Chapter 2. Developing Solid Waste Management Plans

Solid waste management plans offer a host of benefits for tribes and Alaskan Native villages. Through the preparation of these plans, you can assess your current and future waste management needs, set priorities, and allocate resources accordingly. Working through these issues can help you ensure your waste management system offers the highest level of protection to the health of tribal members and the natural environment. This chapter explains the purpose of solid waste management plans and the steps involved in developing these plans. It also includes references to solid waste management plans that tribes have already developed and are successfully implementing. Throughout this chapter, several publications are cited or referenced. For a complete listing of these documents and specific ordering information, refer to the Resources section at the end of this chapter.

> "Solid waste management is an evolving program in which planners try one strategy, and, if they are unsuccessful, change and try another."
>
> ~Laura Weber,
> Director of Solid Waste Management,
> St. Regis Mohawk Tribe

What Is a Solid Waste Management Plan?

A solid waste management plan is simply a document developed by a tribe or Alaskan Native village that outlines how the tribe or Native village will reduce, manage, and dispose of its solid waste. A solid waste management plan will assist and guide your tribe or village in developing and implementing its solid waste management program by establishing what actions need to be taken and setting the criteria for decision-making.

A basic solid waste management plan typically includes:

- A profile of the tribal community.
- The goals and objectives of the plan.
- An overview of the existing solid waste management program.
- Solid waste management alternatives, along with a discussion of the issues and uncertainties associated with each alternative.
- The selected alternative, implementation measures, and potential funding sources.

- Any solid waste codes that need to be developed.

Reasons To Develop a Solid Waste Management Plan

Planning is the first step in designing or improving a solid waste management system. A solid waste management plan will help your tribe take institutional, social, financial, economic, technical, and environmental factors into consideration as it manages its waste stream.

A solid waste management plan is a practical document that can help guide your community's solid waste management efforts. It can help you:

- Define and understand current waste management practices and the system in place.
- Identify problems and deficiencies with the current system.
- Identify opportunities for improvement in the current system.
- Set priorities for action to address problems and affect improvement.
- Measure progress toward implementing actions.
- Identify the resources needed and develop budgets and schedules.
- Revisit and modify priorities as the plan develops.

A solid waste management plan also can support proposals for solid waste management grants. Government agencies that provide financial assistance to tribal communities for solid waste management place a high priority on good planning to support a grant proposal. Agencies involved in funding tribal solid waste management projects often prefer that a tribe complete a solid waste management plan as a prerequisite for grant applications related to solid waste handling facilities or closing open dumps. In addition, tribes can ask for funding for a project that is a step toward solving, but does not completely solve, a solid waste problem. For example, an agency might be more likely to fund clean up and closure of an open dump site if the tribe offers a plan addressing the waste currently being generated, such as taking waste off site to an approved facility. See Chapter 7 for more information on grants and other funding sources.

Determining the Scope of the Solid Waste Management Plan

Several factors help determine the scope of a solid waste management plan, including available funding and technical expertise. You might not have the resources on hand to develop a comprehensive plan initially, but starting a plan is still useful. Solid waste management plans are living documents that can be revisited and revised.

Your initial plan can describe existing waste management practices, identify existing system limitations and opportunities for improvement, and delineate a plan of action to address these limitations and make improvements. If it is well thought out and effectively describes your tribe's priorities, goals, and plans, this initial plan will be sufficient to support your requests for funding future activities.

The Hannahville Indian Community in northern Michigan prepared an initial plan presenting basic information about the tribe and its solid waste needs, including a description of the reservation's location and geography, existing conditions, a brief waste stream analysis, an evaluation of the tribal solid waste management program, and a 3-year action plan. The Washington-based Spokane Tribe of Indians' solid waste management plan also presents basic information and includes details on regulatory requirements and landfill closure.

Figure 1 illustrates all of the steps in the comprehensive solid waste management planning process, from planning to implementation. This diagram can help you see where you are in the process and determine the path you need to take.

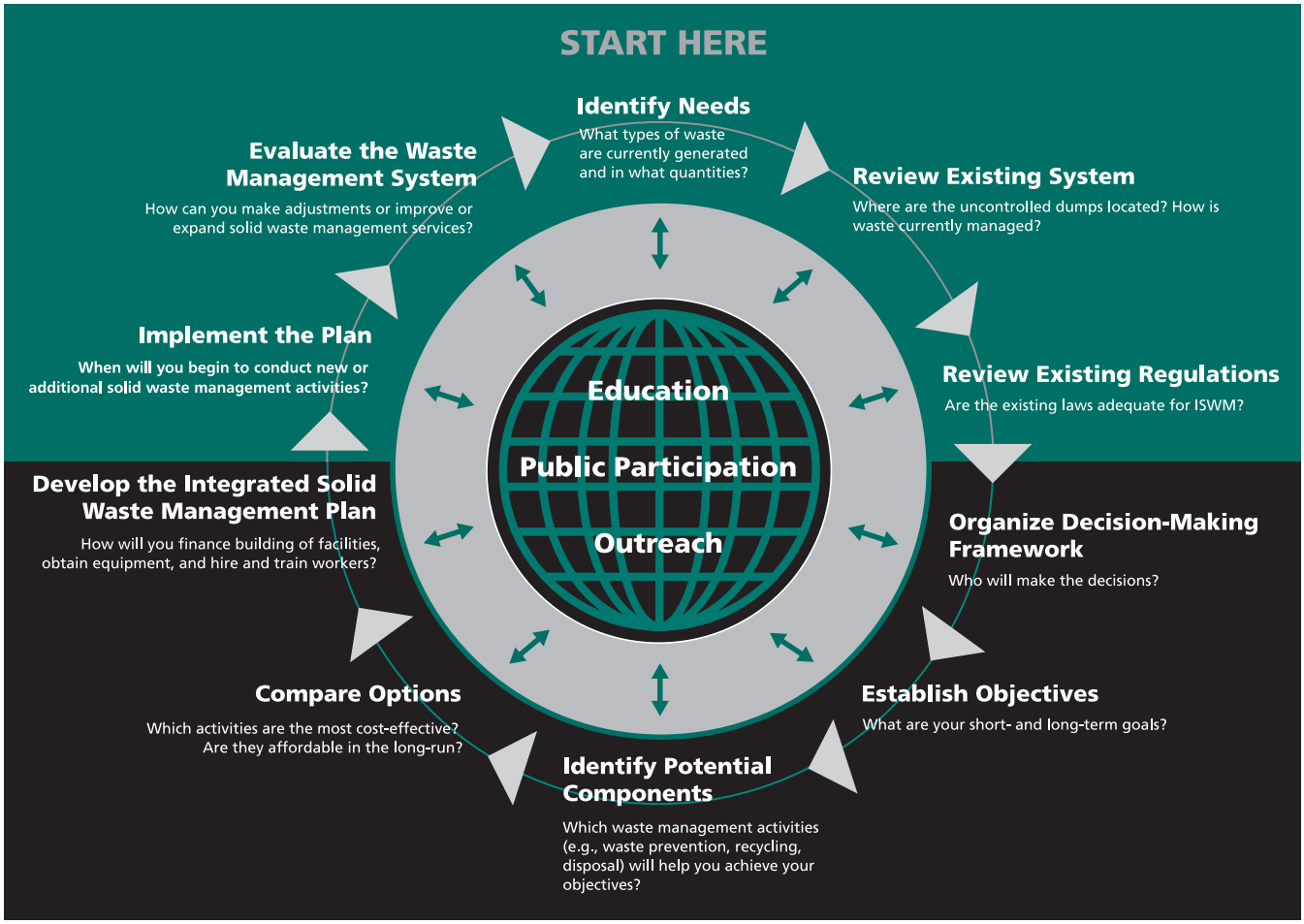
Developing Long-Term and Short-Term Goals

Solid waste management is a complex puzzle with many pieces, and it is easy to get sidetracked in your planning process. Developing goals will help guide your solid waste management planning and keep you focused on your priorities. Goals also can help you set targets by which your tribe can measure progress.

A good way to determine your goals is to develop a list of your tribe's values and what you want to accomplish. Look for problems that require solutions, and actively solicit input from the tribe, including tribal members. Typical considerations related to solid waste management are:

- Protecting tribal members' health and safety.
- Protecting the natural environment.
- Complying with federal and tribal laws.
- Protecting and conserving natural and cultural tribal resources.
- Contributing to the economic development of the tribe.

Figure 1. Comprehensive Integrated Solid Waste Management Planning Process



For each problem or proposed improvement you identify, develop a goal statement. For example, if the community has a problem with uncontrolled open dumping that is impacting the natural environment, a typical goal statement could be: Control open dumping as necessary to protect the environment and tribal resources. One action related to this goal could be developing and enforcing regulations that prohibit open dumping. The tribe would measure success by how much open dumping decreases.

The Gila River Indian Community in Arizona identified illegal open dumping as a goal to address. The community added a provision about illegal dumping to its Solid Waste Management Ordinance and held a workshop for tribal officials to discuss how to enforce the provision and delegate enforcement responsibility. The community also maps dump sites and categorizes them into three levels of risk so it can focus its limited resources on sites that pose the most severe health threats. The tribe measures its success by the reduction in the number of illegal dump sites in the community.

Key Decisions To Be Made on Basis of Plan

The solid waste management plan will provide information and guidance you need to make critical waste management decisions, such as whether you need a transfer station for exporting solid waste or need to construct a landfill on your reservation. The plan also can help your tribe focus on solid waste management enhancements, including waste prevention, materials reuse, recycling, and household hazardous waste management. Key decisions your tribe can address in the planning process include:

- How important is waste reduction, as a priority, compared with other solid waste management priorities?
- What opportunities exist for waste reduction?
- Which materials can be recycled?
- What type of waste and recyclables collection system can the tribe use?
- What type of disposal system can the tribe use?
- What will the present/future costs of the waste management program be?
- What resources does the tribe need to implement its solid waste management plan?
- What resources are available to the tribe?

Getting Started

Before your tribe starts drafting its solid waste management plan, you should consider a few key parameters that will provide a framework around which planning can take place. These include:

- Defining the planning area.
- Identifying the regulatory entities within the planning area.
- Establishing planning periods.
- Developing a community education and outreach plan to solicit public input.

Defining the Planning Area

A natural planning area for tribal communities or nations is defined by the reservation boundary. Some tribes will have a contiguous boundary, while other tribes will have more of a "checkerboard" boundary, whereby some areas of the reservation are not directly connected to other areas. At minimum, the planning area should reflect the extent of the area serviced by the current solid waste management program.

Identifying the Regulatory Entities Within the Planning Area

Regulatory entities will include tribal environmental programs and the other tribal programs that handle solid waste. Include not only the entities actively managing your solid waste, but also departments that might be able to contribute resources, such as the road department for construction equipment, and those that can assist with regulatory development and implementation. Also consider community, county, state, and federal agencies. Tribes might fall under more than one state regulatory entity. Look for opportunities to pool resources and share information and costs.

Establishing Planning Periods

Determine the time period your plan will cover. Typically, a solid waste management plan will cover 20 years, with 5-year review intervals. Longer terms may be needed to site and construct new facilities. Siting, designing, permitting, and constructing a new landfill may take 10 years, while it may take 3 years to design and construct a recycling facility. Regardless of the planning period, the tribe should build a regular review interval into the plan. Review periods let planners incorporate new regulations, changes in waste generation rates, or experience gained from operating the solid waste management program.

Developing a Community Education and Outreach Plan To Solicit Public Input

The backbone of waste management planning is public involvement, participation, and cooperation. The planner can compile data, estimate costs, and develop lists of potential sites and solid waste management options; however, the choices and positive changes must ultimately come from within the tribal community. Tribal education and outreach is a continuous process that includes a variety of activities, such as distributing newsletters, sponsoring open houses, mailing fact sheets, conducting community surveys, and distributing information through advisory groups and committees, public meetings, interviews, and workshops. For more information on developing an education and outreach campaign, refer to Chapter 6.

Steps in Developing a Solid Waste Management Plan

Solid waste management planning is specific to each tribe. The lack of technical or financial resources needed to develop a solid waste management plan can be a drawback for many tribes. Available resources can vary greatly from one tribe to another—every tribe comes into the planning process at a different place. Some tribes have access to landfills but are considering implementing source reduction and recycling programs to reduce disposal costs. Others need to close open dumps, which often requires implementing new waste management practices such as finding an appropriate facility for discarding waste before the dump can be closed.

The following steps outline the general process required to develop your solid waste management plan. As you go through this process, remember to stay focused on your goals. You might wish to revisit and modify your goals as you develop a better understanding of your situation.

Step 1: Develop a Profile of the Planning Area.

Compile information on the population, number of households, and estimated growth rate of your tribe. This can include information on any planned economic development. The tribe can use this information to estimate the present and future waste stream. Information on climate, geology, and natural resources also is important to have when you

are siting waste handling facilities. Identifying transportation routes, distances to potential recycling markets, distance to solid waste (Subtitle D) landfills and other disposal sites, and infrastructure needs will help you when you are developing cost estimates for waste management activities. The Hannahville Indian Reservation in northern Michigan, for example, is composed of 13 separate parcels of land, so its plan identifies the location of the parcels and their proximity to the nearest highway and landfill.

Step 2: Define the Solid Waste Generators Within the Planning Area.

Examine all of the residential, commercial, and municipal solid waste (MSW) generators in your planning area (e.g., homes, tribal government buildings, schools, restaurants, casinos, health care facilities). Also, determine whether you will have to handle solid waste from illegal dumping sites. The St. Regis Mohawk Tribe in New York identified 100 businesses in the community. Time constraints limited the number of waste audits the tribe could conduct, so the tribe took a representative approach—classifying businesses into different categories and selecting 10 percent of the businesses in each category for a waste audit.

Step 3: Identify Existing Waste Management Practices Within the Planning Area.

Where is waste going now? Are individuals or community organizations reusing or recycling products or materials? Identify any significant amounts of waste entering and leaving the reservation. Don't forget to include waste left from illegal dumping or litter. Many tribal members use burn barrels and backyard dumps for waste disposal; your community outreach program can help you identify this portion of your waste stream.

Step 4: Conduct a Waste Assessment/Waste Audit.

Characterizing the solid waste requiring management in your tribal community is the backbone of the whole planning process. The St. Regis Mohawk Tribe in New York used volume-based estimates to determine the waste generated by the residential and commercial sectors. Using information from both the waste collectors and generators, along with visual inspections of waste materials, the tribe quantified the waste composition. Your tribe might need to determine the quantity and composition of your waste to evaluate your options and estimate their costs. Quantity information can include both the weight and volume of your waste, and a composition analysis can tell you what products and materials make up your waste stream. If incineration is an option, you also will need to estimate the energy content of your waste stream to ensure you are generating sufficient waste for effective burning. Information on your waste is collected through a process called a waste stream analysis, discussed later in this chapter.

Step 5: Estimate Future Waste Generation Quantities.

Estimate future waste quantities using the projected growth information you gathered in Step 1 for the established planning period. These are the quantities that will be used to size facilities and estimate long-term waste management costs.

Step 6: Develop Waste Handling Options.

Once you have a good picture of your current situation, start looking at the waste management options available. What percentage of discards can be prevented, reused, reduced, or recycled? How will you dispose of everything else? Does the tribe collect residents' discarded materials, or will members have to take them to a transfer station or disposal facility? A discussion of source

Example of Estimating Future Waste Generation Quantities

The Makah Tribe of Indians in Neah Bay, Washington, had a population of 1,500 in 2002, with an estimated population growth rate of 1.1 percent per year. The planning period is 20 years, and the waste generation rate is 3.7 pounds per person per day (determined through an actual waste stream assessment by the tribe) for the 20-year period.

To determine how much waste it would generate in 2002, the tribe made the following calculation:

Equation 1: (population) x (waste generation rate) x (number of days per year) ÷ (number of pounds per ton)

(1,500 people) x (3.7 lbs/person • day) x (365 days/year) ÷ 1 ton/2,000 lbs = 1,013 tons/year

Rounding up, the tribe estimated it would generate approximately 1,020 tons of solid waste in 2002.

Based on a constant growth rate of 1.1 percent per year and using a simple compound interest equation, the Makah Tribe's population will be approximately 1,866 in 2022

Equation 2: $P(1 + r)^{T}$ where: P = initial population = 1,500 people
r = percent growth rate/100= 1.1/100 or 0.011
T = years= 20 years

$$1{,}500(1 + 0.011)^{20} = 1{,}866 \text{ people}$$

Using Equation 1 again, the tribe calculate that these 1,866 people will generate 1,260 tons of waste during the year.

(1,866 people) x (3.7 lbs/person • day) x (365 days/year) ÷ 1 ton/2,000 lbs = 1,260 tons/year

The easiest way to determine the total amount of waste generated over this 20-year period is to set up a spreadsheet, similar to the one depicted in Figure 2, that tracks the tribe's population and waste generated increases year by year. Summing the annual waste generated amounts from 2003 through 2022 shows that a total of 22,802 tons of waste will be generated during this time period.

Using these projected waste quantities in its planning process, the Makah Tribe would know that a transfer station would need to be large enough to accommodate the 1,260 tons of waste expected in 2022, while a landfill would need to be large enough to hold the 22,802 tons generated during this 20-year period.

Figure 2. Population and Waste Generation Spreadsheet

Year	Population	Annual Waste Generation (Tons)
2002 (base year)	1,500	1,013
2003 (year 1)	1,517	1,024
2004 (year 2)	1,537	1,037
2005 (year 3)	1,554	1,049
2020 (year 18)	1,830	1,235
2021 (year 19)	1,847	1,247
2022 (year 20)	1,866	1,260
20-year Total	—	22,802

reduction, recycling, and composting is presented in Chapter 5. Waste collection and disposal options are presented in Chapter 4.

Step 7: Identify Existing Regional Programs or Infrastructure That the Planning Area Might Use.

When evaluating the potential benefits of developing or participating in regional programs, the following questions should be answered: Where is the closest permitted landfill? Do other tribes in your region export their waste? Is there an opportunity to combine your efforts and share certain resources? What types of collection and disposal programs does the county or state currently run? Does the county or state hold annual household hazardous waste collection events near your tribe?

Planners and managers involved in solid waste management usually find that it is beneficial to participate in regional solid waste advisory committees or work groups to gain an understanding of how others are dealing with their challenges. Often, tribes involved in regional partnerships can use their increased size and associated bargaining power to gain economic advantages. In the Prince William Sound regions of Alaska, for example, seven Native villages and two Alaska Native Claims Settlement Act corporations have formed the Nunagpet/Chugachmiut Environmental Consortium. This coalition covers all aspects of environmental protection for the region, supporting solid waste management and recycling efforts. Most recycling revenue is used to cover transportation costs; it takes the commitment of the member villages to keep the program viable.

Step 8: Develop Costs for Waste Handling Options.

Once a tribe has compiled information on the quantity and composition of its waste stream, planners and managers can develop options and associated costs for solid waste handling and disposal. Cost estimates should include both capital costs and operation and maintenance costs for the facilities for each option. Capital costs include costs to design and construct new facilities and purchase equipment. Operation and maintenance costs are those necessary for the day-to-day operation of the solid waste management system and include employee salaries, employee benefits, utility costs, equipment fuel, equipment maintenance, and other expenses related to handling and disposing of the materials in the waste stream.

Step 9: Compare Options Based on Criteria Defined by the Tribe.

Look to your goals to help you develop the criteria for comparing options, and prioritize your criteria. Some common criteria include:

- Environmental impacts
- Relative cost
- Potential to create jobs in the tribe
- Operation and maintenance challenges
- Regulatory requirements
- Degree of tribal control
- Cost of closure, post-closure care, and financial assurance for municipal landfills

The Metlakatla Indian Community, a community of 1,600 residents located on the Annette Islands Reserve in southeast Alaska, developed a solid waste management plan in 1999 with funding from an EPA grant. The community had to address many of the issues faced by tribes today, including its remote location, open dumping, lack of infrastructure, and competing environmental concerns. The plan includes the results of a waste stream analysis, a discussion of solid waste management options and costs, and a list of the criteria used to evaluate sites for waste handling facilities.

When and How To Use a Consultant

Most tribes and Alaskan Native villages have found that they do not need a consultant to develop their solid waste management plans. Tribes and Native villages already possess or are able to obtain most of the information needed for developing a plan. Additional information and resources are available to tribes and Native villages free of charge through federal agencies such as EPA, other tribes and villages, tribal and regional associations, or state environmental agencies.

Some tribes and villages have hired consultants to help them develop solid waste management plans. These consultants helped organize the planning process, provided technical assistance, facilitated planning sessions, and in some cases, wrote the plan. While consultants often do have expertise in developing plans in general, they still do not have as much expertise and knowledge of your tribe or village as a tribal member does. The consensus among many tribes and Alaskan Native villages is that tribes and villages possess enough expertise and knowledge and have access to enough free resources to develop a basic solid waste management plan without hiring outside consultants.

When the time comes to implement your solid waste management plan, you might find that obtaining the help of a consultant is necessary. Designing and building a landfill, transfer station, or recycling center, for example, will require the expertise of a trained and certified engineer. If your tribe or village does not have this expertise in-house, hiring a consultant is one method of obtaining it. Contacting IHS or your state environmental agency and asking the agency to provide an engineer is another potential option.

To find a qualified consultant, contact your regional EPA office, IHS, or the Bureau of Indian Affairs (BIA). These agencies can usually provide the names of several consultants that offer professional engineering and consulting services to tribes. Another place to look is in tribal newspapers and publications, such *Indian Times, Indian Country Today,* or *American Indian Report.* You can also check with other tribes and villages to ask for references and recommendations for consultants they have worked with in the past.

Before hiring a consultant, ask for a statement of qualifications and references from former clients. If it is a large project, or if it is being performed through an EPA grant, a formal award process might be necessary. This involves fully describing your technical need, advertising the requirement, and requesting and reviewing several consultants' technical and cost proposals. These need to specifically state what, where, when, and how the work will be done. The technical proposal needs to address past performance, including references from clients. Always check their references.

The Alaska Native Health Board's (ANHB) *Solid Waste Management & Planning for Rural Communities in Alaska* provides helpful tips on using consultants effectively while maintaining control over your solid waste management decisions. Some of these tips include:

- Only ask a consultant to prepare parts of your solid waste management plan that no one else in your community or agency can do for you, or to provide technical/engineering expertise that you can not provide internally.
- Have a get-acquainted meeting. Make sure the consultant understands your needs and exactly what you want.
- Encourage the consultant to ask questions about your community; this will ensure that you receive a plan or design that meets your tribe or village's specific needs and situation.
- Ask your consultant for suggestions, and carefully weigh the advice. Accept advice, not direction.

Conducting a Waste Stream Analysis

"Know your waste stream. A waste assessment provides information about potential recycling opportunities and helps you choose a transfer station design."

~Calvin Murphy,
Eastern Band of Cherokee Indians

As discussed in Step 4, conducting a waste stream analysis or audit will lay the foundation for your planning process. A waste stream analysis helps estimate the amount of solid waste generated within a planning area. The process involves compiling reliable information on the types and quantities of solid waste being generated. The weight or volume of materials and products that enter the waste stream are measured before any recycling, composting, burning, or landfilling takes place. For example, in 2001 the U.S. waste generation rate was 4.4 pounds of discards per person per day. In rural areas, however, the generation rate is commonly lower. The St. Regis Mohawk Tribe, for example, determined its waste generation rate to be 1.5 pounds per person per day. Conversely, Alaskan Native villages tend to be above the national average. According the Alaskan Native Health Board's *Solid Waste Management & Planning for Rural Communities in Alaska,* the average Alaskan generates 6 pounds of waste per day. The Tribal Association of Solid Waste and Emergency Response (TASWER) and the Solid Waste Association of North America's (SWANA) joint training course guide, *Developing and Implementing Integrated Solid Waste Management Systems for Tribal Nations*, provides several approaches to estimating tribal waste generation rates.

A waste stream analysis will give you the information you need to answer questions such as: How much of your waste can be recycled? and, What percentage will require disposal? It gives your tribe the data it needs to develop an effective solid waste management plan.

Purpose and Outcome of a Waste Stream Analysis

What solid waste management goals has your tribe developed during the planning process? A tribe's goals dictate the information and accuracy needed in a waste stream analysis. A tribe that is interested in the economic benefits of recycling might want to determine the quantities of higher-valued materials (such as aluminum cans) it generates. On the other hand, a tribe that is interested in preserving landfill space might need to know the quantities of all materials it generates that it can reduce. Source reduction and landfill projects require knowledge of gross waste volumes. Recycling and waste-to-energy programs require knowledge of the quantity and composition of wastes, not only for value of the material, but also for sizing storage and handling areas.

The Eastern Band of Cherokee Indians in North Carolina conducted a weight-based waste assessment. The tribe's Public Utilities Department randomly selected 212 houses and several businesses to participate in the study. Department staff visited each participant to obtain consent and explain study procedures. For a specified period of time, participants placed all of their solid waste and recyclable materials in special garbage bags. At the end of the study period, department staff collected the bags and separated the waste by hand, weighing paper, food scraps, and glass separately. The tribe used the waste assessment data to estimate its waste generation rates and identify recycling opportunities. For example, the study revealed that homes and businesses generate large quantities of cardboard. The tribe found a market to sell its recovered cardboard to make money

to support other, less profitable, recycling activities.

Methods of Conducting Waste Stream Analysis

Two basic approaches a tribe can use to analyze its waste stream are 1) desktop estimates and 2) field surveys. The desktop estimate uses existing data to quantify the amount of waste generated. A desktop estimate will provide a first-cut estimate. Existing data can come from your state, or a nearby county, city, or tribe. Table 1 provides the average densities of common waste categories that might also prove useful in making initial estimates. Many tribes use the EPA national generation rate and characterization data for their first-cut estimate. Visit the EPA Web page for the most current update of *Municipal Solid Waste In the United States: Facts and Figures*. Keep in mind, however, that tribes and other communities in rural areas often generate less waste per capita than the amount reflected in EPA's numbers. For example, for 2001, EPA reports the per capita waste generation rate to be 4.4 pounds per person per day, while the Makah Tribe of Indians, referenced earlier in this chapter reported a rate of 3.7 pounds per person per day in waste generation. Conducting a field survey will provide you with more tribal-specific data.

Desktop estimates can use an average generation rate or a more sector-specific generation rate. Both approaches use generation rate (pounds per person per day) multiplied by population (number

Table 1. Average Waste Densities

Waste Type	Density of uncompacted waste (pounds/yard^3)
General household waste (organic and inorganic wastes including food wastes, paper, cardboard, plastics, textiles, rubber, leather, wood, aluminum, tin, other metal, glass, dirt, and ashes)	
Uncompacted	150-300
Compacted	500-1,000
Large metal scrap (depending on metal type)	750-3,000
Mixed wood, plastic, metal waste	150-300
Miscellaneous plastics	70-120
Commercial waste (uncompacted)	300-600
Special wastes	
Tires (non-shredded)	45-110
Furniture (large, e.g., couches, armchairs)	75-400
Refrigerator	160-280
Other appliances (white goods)	230-340
Automobiles	1,000-5,000 lbs/vehicle
Yard and agricultural wastes	
Yard trimmings (e.g., tree trimmings, brush, leaves)	100-300
Grass clippings	500-1,000
Agricultural wastes (mixed)	675-1265
Dead animals	605
Fruit or vegetable waste	605
Construction and Demolition Debris	
Wood (unstacked)	180-350 (well stacked wood is 2 to 4 times larger)
Broken concrete	2,020-3,035
Mixed construction	305-605
Mixed demolition (non-combustible)	1,685-2,695
Mixed demolition (combustible)	505-675

Source: TASWER and SWANA. *Developing and Implementing Integrated Solid Waste Management Systems for Tribes.* Spring 2003, pp. 41 & 66.

of residents or employees). Using generation rates from a community of similar size will improve the reliability of the estimate. The sector estimate uses generation rates for different generators, then combines the data to derive the total generation rate. EPA's *Waste Prevention, Recycling, and Composting Options: Lessons from 30 Communities* lists waste generation rates for 30 urban, suburban, and rural communities discussed in the report. Your tribe might be able to use one of these generation rates from a similar size community for a desktop estimate.

The Spokane Tribe of Indians in Washington state used desktop methods to estimate its volume and tonnage of waste. The Tribal Solid Waste Program did not keep track of the waste managed through its collection and landfill services. The tribe derived estimates using a combination of state-wide averages, observations by the collection employee, billing records for commercial accounts, and general demographic data. The tribe developed separate estimates for the waste stream from the collection service, the commercial accounts, and the commercial accounts not serviced by collection. Then they combined these three estimates for a reservation-wide estimate.

Field surveys can help you obtain a more accurate measure of your waste stream. Three tasks are required to develop reliable data—planning, execution, and data analysis. The importance of planning cannot be overemphasized. Planning considerations include determining what type and how much waste is generated in the area and what equipment and personnel are available, and calculating bias factors.

Several approaches are available for executing the field survey. One is a field weighing program, where tribal staff or contractors weigh all vehicles entering the landfill, or a randomly selected subset. The other is a field composition study, where tribal staff determines the composition of the waste stream by sorting and weighing individual components. A brief overview of the steps to perform a field waste sort follows:

1. Obtain a guide on how to perform a field waste sort and talk to other tribes that have performed a waste sort.
2. Decide whether you want to conduct the waste sort in-house, using tribal staff, or whether you want to hire an outside contractor.
3. Define the waste categories to be sampled. Based on your tribal community's goals, select the components you will use for the field sampling.
4. Select containers for the waste components. Make sure containers are of a manageable size for weighing. A 55-gallon container filled with glass can weigh between 200 and 500 pounds. The size and weight capacity of the scale you will be using also will influence your container choices.
5. Determine the number of samples and the physical sizes of the samples. Consider the following factors: the consistency of the waste stream, the amount of solid waste delivered to a facility by the different generators, and the number of vehicles delivering solid waste to the facility each day. Sampling 10 percent of the vehicles using the facility (daily or weekly) is a good guide.
6. Arrange for a crew and set up the equipment.
7. Sort and weigh the waste, recording weight on category forms.
8. Compile and analyze the data.

Estimating Composition and Quantity of Solid Waste Generation, by the National Environmental Training Center for Small Communities, provides technical guidance

for performing a waste stream analysis. The guide has worksheets and checklists for both desktop and field surveys. For a less technical approach, consult *Counting Your Community's Trash*. This two-page fact sheet provides an overview for small communities on how to calculate the materials in the residential waste stream.

The St. Regis Mohawk Tribe Environment Division's *Solid Waste Handbook* provides examples of two different approaches to field surveys. Appendix B of the *Solid Waste Handbook* describes in detail how the St. Regis Mohawk Tribe performed a volume based waste audit, while the Eastern Band of Cherokee Indians in North Carolina performed a weighted-based audit. The *Solid Waste Handbook* also provides a link to a waste audit manual.

Potential Bias Factors

Accounting for potential bias factors that can affect the estimates of waste generation rates is important. Seasonal variations account for most of the potential bias. The quantity of waste generated in any area will vary from month to month. Lack of yard trimmings in the winter months reduces the amount of residential waste. Retail wastes are higher during peak sales periods like Christmas. School-related wastes decrease during the summer. Tourism causes variations in population and types of waste, which impacts waste generation. Work force fluctuations affect population and also waste types and quantities generated. Subsistence activities can generate specific types of waste only at certain times of the year.

To help control potential bias factors caused by the increased population during tourist season, the Eastern Band of Cherokee Indians, for example, conducted its waste sort twice, once during the height of tourism season and once during the tourism low point.

The St. Regis Mohawk Tribe collecting waste as a part of its waste stream analysis.

Chapter Highlights

- Prepare a solid waste management plan as the first step in developing a solid waste management program. It is the foundation upon which you will build your tribe or village's program.
- Use your solid waste management plan to define, prioritize, and focus your tribe or village's solid waste management goals.
- Conduct a waste stream analysis to understand the types and amounts of waste your tribe or village generates.
- Complete your solid waste management plan before applying for federal solid waste grants. Many grant programs place a premium on having a solid waste management plan—for a few it is even a prerequisite.
- Revisit and update your solid waste management plan as your program develops and as your tribe or village's solid waste-related goals change.

Resources

EPA's *Decision-Maker's Guide to Solid Waste Management, Second Edition* (EPA530-R-95-023), available on EPA's Web site at <www.epa.gov/epaoswer/non-hw/muncpl/dmg2.htm> or by contacting the RCRA Call Center at 800 424-9346.

EPA's *Solid Waste Management: A Local Challenge with Global Impacts* (EPA530-F-02-026), available on EPA's Web site at <www.epa.gov/epaoswer/non-hw/muncpl/ghg/f02026.pdf> or by contacting the RCRA Call Center at 800 424-9346.

EPA's *Waste Prevention, Recycling, and Composting Options: Lessons from 30 Communities* (EPA530- R-92-015), available on EPA's Web site at <www.epa.gov/epaoswer/non-hw/reduce/recy-com/ toc.pdf> or by contacting the RCRA Call Center at 800 424-9346.

Estimating Composition and Quantity of Solid Waste Generation, by the National Environmental Training Center for Small Communities. Available by calling 800 624-8301 or through the Center at <www.nesc.wvu.edu/netcsc/pdf/NETCSC2000catalog.pdf>.

Counting Your Community's Trash, available on the Web at <www.zender-engr.net/docs/counting_trash_final.pdf>.

St. Regis Mohawk Tribe-Environment Division's *Solid Waste Handbook* available at <www.srmtenv.org/ swhandbk.pdf>.

Developing and Implementing Integrated Solid Waste Management Systems for Tribal Nations: A Training Course Prepared by the Tribal Association for Solid Waste and Emergency Response (TASWER) and the Solid Waste Association of North America (SWANA), Spring 2003. Contact TASWER <www.taswer.org> or SWANA <www.swana.org> for more information.

Solid Waste Management & Planning for Rural Communities in Alaska: Community Resource Guide & Planning Workbook, Draft 2003. By the Alaskan Native Health Board. Contact your ANHB contact for more information.

7 Generations: Addressing Village Environmental Issues for the Future Generations of Rural Alaska, March 1999, available on the Web at <www.state.ak.us/local/akpages/ENV.CONSERV/dsps/compasst/7generations/7gen.htm>.

Regular updates of *Municipal Solid Waste In the United States: Facts and Figures,* available on EPA's Web site at <www.epa.gov/epaoswer/non-hw/muncpl/ msw99.htm>.

Solid Waste Disposal Facility Criteria (EPA530-R-93-017), November 1993, available on EPA's Web site at <www.epa.gov/epaoswer/non-hw/muncpl/landfill/techman/index.htm>or by contacting the RCRA Call Center at 800 424-9346.

Sample Solid Waste Management Plans

The Inter Tribal Council of Arizona, Inc., *Model Tribal Solid Waste Management Code,* available on the Web at <www.epa.gov/tribalmsw/pdftxt/itc10746.wpd>, includes information on how the tribe developed its solid waste management plan.

Solid Waste Management Plan for the Hannahville Indian Community, available on the Web at <www.epa.gov/ tribalmsw/pdftxt/hanplan.pdf>.

Solid Waste Handbook, by the St. Regis Mohawk Tribe of New York, available on the Web at <www.srmtenv.org>.

Description of the Metlakatla Community Integrated Waste Management Plan, available on the Web at <www.ridolfi.com/Annette/IWMP.index.html>.