS				
Mixed Plastic				
Other Plastic				
Subtotal Plastic				
Textiles				
Tires				
Wood:				
Wood Packaging				
Other Wood				
Subtotal Wood				
Yard Trimmings:				
Brush and Branches				
Grass				
Leaves				
Tree Stumps				
Mixed Yard Trimmings				
Subtotal Yard Trimmings				
Other Recyclables:				
_____				
_____				
_____				
Subtotal Other Recyclables				
TOTAL (tons)				

1B. If you received data from survey respondents on Commingled Materials for residential programs, use the following method to estimate the weight of each recyclable material that makes up the commingled category. Tons for each material should be entered separately into the corresponding category in the table in Part 1A. You will need to complete this exercise for each different type of commingled mix reported on the survey forms.

Step 1:

Based on the comments received on the survey forms, list the individual recyclable materials that make up Commingled Materials in Column 1 of the blank table titled Actual Data.

Step 2:

Using the national recovery data in the reference table below as default data, estimate the percentage of each material in the commingled mix, and then enter the percentages in Column 2 of the blank table. For example, if your mix consists of aluminum cans and steel cans, you would have a total of 2,670 tons of materials (1,120 + 1,550) according to the reference table. This is equal to a mix consisting of 42% aluminum cans and 58% steel cans by weight. To arrive at these percentages, divide the tons of each material by the total tons for the mix (e.g., 1,120/2,670 x 100 = 42%).

Step 3:

Apply the percentages calculated in Step 2 to the total commingled tons reported on the survey forms to arrive at a weight for each recyclable material. For example, if you determined in Step 2 that the commingled mix is 42% aluminum cans by weight according to the reference table, and the total for commingled materials reported on the survey forms is 10,000 tons, then the actual amount of aluminum cans is 4,200 tons (42% x 10,000).

Step 4:

Enter the tons from Step 3 in Column 3 of the blank table. Finally, add these amounts to the corresponding material totals in the table in Part 1A.

Reference Data:

Recovery of Products in Municipal Solid Waste, 1995 [1]

Product	Amount Recovered (in thousands of tons)
Aluminum Cans	990
Corrugated Boxes	18,480
Glass	3,140
Magazines	670
Newspaper	6,960
Office Paper	3,010
Plastic Bottles	490
Steel Cans	1,500
Telephone Directories	60
Third Class Mail	710

[1] U.S. EPA. 1997. Characterization of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC. (Please use the latest available version.)

1B.

Example:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)*
Aluminum Cans	19%	190 tons
Steel Cans	27%	270 tons
Glass Bottles	54%	540 tons

*Assume a total of 1,000 tons of Commingled Materials.

Actual Data:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)

2. Commercial Recycling Data

2A. For each recyclable material, total the data reported by each collector in the Commercial column of Form 1, Part 2A. Do the same for the data reported by processors (Form 2, Part 2A) and then end users (Form 3, Part 2A).

To avoid double counting, for those materials where you received data from more than one type of survey respondent, circle the data that you believe is the most complete and accurate. Draw a line through the other data. If you surveyed only one type of respondent, simply fill out the corresponding column below.

2A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Food Waste				
Glass Containers:				
Clear				
Amber				
Green				
Mixed Glass				
Other Glass				
Subtotal Glass				
Lead-Acid Batteries				
Metals:				
Aluminum Cans				
Tin/Steel Cans				
Major Appliances				
Other Ferrous				
Other Nonferrous				
Mixed Metals				
Subtotal Metals				
Paper:				
Old Magazines				
Old Newspaper				
Old Corrugated Containers				
Office Papers				
Telephone Directories				
Mixed Paper				
Other Paper				
Subtotal Paper				

2A. RECYCLABLE MATERIAL	Survey Respondent			TOTAL (tons)
	Collectors (tons)	Processors (tons)	End Users (tons)	
Plastic:				
PETE				
HDPE				
PVC				
LDPE				
PP				
PS				
Mixed Plastic				
Other Plastic				
Subtotal Plastic				
Textiles				
Tires				
Wood:				
Wood Packaging				
Other Wood				
Subtotal Wood				
Yard Trimmings:				
Brush and Branches				
Grass				
Leaves				
Tree Stumps				
Mixed Yard Trimmings				
Subtotal Yard Trimmings				
Other Recyclables:				
_____				
_____				
_____				
Subtotal Other Recyclables				
TOTAL (tons)				

2B. If you received data from survey respondents on Commingled Materials for commercial programs, use the following method to estimate the weight of each recyclable material that makes up the commingled category. Tons for each material should be entered separately into the corresponding category in the table in Part 2A. You will need to complete this exercise for each different type of commingled mix reported on the survey forms.

Step 1:

Based on the comments received on the survey forms, list the individual recyclable materials that make up Commingled Materials in Column 1 of the blank table titled Actual Data.

Step 2:

Using the national recovery data in the reference table below as default data, estimate the percentage of each material in the commingled mix, and then enter the percentages in Column 2 of the blank table. For example, if your mix consists of aluminum cans and steel cans, you would have a total of 2,670 tons of materials (1,120 + 1,550) according to the reference table. This is equal to a mix consisting of 42% aluminum cans and 58% steel cans by weight. To arrive at these percentages, divide the tons of each material by the total tons for the mix (e.g., 1,120/2,670 x 100 = 42%).

Step 3:

Apply the percentages calculated in Step 2 to the total commingled tons reported on the survey forms to arrive at a weight for each recyclable material. For example, if you determined in Step 2 that the commingled mix is 42% aluminum cans by weight according to the reference table, and the total for commingled materials reported on the survey forms is 10,000 tons, then the actual amount of aluminum cans is 4,200 tons (42% x 10,000).

Step 4:

Enter the tons from Step 3 in Column 3 of the blank table. Finally, add these amounts to the corresponding material totals in the table in Part 2A.

Reference Data:

Recovery of Products in Municipal Solid Waste, 1995 [1]

Product	Amount Recovered (in thousands of tons)
Aluminum Cans	990
Corrugated Boxes	18,480
Glass	3,140
Magazines	670
Newspaper	6,960
Office Paper	3,010
Plastic Bottles	490
Steel Cans	1,500
Telephone Directories	60
Third Class Mail	710

[1] U.S. EPA. 1997. Characterization of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC. (Please use the latest available version.)

2B.

Example:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)*
Aluminum Cans	19%	190 tons
Steel Cans	27%	270 tons
Glass Bottles	54%	540 tons

*Assume a total of 1,000 tons of Commingled Materials.

Actual Data:

Recyclable Material (from Step 1)	Percentage (from Step 2)	Tons (from Step 3)

3. Total Recycling Data

3A. If you used the double counting exercise, in the table below enter the circled data from Parts 1 and 2 for each residential and commercial recyclable material. If you did not use the double counting exercise, simply enter below the available data from Parts 1 and 2. Then, add those numbers to arrive at the total amount recycled for each material. Finally, add the totals in the last column to arrive at the total amount of MSW recycled in your state or locality.

3A. Recyclable Material	Source of Recyclable Material		
	Residential (tons) +	Commercial (tons) =	Total (tons)
Food Waste			
Glass Containers:			
Clear			
Amber			
Green			
Mixed Glass			
Other Glass			
Subtotal Glass			
Lead-Acid Batteries			
Metals:			
Aluminum Cans			
Tin/Steel Cans			
Major Appliances			
Other Ferrous			
Other Nonferrous			
Mixed Metals			
Subtotal Metals			
Paper:			
Old Magazines			
Old Newspaper			
Old Corrugated Containers			
Office Papers			
Telephone Directories			
Mixed Paper			
Other paper			
Subtotal Paper			
Plastic:			
PETE			
HDPE			
PVC			
LDPE			

3A. Recyclable Material	Source of Recyclable Material: Residential (tons) +	Commercial (tons) =	Total (tons)
Plastic (continued)			
PP			
PS			
Mixed Plastic			
Other Plastic			
Subtotal Plastic			
Textiles			
Tires			
Wood:			
Wood Packaging			
Other Wood			
Subtotal Wood			
Yard Trimmings:			
Brush and Branches			
Grass			
Leaves			
Tree Stumps			
Mixed Yard Trimmings			
Subtotal Yard Trimmings			
Other Recyclables:			
_____			
_____			
_____			
Subtotal Other Recyclables			
TOTAL (tons)			_____ **This is the numerator of the recycling rate equation (for Worksheet B3).**

B2 Determining Waste Generation

Use this worksheet to determine total municipal solid waste (MSW) generation for your state or locality. Waste generation is equal to the total amount of MSW recycled plus the total amount of MSW disposed of, in tons. It is the denominator of the recycling rate equation.

This worksheet can be used for compiling waste disposal data reported on the standard survey forms (Parts 1 and 2), or for estimating waste generation if actual disposal data are not available or reliable (Part 3).

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.
- State and local governments using Worksheet A to convert to the standard recycling rate (Part 3 only).

What You Will Need:

- Completed Survey Forms 4 (Collectors), 5 (Transfer Stations), and 6 (Disposal Facilities).
- Population data for the current measurement year (Parts 2 and 3 only).
- Your state or local waste characterization study, if available (Part 3 only).

How You Will Use The Information Obtained:

- The waste generation figure calculated in this worksheet will be used in conjunction with the recycling data obtained in Worksheet B1 to calculate a recycling rate in Worksheet B3.

Important Tips:

- ✔ Before you begin, group all the survey forms together according to number.
- ✔ If you received incomplete information on any part of a survey form, follow up with the respondent in order to complete the data.
- ✔ This worksheet contains three sections. Read the description of each to determine which are applicable to your particular situation. In most cases, only one or two of the sections will be need to be completed.
- ✔ Check to make sure that the data reported on the survey forms is in tons before you begin to complete this worksheet. If it is not in tons, use the standard volume-to-weight conversion factors to convert the data into tons.

Determining Waste Generation

I. Compiling Waste Disposal Data

Complete this section if you have current survey data on waste disposal.

1A. In-State Disposal

For each type of survey respondent (i.e., collectors, transfer stations, disposal facilities), total the amount of residential MSW from sources within your state or locality that remained within your area (e.g., not hauled to a transfer station or disposal facility outside your state or locality). This data can be found on Forms 4, 5, and 6, Part 2A, first column. If you used more than one type of survey form to collect data, be sure to not double count any data, i.e., MSW sent by a surveyed transfer station to a surveyed disposal facility. If you used only one type of survey form (e.g., Survey Form 5, Transfer Stations), simply fill out the corresponding column below.

Repeat the above procedure for commercial MSW.

MSW REMAINING INSIDE THE STATE OR LOCALITY	Survey Respondent			TOTAL (tons)
	Collectors	Transfer Stations	Disposal Facilities	
Residential (tons)				
Commercial (tons)				

1B. Exports

For each type of survey respondent, total the amount of residential MSW from sources within your state or locality that was exported from your area (e.g., hauled by a collector or transfer station to a disposal facility outside your state or locality). This data can be found on Forms 4 and 5, Part 2A, second column. Be sure to not double count any data, i.e., MSW sent by a surveyed collector to a surveyed transfer station.

Repeat the above procedure for commercial MSW.

MSW EXPORTS	Survey Respondent		TOTAL (tons)
	Collectors	Transfer Stations	
Residential (tons)			
Commercial (tons)			
TOTAL (tons)			

1C. Imports

For each type of survey respondent, total the amount of residential MSW from sources outside your state or locality that was imported into the area (e.g., hauled by a collector to a transfer station or disposal facility inside your state or locality). This data can be found on Forms 4, 5 and 6, Part 2B. Be sure to not double count any data, i.e., MSW sent by a surveyed collector to a surveyed disposal facility.

Repeat the above procedure for commercial MSW.

MSW IMPORTS	Survey Respondent		TOTAL (tons)
	Collectors	Transfer Stations	
Residential (tons)			
Commercial (tons)			
TOTAL (tons)			

1D. Total Residential MSW Disposed Of

_____ + _____ − _____ = _____

MSW Remaining Inside the State or Locality *(from 1A)* | MSW Exports *(from 1B)* | MSW Imports *(from 1C)* | **Total Residential MSW Disposed Of (tons)**

1E. Total Commercial MSW Disposed Of

_____ + _____ − _____ = _____

MSW Remaining Inside the State or Locality *(from 1A)* | MSW Exports *(from 1B)* | MSW Imports *(from 1C)* | **Total Commercial MSW Disposed Of (tons)**

1F. Total MSW Disposed Of

_____ + _____ = _____

Total Residential MSW *(from 1D)* | Total Commercial MSW *(from 1E)* | **Total MSW Disposed Of (tons)**

1G. Total MSW Generated

_____ + _____ = _____

Total MSW Disposed Of *(from 1F)* | Total MSW Recycled *(from Worksheet B1, Part 3)* | **Total MSW Generated (tons) This is the denominator of the recycling rate equation (for Worksheet B3).**

2. Extrapolating Waste Generation Data (optional)

Complete this section if you received less than a 100 percent response rate to your survey. In this section you will use the partial data received to extrapolate total MSW generation. In other words, it will allow you to calculate a total even though you have data from only a portion of your state or locality.

2A. Estimate the population represented by the data received in your latest survey:

_____
Estimated Population

2B. Complete Part 1 using the data received in your latest survey.

2C. Per Capita Waste Generation:

_____	÷	_____	=	_____
Total MSW Generated *(from 1G)*		Estimated Population *(from 2A)*		**Per Capita Waste Generation**

2D. Extrapolated MSW Generation:

_____	x	_____	=	_____
Per Capita Waste Generation *(from 2C)*		Current Measurement Year Total Population		**Extrapolated MSW Generation (tons) This is the denominator of the recycling rate equation (for Worksheet B3).**

3. Using Waste Characterization Data to Determine Waste Generation

Complete this section if you do not have the resources or authority to conduct annual surveys, or if you are not confident in the data generated by your latest survey. This section will allow you to estimate the total amount of MSW generated in your state or locality using either national default data or a waste characterization study, if available.

3A. If you have a state or local waste characterization study, use Worksheet A to determine if the scope of waste in your study is consistent with the scope of MSW used here. If inconsistencies exist, proceed to Part B to estimate MSW generation. Alternatively, you may complete Worksheet A to arrive at a recycling rate that has the same scope as the standard recycling rate. If inconsistencies do not exist, then calculate estimated waste generation using the following method:

1) **Per Capita Waste Generation:**

Total Annual MSW Generated *(from study)*	÷	Total Population *(year of study)*	=	**Per Capita Waste Generation**
_____		_____		_____

2) **Estimated Waste Generation:**

Per Capita Waste Generation	x	Current Measurement Year Total Population	=	**Estimated MSW Generation (tons) This is the denominator of the recycling rate equation. (for Worksheet B3).**
_____		_____		_____

3B. If you do not have a waste characterization study, or your study does not define MSW in the same way as the standard definition used here, calculate estimated waste generation using the following equation:

1) **Estimated Waste Generation:**

Current Measurement Year Total Population	x	**0.78 tons/person/year***	=	**Estimated Waste Generation (tons) This is the denominator of the recycling rate equation. (for Worksheet B3).**
_____				_____

*U.S. EPA. 1997. Characterization Study of Municipal Solid Waste in the United States: 1996 Update. EPA530-R-97-015. Washington, DC.

WORKSHEET

B3 Calculating Your Municipal Solid Waste (MSW) Recycling Rate

Use this worksheet to determine your state or locality's MSW recycling rate for the current measurement year.

Who Should Use This Worksheet:

- State and local governments that do not currently have a recycling measurement system in place and are establishing a recycling rate for the first time.
- State and local governments that are redesigning their recycling measurement system according to the standard methodology.

What You Will Need:

- Total MSW recycled from Worksheet B1.
- Total MSW generated from Worksheet B2.

I. Calculating Your Municipal Solid Waste Recycling Rate

Calculate your state or local MSW recycling rate according to the following equation:

Total MSW Recycled *(from Worksheet B1, Part 3)*	÷	Total MSW Generated *(from Worksheet B2, Part 1G, 2D, 3A, or 3B)*	x 100 =	**Municipal Solid Waste Recycling Rate (%)**
_____		_____		_____

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