

Reduce, Reuse, Recycle—  
It's Good Business!

A Guide  
for  
California  
Businesses



State of California

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*Governor*

JAMES M. STROCK  
*Secretary for Environmental Protection  
California Environmental Protection Agency*

## CALIFORNIA INTEGRATED WASTE MANAGEMENT BOARD

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NOTE: Legislation (SB 63, Strickland, Chapter 21, Statutes of 2009) signed into law by Gov. Arnold Schwarzenegger eliminated the California Integrated Waste Management Board (CIWMB) and its six-member governing board effective Dec. 31, 2009.

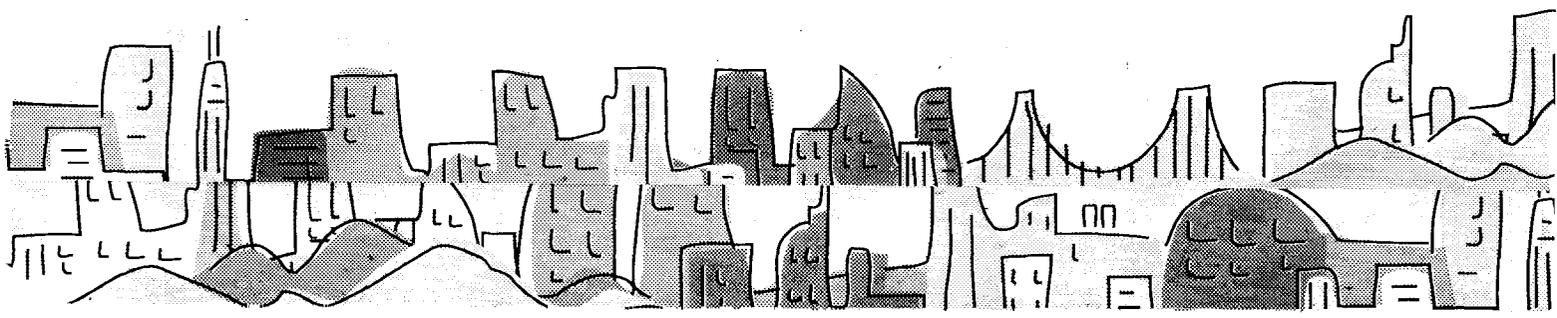
CIWMB programs and oversight responsibilities were retained and reorganized effective Jan. 1, 2010, and merged with the beverage container recycling program previously managed by the California Department of Conservation.

The new entity is known as the Department of Resources Recycling and Recovery (CalRecycle) and is part of the California Natural Resources Agency. It is no longer part of the California Environmental Protection Agency (Cal/EPA).

This document was originally printed in hard-copy format in 1994 and was declared out of print in 2004 when all known copies had been distributed. A complete version of the report was located in 2011 and was scanned to a digital format, making it available for downloading.

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# Step 1

## **Choosing Your Waste Management Coordinator**

### **Select an employee to coordinate waste management activities.**

Establish a team that includes management and staff. Select an organized, enthusiastic, creative person as the Waste Management Coordinator. Consider someone who is interested in environmental matters and has some knowledge about solid waste management and recycling. The coordinator should be someone who is enthusiastic, communicates well with co-workers, and who can dedicate enough time in the immediate future to establish an effective program.

The Waste Management Coordinator's primary responsibilities will include:

- Looking for opportunities to prevent waste by purchasing reusable, durable, and repairable equipment and supplies.
- Working with suppliers to reduce packaging.
- Reusing items and altering other waste generating activities wherever possible.
- Targeting materials for composting and recycling, and selecting and working with your waste hauler or recycling company to arrange costs, pickup schedules, and other program specifics.
- Setting up a collection bin system in common work areas.



- Locating storage areas and developing a system for moving materials to storage areas.
- Networking with other businesses and local government staff, attending training and seminars on waste management if possible, and subscribing to waste management publications.
- Promoting waste reduction awareness in the workplace.
- Monitoring, evaluating, and changing the system as needed.

A large business can form a waste management committee.

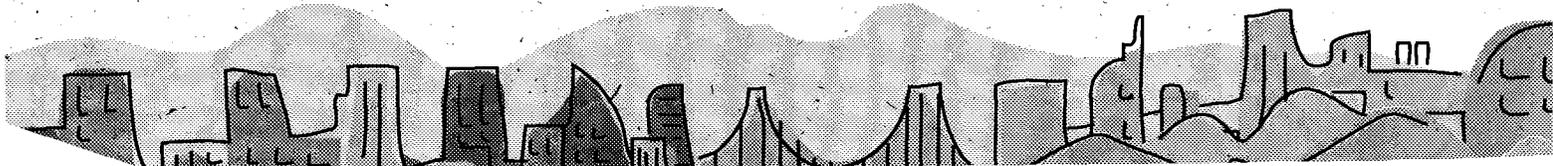
Consider forming a committee with representatives from key departments, such as purchasing, receiving, and maintenance, to discuss how to best implement waste reduction at your workplace. Include fellow employees in the development of the program, including department heads and support staff. The broader the base of support and enthusiasm, the greater your chances of cooperation and success.

# Step 2

## **Winning Organizational Support**

### **Management Support**

Management should initiate and promote a company waste management program so employees feel empowered to act. Issuing a company environmental policy statement is one way for management to show commitment for a



## **Make A Difference**

California faces an enormous solid waste disposal challenge. Every year approximately 45 million tons of garbage are generated and half of that comes from business and industry. Cities and counties are required to reduce the amount of waste going to landfills by the year 2000 by 50 percent. Currently they are developing strategies to reduce, reuse, and recycle solid waste, and they need your help to make it happen. They can't do it without you!

### **"Green" Business**

If waste reduction goals are to be fully reached in your community, businesses must lead the way. You can help change the habits and practices of your customers and employees. More than ever, consumers are responding by patronizing businesses that show a strong commitment to the environment.

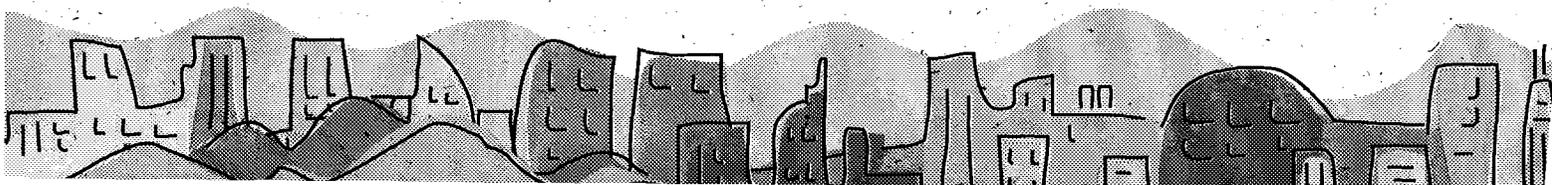
Many corporations are dedicating resources and personnel to the development of waste management programs. Integrated waste management, or waste reduction, is the combined effort of activities such as waste prevention, reuse, recycling, and composting:

- **Waste Prevention.** There is something businesses can do today that can significantly reduce the amount of waste that goes to the landfill. It's called waste prevention. Although this may be a new term for some businesses, it is not a new concept. Waste prevention is any practice which causes a net reduction in the generation of waste. Simply put, waste prevention reduces the amount or toxicity of waste generated.

- **Reuse** Many so-called waste items can be used again. Some examples are plastic pails, fiber drums, packing materials such as foam peanuts, cardboard boxes, mailing tubes, etc.
- **Composting** Composting is the biological decomposition of organic materials such as leaves, grass clippings, brush, and food waste into a soil amendment.
- **Recycling** Recycling is defined as the process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new products.

### **Waste Management Programs**

This guidebook was developed to provide you with the information necessary to start a waste reduction program in your company. It includes tips on waste prevention, easy-to-follow methods to help you determine which materials can be recycled in your type of business, and step-by-step information for setting up a collection program.



successful program. The potential for successful employee participation is greater when there is enthusiastic support by management. Sell the program ideas to your employees so they become dedicated and involved in the effort. Be sure to explain the environmental benefits, which include saving energy and resources and a reduction in air pollution and landfilled waste. Also, explain the economic benefits, including the potential for savings on waste prevented, disposal costs, and the possibility of generating income from properly sorted recyclables.

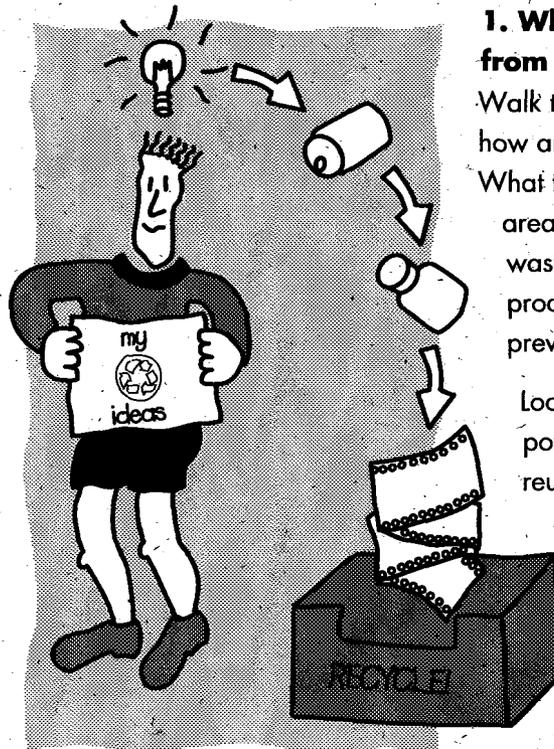
## Step 3

### **Estimating Your Waste Reduction Potential**

Opportunities for waste prevention are often hidden in inefficient processes. Looking for ways to operate more efficiently is good business.

To develop an effective program, conduct a "waste evaluation" to estimate your waste reduction potential and understand existing waste management practices. A waste evaluation identifies the materials generated and their path through your facility from point of purchase to ultimate disposal. This can be a simple visual survey of your trash, or you can sort, weigh, and measure the volume of all the

materials in your garbage to get more detailed information regarding the make up of your company's waste stream. Use the worksheets in Appendix B to assist you in evaluating your current waste management practices.



#### **1. Where does the waste come from and what is recoverable?**

Walk through your facility and note how and where waste is generated. What type of work is done in each area? What activities produce waste? What type of waste is produced? What waste can be prevented, reused, or recycled?

Look for materials which are potentially recoverable through a reuse and recycling program. Use a copy of a floor plan or a map of your facility to write down which materials are generated in each room. Also, look in the containers where waste is stored for more information on what type

of waste is being generated by your business. Different businesses will generate different types of preventable, reusable, or recyclable materials. For example, an administrative office may generate white office paper while a retail outlet may generate large amounts of corrugated cardboard.

#### **2. What materials are commonly purchased and discarded?**

Ask purchasing and maintenance staff about current purchasing and disposal practices to get a better idea of the flow of materials through your facility and the types of waste being generated. Keep in mind "What if." What if



this material could be reused? What if this material could be packaged differently? What if the activity could be altered to prevent waste?

If applicable, interview your landscaper/groundskeeper or other responsible staff about "green waste" (grass clippings, leaves, etc.) and potential opportunities for reduction through composting, mulching or "grasscycling." Grasscycling is the natural recycling of grass by leaving the clippings on the lawn when mowing.

### **3. Understand your waste hauling system.**

It is important to know who your waste hauler is and to understand your existing waste hauling system.

"Direct" service means that the hauler deals with your account individually and only refuse from your business is going into the dumpster.

"Shared" service is usually provided by the property manager for a group of businesses. If this is the case, contact your property manager and inquire about recycling. Shared service provides a greater opportunity to develop a cost-effective recycling program by combining materials with other commercial establishments on the property.

### **4. Are there waste management programs at neighboring businesses? What wastes are being reduced, reused, and recycled?**

If neighboring businesses have waste management programs, inquire about the logistics and details of these programs. Often, simple and practical systems can be duplicated. There is no reason to "re-invent the wheel." What works for business establishments similar to yours will likely work for you. Of particular

interest would be what wastes are eliminated or reduced. What materials are reused or recycled, how they are collected and transported, and what costs are associated with the program. Find out if it is possible to consolidate your efforts with other businesses, to generate more material thereby making recycling more cost-effective. Also, know how many people are employed at your workplace and whether or not you plan to coordinate with neighboring businesses so your hauler/recycling company can better estimate your potential for recycling.

## **Organize your information**

Once you have completed your waste evaluation using the worksheets in Appendix B, you will have a good idea of the types and quantities of recyclable materials your company produces and opportunities for waste prevention. You will then be ready to plan your program and to contact your waste hauler or a recycling company.

## **Step 4**

### **Finding the Right Vendor to Provide Recycling Services**

#### **Contact your existing waste hauler about recycling.**

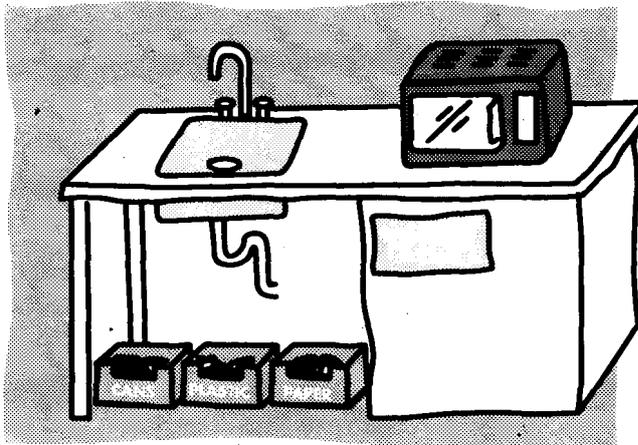
Recycling will undoubtedly be a major component of your waste management program. Recycling is more cost-effective when integrated with existing waste removal operations. If your company pays for waste disposal based upon the frequency of service or the amount of waste generated rather than a flat fee, waste prevention and recycling may be financially rewarding. Often, businesses can reduce disposal costs and sometimes even earn revenue from the sale of separated recyclables.



In addition to waste hauling companies, there are a number of private recycling companies that offer business programs. Contact these companies to locate a vendor that can provide the services you need. These services may include providing recycling containers, shredding of confidential and restricted documents, as well as promotion and education for your employees.

The following list of questions will help you locate a vendor for your recyclables.

1. What materials does the vendor accept for recycling? How should the materials be separated? Is there a minimum amount required for a pick-up? Do they charge for pick-up?
2. Will the vendor pay for the recyclables?
3. Will the vendor assist with education and related promotional efforts?
4. Will the vendor supply recycling containers to use throughout the workplace and large bins for the main storage area?
5. How will pick-ups be arranged? Scheduled? On-call?
6. Does the vendor offer shredding services for confidential materials?
7. Does the vendor have references?



## Step 5

### Setting Up Your Program

#### Set up a reuse area.

If you have available space, set up a reuse area, where reusable items can be stored rather than thrown away. Encourage employees to reuse these items in the workplace or at home. Make reusable items available to customers, or donate them to a school or charitable organization.

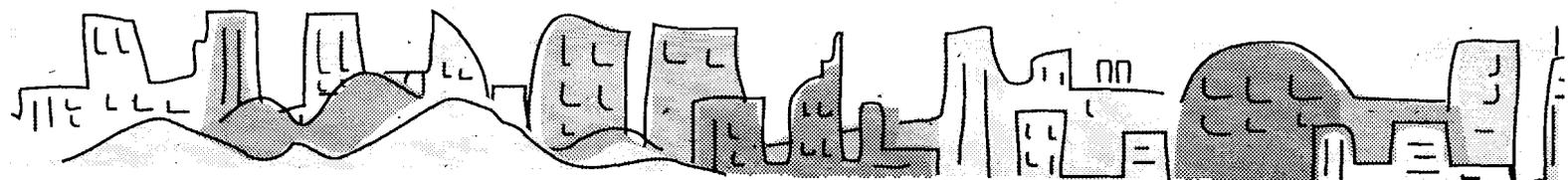
#### Establish a composting or grass-cycling program.

Grass clippings and other plant prunings make up a surprisingly large portion of California's waste stream during the growing season.

If your business produces "green" waste, such as plant or lawn clippings, consider composting the materials on site or use the materials as mulch for landscape plants." Or start grasscycling, that is, leaving your grass clippings on the lawn when mowing.

#### Analyze the costs and benefits of waste prevention activities.

Analyze the purchase costs, labor costs, utility costs, and disposal costs of waste prevention activities such as purchasing longer-lived, durable, or repairable supplies and equipment. While it may cost more up front, you will probably find there are significant cost savings in the long term.



**Coordinate with neighboring businesses to collect greater amounts of materials and form purchasing coalitions.**

In many businesses, especially those in malls or groups of stores on the same property, waste management is provided by the lessor, and refuse charges are incorporated into rent. As you know from step 3, this type of service is referred to as "shared service" and can lead to more cost-effective recycling programs, since neighboring businesses can combine recyclables to collect greater amounts of material.

If feasible, you can also work with neighboring businesses, trade associations, or other members of your industry type to lower the price of recycled products by buying in larger quantities.

**Choose appropriate recycling containers.**

The size and style of recycling equipment varies. Ask your hauler or recycler which size receptacles are suitable for your situation. Will the hauler or recycler provide containers? Many vendors will supply a variety of small-size containers for business recycling programs and nearly all provide and service the larger storage dumpsters. You may wish to purchase your own personalized recycling bins with your company's logo or convert existing trash containers into

recycling containers. Many recycling containers are made of recycled materials, so purchase and use them whenever possible.

**Locate and label workspace recycling bins strategically.**

To encourage participation among employees and to avoid contaminating recyclables, it helps to place recycling bins in all heavy traffic areas, common work areas, and most importantly, in locations where the recyclables are typically generated. Recycling bins near copy machines and desktop containers for office paper, as well as larger, leak-resistant, recycling bins for bottles

and cans in cafeteria areas are typical examples. It is important to clearly label recycling containers in order to prevent employees and visitors from using them for trash bins. Make sure there are plenty of trash and recycling containers.

**Storage areas and collection procedures.**

Your hauler or recycler will assist you in setting up the main storage area so that both trash and recycling dumpsters are accessible for pick-up crews and any heavy equipment that may be needed for unloading and loading operations. Some recyclables are valuable and invite theft. Select a site that can

# ASSIGNED STAFF

MON. TUE. WED. THURS. FRI.  
REFUSE RECYCLE REFUSE RECYCLE REFUSE



be locked and ask your vendor about theft-proof storage dumpsters.

**Use in-house staff to consolidate the recyclables from the recycling containers to one main storage area.**

There are several reasons to use in-house staff to consolidate the recyclables:

- You will receive a better price for your materials because you will accumulate larger loads and reduce any charges for recycling service.
- Recycling bins in the workplace will not overflow.
- The vendor will not disturb your business operations during work hours to remove recyclables.



Waste management programs are generally more cost-effective when integrated with existing waste disposal and removal systems. Often, existing maintenance operations can be adjusted to include recycling with no significant increase in workload. Many companies will use an alternating collection system in which assigned staff collect recyclables one day and refuse the next. Also, for office settings, consider whether your recyclables would be better consolidated by an evening clean-up crew as opposed to regular daytime personnel.

When introducing waste-handling personnel into the new program, explain that they are handling the same materials, but will empty recyclables and trash into different containers.

If existing waste removal personnel are not involved with the recycling program, be sure they are made aware of your new program in order to avoid mixing and contaminating materials.

## Step 6

### **Educating and Motivating Employees**

To prevent waste and collect contaminant-free recyclables, your participating staff must be knowledgeable about program guidelines and the benefits of participating.

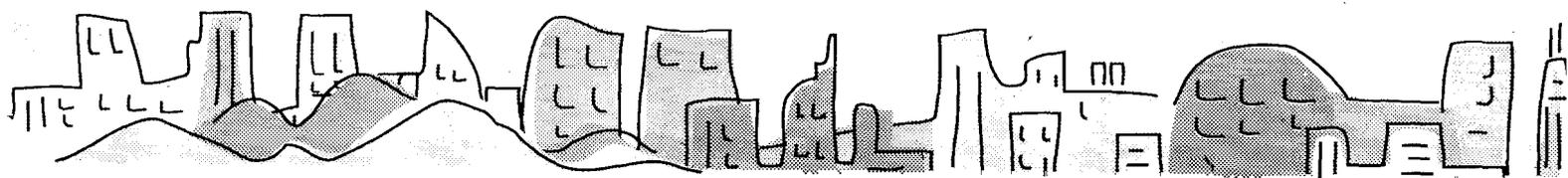
#### **Announce your program.**

An announcement, supported by the company's owner or senior officer, highlighting the benefits of waste reduction and outlining separation and collection procedures, is a key element

to informing employees of new procedures and soliciting participation. For your convenience, a sample "kick-off" memo is included on the next page. Post it conspicuously and encourage your employees to read it. Or better yet, reduce paper waste and announce the program on your electronic mail system! Some companies give their employees coffee mugs or desk top paper recycling containers emblazoned with company and recycling logos.

#### **Establish a contact for waste management questions and information.**

Some employees might be uncomfortable with the new system. Therefore, it is important to have an outlet for questions and information. The waste management coordinator is most familiar with the details and logistics of the



## **Sample Kick-off Memo**

The following is a sample memo to use to announce your waste management program to your employees. Fill in the blanks or customize to meet your needs.

To: All Employees

From: Susan Smith, CEO

Date: (Insert Date)

Re: Establishment of Waste Management Program

(Company Name) will begin a waste management program to prevent waste and to reclaim and recycle (materials to be recycled). Your participation is important to the success of the program.

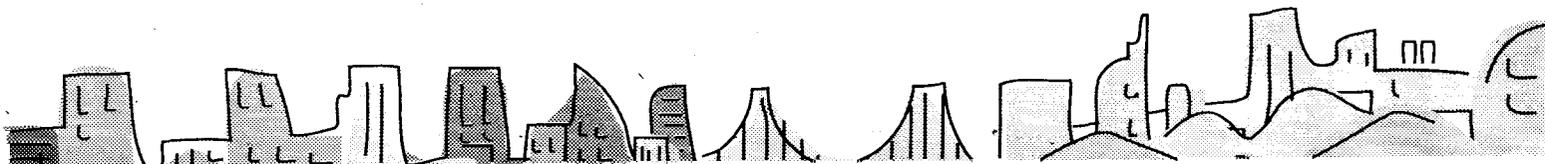
Involvement in this program will require minor changes in your daily habits. (For instance, you may be urged to reuse waste paper printed on one side only as scratch paper, rather than throw it away.) Work station containers for materials to be recycled will be located at (desktop, common areas). When these containers are full, maintenance staff will empty the contents into the central containers nearest your desk. The locations of the central containers will be (list locations).

Please attend a short orientation session to learn more about how the program works. Three fifteen minute sessions have been scheduled for (dates). The sessions will start at (list times). Your supervisor has a sign-up sheet.

Your participation will make a difference! For every pound of waste you reduce, reuse or recycle, you will:

- Save money for our company;
- Protect the environment;
- Save natural resources;
- Conserve landfill space; and,
- Reaffirm our company's support for environmental programs.

I have appointed (name) as coordinator of waste management activities. If you have any questions, he/she can be reached at (phone #). Thank you for your cooperation.



program and is the most appropriate person to handle questions from other employees. The coordinator's name and phone number should be included in the memo announcing the program.

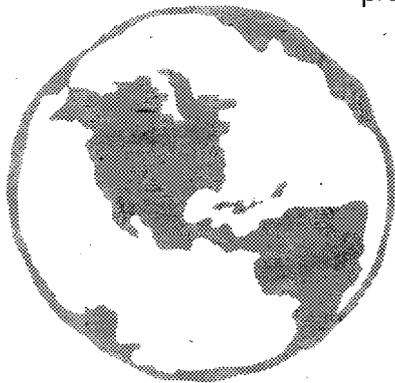
Employee training is essential for a successful program. Your coordinator should provide initial training for all staff and refresher sessions as necessary. New employees should receive training when hired. Use posters and other training materials to promote information to employees.

Encourage feedback and suggestions from employees. Incentives such as contests and prizes will help ensure success. Give credit and recognition to employees for their efforts.

#### **Follow-up publicity.**

It is important to continually publicize the success of your waste reduction efforts and address any shortcomings. Success encourages continued participation. Information about quantities of waste prevented and recycled, revenue earned, and disposal cost savings should be shared with staff. Problems such as material contamination or low participation rates should also be shared. Reminders like these will help maintain a successful program.

Money generated from the sale of recyclables or saved through avoided disposal costs can be donated to a charity selected by employees, or applied toward employee holiday parties, labor saving equipment for employees, or the purchase of additional waste reduction equipment.



## Step 7

### **Purchasing with Waste Prevention in Mind**

#### **Buy products that are reusable, durable, repairable, and recyclable.**

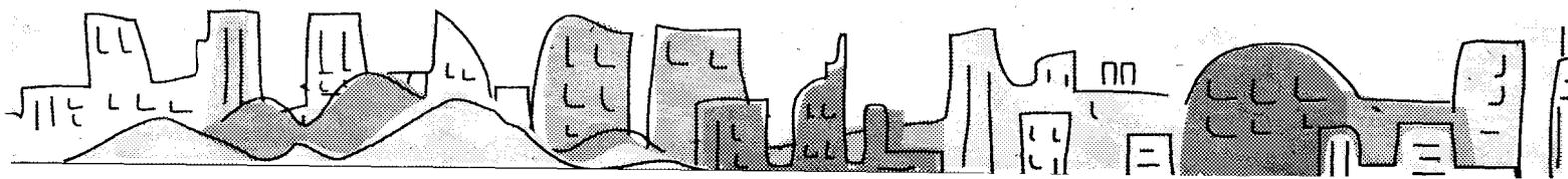
By purchasing and using products that are reusable, durable, and repairable, you will be cutting down on the amount of waste that is produced and landfilled. These products will last longer and save you money in the long run. Urge your suppliers to provide you with these items.

Remember to also request supplies and materials which are recyclable. If you manufacture a product, keep the recyclability of that product in mind.

#### **Buy products with recycled content.**

The collection of recyclable materials is one step of the three-part process we call recycling. The reprocessing of these materials into new products and the purchase of these new products by consumers and businesses like yours are the essential last two steps in closing the loop of the recycling process. When you buy goods with recycled content, your purchases help to create a demand for materials collected in recycling programs. Business purchases of recycled-content products are extremely important to develop and maintain markets for the increasing quantity of materials that will be diverted from landfill disposal. Some items commonly made of recycled material include:

- All kinds of printing and writing paper
- Envelopes



- Desk products made of recycled plastic and paper
- Paper towels and tissue paper
- Plastic lumber
- Carpeting
- Insulation
- Retreaded tires
- Re-refined motor oil

### **Reduce packaging waste.**

Did you know that packaging makes up approximately one third of all solid waste in California? Coalitions of government, public interest groups, and industry across the nation are recommending that reduced packaging guidelines be followed to cut down on packaging waste. Basically they are suggesting that packaging be eliminated whenever possible, minimized, refilled or reused, be recyclable, and be made from recycled materials.

Tell your suppliers that you are interested in buying products that contain less packaging whenever feasible. Ask them to take back shipping boxes to reuse or recycle. Make reduced packaging available to your customers too.

### **Other Resources**

#### **California Materials Exchange(CALMAX)**

CALMAX is a materials exchange program that publishes a bi-monthly Business Reuse and Recycling Catalog which lists recoverable

materials both available and wanted by business and industry. It is designed to help businesses find markets for materials they have traditionally discarded. For information on CALMAX, call the California Integrated Waste Management Board at (916) 255-2369.

#### **California Market Watch**

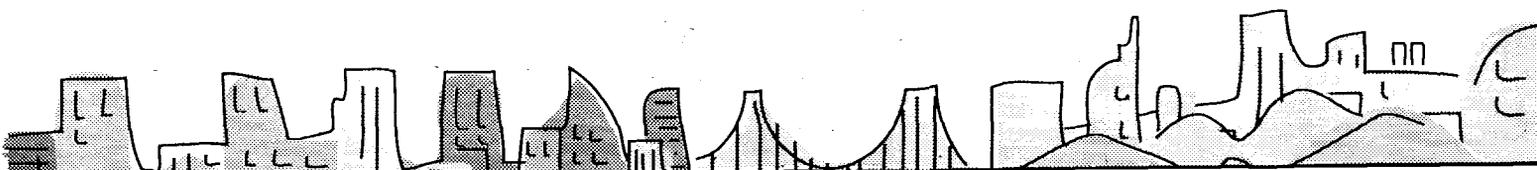
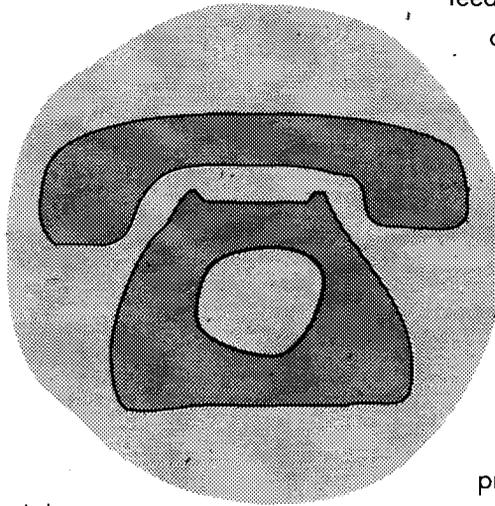
California Market Watch is a computer database designed to store and access information on recycled products, recycling equipment, and feedstock sources for production of recycled products. Two reports are printed and updated monthly: Market Watch (List 1) identifies recycled product dealers, recycled product manufacturers, and reuse manufacturers; Market Watch (List 2) identifies recycling equipment suppliers, materials brokers, processors recycling collection programs, and industry organizations. These Market Watch reports are available upon request.

For information, call 1-800-RECYCLE or (916) 327-2760. Or write, Department of Conservation, Division of Recycling, Market Development Section, P.O. Box 944268, Sacramento, CA 94244-2680.

#### **Recycling Hotlines**

These hotlines provide information about recycling locations and the materials you can recycle throughout California:

**California Integrated Waste Management Board: 1-800-553-2962**  
**Division of Recycling: 1-800-RECYCLE.**



**To obtain additional information on waste reduction, contact the offices below:**

- California Integrated Waste Management Board, Residential and Business Education Section  
8800 Cal Center Drive  
Sacramento, CA 95826  
(916) 255-2200

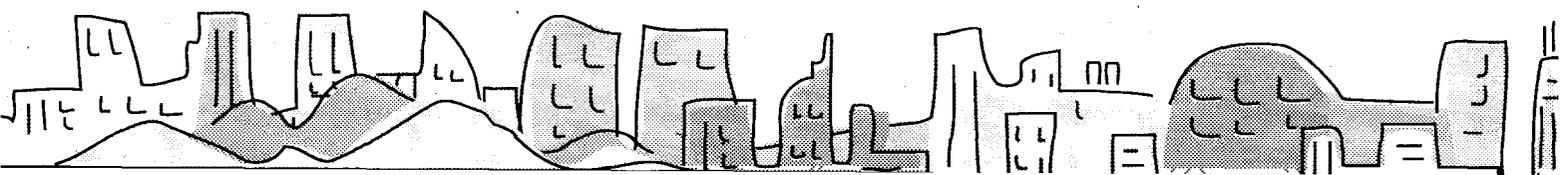
The Residential and Business Education Section and the Waste Prevention Program Development Section provide solid waste management information to businesses and consumers. The Markets, Research, and Technology Division provides information about the Recycling Market Development Zones program, recycled materials (paper, glass, plastics, metals, etc.), and recycled products.

- California Department of Conservation, Division of Recycling, Resource Center  
801 K Street, MS 18-55  
Sacramento, CA 95814-3533  
(916) 323-3836 or 1-800-RECYCLE

The Division of Recycling (DOR) has pamphlets available on recycling and offers technical support to businesses interest in developing recycling programs. DOR offers Info Cycle and Market Watch, an electronic bulletin board and information on recycled products, respectively.

- California Environmental Protection Agency  
555 Capitol Mall, Suite 235  
Sacramento, CA 95814  
(916) 445-3846

- California Air Resources Board  
P.O. Box 2815  
Sacramento, CA 95812  
(916) 322-2990
- State Water Resources Control Board  
901 P Street  
Sacramento, CA 95812-0100  
(916) 657-1117
- Department of Toxic Substances Control  
400 P Street  
Sacramento, CA 95812-0806  
(916) 324-1826.
- Californians Against Waste Foundation  
926 J Street, Suite 606  
Sacramento, CA 95814, (916) 443-5422.  
CAW publishes Buy Recycled! - The Business and Government Buyer's Guide to Recycled Products, (1 year subscription - \$24.95), and other publications.
- U.S. Environmental Protection Agency, 75 Hawthorne Street, San Francisco, CA 94105-3901, (415) 744-1305 or 1-800-424-9346. The EPA has numerous specialized Region IX publications on a variety of waste management topics.



### **Applause!! Applause!!**

Good luck and congratulations for implementing waste reduction at your business! The true success of your program will depend on the cooperation and participation of your employees. Your efforts can dramatically impact your bottom line while helping to preserve a better environment for this and future generations.

### **Take Credit**

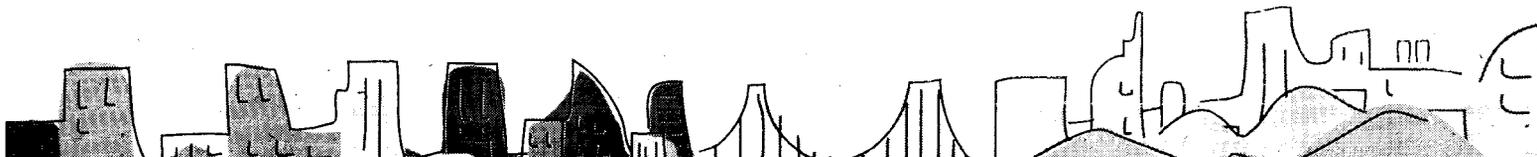
When your company recycles, uses products made of recycled material and practices other waste reduction strategies, you're doing your part to preserve the environment. As an environmental leader in the community, you should take credit for this commitment and be recognized. Be sure to include "Printed on Recycled Paper" whenever you purchase and use recycled paper. Also, publish your efforts in company newsletters and periodicals.

The Waste Reduction Awards Program (WRAP) provides public recognition to California businesses that have made outstanding efforts to reduce and divert waste from landfills. Businesses compete against a set of criteria, rather than against each other. Practices that are evaluated include waste prevention, materials

reuse, recycling, buying recycled, composting, and employee education. Call (916) 255-2200 for a WRAP application.

### **Tell Us Your Story**

Remember, if you have any questions, would like to receive more information, need assistance with your waste management program, or would like to tell us your success story, please call the California Integrated Waste Management Board, Residential and Business Education Section at (916) 255-2200 or the California Department of Conservation, Division of Recycling, Market Development Section at (916) 327-2760.



# Appendix A - Waste Prevention Ideas

Begin by assessing the products and equipment used and the waste generated by your business. Then identify ways to improve efficiency and eliminate waste. The ideas below can help you decide what waste prevention practices to adopt.

## Purchasing

- Establish purchasing guidelines to encourage waste prevention (durable, concentrated, reusable, high quality products).
- Consider length of warranty and availability of repair services when purchasing equipment.
- Use optical scanners, which give more details about inventory, allowing more precise ordering.
- Order supplies in bulk to reduce excess packaging.
- Order supplies by voice mail or electronic mail.
- Substitute less toxic materials for toxic materials (e.g., vegetable based inks, water based glue, markers, and paints).
- Ask suppliers to minimize packaging on orders.
- Request that deliveries be shipped in returnable containers.
- Reuse packaging (e.g., foam peanuts, bubblewrap, and cardboard boxes) or find someone who can.
- Set up a system for returning cardboard boxes and foam peanuts to distributors for reuse.
- Return, reuse, and repair wooden pallets and spools.
- Order merchandise with minimal packaging, in concentrated form and in bulk.

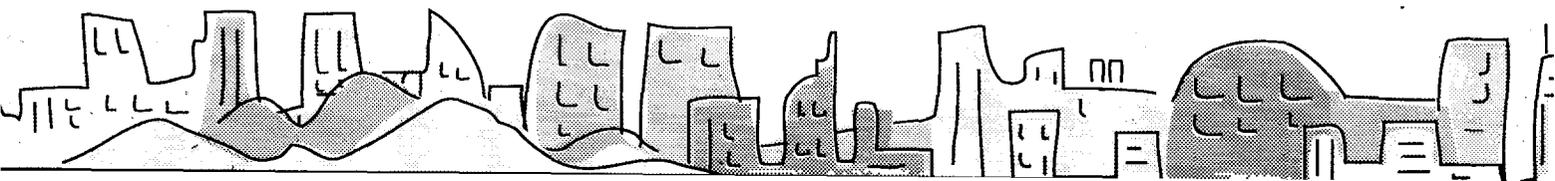
## Packaging

- Eliminate unneeded packaging or layers of packaging.
- Use lightweight packaging.
- Use reusable boxes and mail bags for shipping to branch offices, stores, and warehouses.

## Writing/Printing Paper

- Make double-sided copies whenever possible.
- Reuse envelopes or use two-way envelopes.
- Circulate memos, documents, periodicals, and reports rather than individual copies.
- Use voice or electronic mail or put messages on a chalkboard or central bulletin board.
- Make scratch pads from used paper.
- Use outdated letterhead for in-house memos.
- Eliminate unnecessary forms. Double-side forms or redesign them to fit on a half sheet.
- Use narrow-ruled notebooks.
- Seek methods to reduce production errors.
- Save documents on floppy disks instead of making hard copies.

Modified from *Reducing Waste in Your Business*, Washington State Department of Ecology



- Use central files for hard copies.
- Print more words on each page (e.g., smaller font, narrow margins).
- Proof documents on screen before printing.
- Print drafts on paper already printed on one side.
- Use same draft of report for corrections by several people.
- Donate old magazines and journals to hospitals, clinics, or libraries.
- Keep mailing lists current/one copy per address.
- Call or mail postcards directly to senders asking that your business be removed from mailing lists.
- Reduce advertising mail by writing to: Direct Marketing Assoc., Mail Preference Service, P.O. Box 3861, NY, NY 10163-3861. Ask that your business be eliminated from mailing lists.
- Accept final in-house documents with hand corrections.

### **Over-Stocked, Exchangeable Items**

- Set up an area for employees to exchange used items.
- Advertise surplus and reusable waste items through a commercial waste exchange. CALMAX is a materials exchange network in California; services are available at no cost to users. Call (916) 255-2369 for a free catalog and materials listing form.

### **Equipment**

- Rent equipment that is used occasionally.
- Use remanufactured office equipment.
- Invest in equipment that facilitates waste prevention such as:

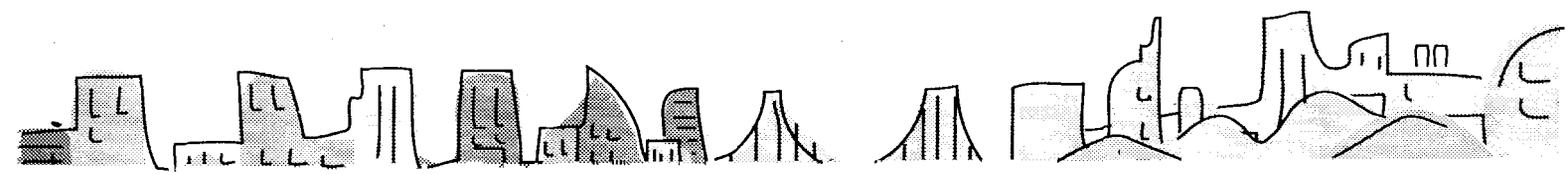
- high quality, durable, repairable equipment

- copiers and printers that make two-sided copies

- Install reusable heating, ventilation and air conditioning filters.
- Replace incandescent with fluorescent lights.
- Institute maintenance practices to prolong the use of copiers, computers, and other equipment.
- Reclaim reusable parts from old equipment.
- Use recharged or rebuilt fax and printer cartridges.
- Sell or give old furniture and equipment to employees or donate it to a local charity.
- Find uses for worn tires (e.g., landscaping, swings).
- Use retreaded tires on company vehicles. Rotate tires on a regular basis to prolong tire life. Keep tires properly inflated.

### **Landscaping/Organics**

- Use a mulching mower or retrofit your mower and leave grass clippings on lawn (grasscycling).
- Compost grass clippings and leaves or ask your landscaper to send trimmings to a composting facility (check with recycling coordinator about any composting requirements).
- Use compost as a topsoil amendment or request your landscaper contractor to use it.
- Choose a landscape design that needs low maintenance and generates little waste (e.g., perennials, slow growing shrubs).
- Buy a chipper and turn tree and shrub clippings into mulch.

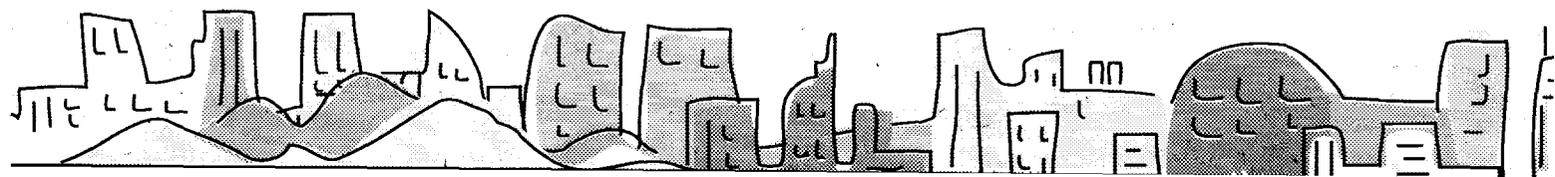


### Food and Personal Services

- Use durable towels, tablecloths, napkins, dishes, flatware, cups, and glasses.
- Encourage employees to bring their own mugs and utensils. Ask food vendor to offer discounts on beverages served in own mug.
- Buy company mugs; stop providing disposable cups.
- Encourage customers to take home extra food.
- Offer smaller portions (e.g., child's menu).
- Arrange for food bank pick-up of unserved food.
- Sell or give food scraps to farmers who can process it for feed (check with local health and agricultural agencies).
- Compost vegetable food scraps. (Check with your recycling coordinator concerning local guidelines or restrictions.)
- Set up a worm bin at the office to convert your food wastes (banana peels, coffee grounds) into high quality potting soil (vermicompost).
- Use reusable coffee filters or unbleached disposable filters.
- Reuse trash can liners or eliminate where possible.
- Consider using cloth roll towels, hot air dryers, large paper rolls in rest rooms or buy smaller/lighter sized paper towels.
- Provide condiments in bulk dispensers.

### Consumer Choices

- Teach your customers about the importance of *reducing waste*. Effective tools for getting across the message include: promotional campaigns, brochures and newsletters (remember to use recycled paper), banners, newspaper ads, product displays, store signs, and labels.
- Encourage customers to bring their own bag(s) and compliment them when they do.
- Offer customers a rebate when they reuse grocery bags, containers, mugs, and cups.
- Offer customers waste reduction choices such as:
  - items in bulk or concentrate;
  - solar-powered items such as calculators, flashlights;
  - durable merchandise;
  - repairable merchandise; and
  - items in refillable bottle.
- Encourage customers to return reusable items such as metal hangers to dry cleaners.
- Promote waste prevention through advertising.



# About the Worksheets

This guide contains seven worksheets designed to help you implement a waste reduction program:

- Worksheet A: Facility Background Information**
- Worksheet B: Records Review: Waste Collection and Removal**
- Worksheet C: Facility Walk-Through**
- Worksheet D: Waste Sort**
- Worksheet E: Identifying Potential Waste Reduction Options**
- Worksheet F: Economic and Operational Feasibility**
- Worksheet G: Monitoring and Evaluation**

These worksheets will help companies to understand the types and amounts of waste generated and carefully analyze the options for reducing this waste. Companies can invest as much time and resources into their waste reduction program as they feel is necessary. The worksheets have been designed to be flexible in order to meet the waste reduction needs of different companies. Using these worksheets, companies can opt for the most basic program, which might simply involve collecting facility information, identifying potential waste reduction options, and program evaluation. More involved programs might entail reviewing records and/or conducting a facility walk-through, identifying program options, and evaluation. The most comprehensive program would entail examining facility records, conducting a waste sort, identifying and evaluating potential options, and monitoring the program over time. Depending on the level of your waste reduction effort, you might only want to complete certain worksheets. After determining the scope of your program, use the following chart to determine which worksheets are actually needed to achieve the level of waste reductions you are seeking.

<b>Level of waste reduction</b>	<b>Complete worksheets...</b>	<b>Optional</b>
Basic program	A, E, and G	B and F
Moderate program	A, B, C, E, and G	F
Comprehensive program	A, B, C, D, E, F, and G	—

Because there are a wide range of waste reduction programs, this chart is intended to offer guidance regarding the resources needed to complete the different worksheets. Your company should review the worksheets and determine which ones are needed to help you design and evaluate your waste reduction program.

**Note:** Because repeated duplication of the worksheets will diminish their clarity and make them more difficult to complete, it is recommended that you retain the original worksheets in this guide as masters. Be sure to use these originals whenever copies of the worksheets are needed.

# **A Facility Background Information**

***Use this worksheet to assemble background information on your company's layout and organization.***

**Data collected for this worksheet will be useful in designing and implementing your waste reduction program. Company records will provide much of the information requested. Interviewing building and department contacts may also be helpful.**

**If your company occupies several different buildings, you may want to record the requested information separately for each building, copying this worksheet as needed.**

# A Facility Background Information



<b>Building Name/Address:</b>
<b>Building Owner or Management Company:</b>
<b>Name of Contact:</b>
<b>Telephone Number:</b>

## 1 Physical Layout and Organization

Building Location:		
Number of Employees:	Size (Area):	Number of Floors:
Is the Facility Equipped with <input type="checkbox"/> Freight Elevators <input type="checkbox"/> Loading Dock		
List any Other Companies Leasing Space in the Building:		
Company	Name of Contact	Telephone Number

## 2 Company Departments and Functions

Department:
Name of Contact:
Telephone:
Location:
Major Functions:
Department:
Name of Contact:
Telephone:
Location:
Major Functions:

# **B** Records Review: Waste Collection and Removal

***Use this worksheet to record information on how solid waste is removed from your facility and to estimate the total amount paid for waste removal services.***

Company records (including waste hauling contracts, maintenance and operating logs, and waste removal records) will be the primary sources of information needed to complete this worksheet. Maintenance staff or contractors also might be able to provide information.

This worksheet measures current costs of "onsite waste collection" and "offsite waste removal." *Waste collection* involves gathering trash from individual offices and taking it to an onsite collection area such as a dumpster. *Waste removal* involves shipping the waste off site for disposal. In addition, this worksheet is designed to help you calculate waste removal costs whether you pay a flat fee for this service or are charged per pull. A *flat fee* is a rate charged for waste removal services that remains constant over a specific period of time (such as a year) regardless of fluctuations in the amount of waste generated. A *per pull* charge is a fee paid each time waste is hauled from a company.

If waste removal practices vary significantly among buildings, or if different waste contractors are used, record the information separately for each building in your company, copying this worksheet as needed.

# B Records Review: Waste Collection and Removal

<b>Building:</b> _____	<b>Department:</b> _____
<b>Name of Contact:</b> _____	
<b>Telephone Number:</b> _____	

## 1 Onsite Waste Collection

**A.** Name of Waste Collector: \_\_\_\_\_  
 Telephone Number: \_\_\_\_\_  
 Check One:  Maintenance Staff  Maintenance Contractor

**B.** Collection Schedule:  
 \_\_\_\_\_ times per \_\_\_\_\_ (day/week)

**C.** Annual Cost of Waste Collection (if maintenance contractor)  
 If waste collection is performed by a maintenance contractor and the fee for this service is not included in rent, use this formula to calculate the annual cost. If waste collection is performed by in-house staff, go to step 1-D.

_____	+	_____	=	\$ _____
Annual payments to maintenance contractor		Waste container rental fee, if any		<b>Annual Cost of Waste Collection</b>

**D.** Annual Cost of Waste Collection (if maintenance staff)  
 If waste collection is performed by in-house staff, calculate the costs below. When filling in hourly rate, be sure to calculate wage rate plus overhead including benefits. (In many businesses, a factor of 1.3 is often used. For example, for an employee earning \$10.00/hr, use an hourly rate of \$13.00.)

Collection personnel:

_____	<b>x</b>	_____	<b>x</b>	_____ <b>x 52 =</b> _____
Number of employees		Hourly rate		Hours per week spent on waste collection      Annual cost

_____	<b>x</b>	_____	<b>x</b>	_____ <b>x 52 =</b> _____
Number of employees		Hourly rate		Hours per week spent on waste collection      Annual cost

= \_\_\_\_\_  
Total annual labor cost

If applicable, add:

_____	per	_____	<b>x</b>	_____ <b>=</b> _____
Waste container(s) rental fee		Time period		Time periods per year      Annual waste container rental cost

_____	+	_____	=	\$ _____
Total annual labor cost		Annual waste container rental cost		<b>Annual Cost of Waste Collection</b>



# C Facility Walk-Through

***Use this worksheet to identify and record the different waste-generating activities and equipment in your facility, the types of waste produced, and any current waste reduction efforts. In addition, identify all materials that could be targeted by your waste reduction program and brainstorm ways to reduce, recycle, or compost these materials.***

The information needed to complete this worksheet can be obtained by conducting a walk-through of targeted functional areas or of your entire facility. The walk-through entails carefully observing waste-generating activities and equipment, examining the contents of waste containers, and interviewing supervisors and employees.

Be sure to pay close attention to areas and operations that tend to generate the largest amounts of waste, such as shipping and receiving departments, copying areas, cafeterias, assembly lines, and offices. Remember to include a review of the grounds maintenance operations. While conducting the walk-through, watch closely for activities and equipment that generate waste unnecessarily, as well as waste reduction efforts that are already in place.

Before the walk-through begins, contact department managers to inform them of the visit and the possibility of short interviews with department staff. (More involved interviews should be scheduled separately.) You may also want to interview custodial workers and operations staff.

If possible, schedule the walk-through just before trash pickups to allow a sufficient amount of waste to accumulate. Avoid scheduling it on or around holidays, company parties, or other special events that would produce wastes not representative of a normal workday.

During the walk-through, ask questions about variations in daily waste generation. For example, periodic deliveries may result in more discards on the delivery day. In addition, ask about any recent or upcoming changes within the department, such as new equipment or procedures, that could alter the types or amounts of waste generated.

Larger companies may want to record information gathered on the walk-through by department, copying this worksheet as needed.

# C Facility Walk-Through



<b>Date and Time of Walk-Through:</b>	<b>Department:</b>
<b>Department Manager:</b>	<b>Telephone Number:</b>
<b>Team Members Conducting Walk-Through:</b>	
_____	
_____	
<b>Employees Interviewed:</b>	
_____	
_____	
_____	

## 1 Waste Components

<b>Waste-Producing Activity or Equipment</b>	<b>Waste Material Produced</b>	<b>Estimated Amount of Waste Produced per Year</b>	<b>Current Waste Reduction Activities (if any)</b>
<i>Receiving shipments</i>	<i>Cardboard boxes</i>	<i>About 50 boxes per week/2,600 per year</i>	<i>Recycling</i>
	<i>Foam peanuts</i>	<i>2 waste containers (5 cubic yards each) per week/100 per year</i>	<i>None</i>





# D Waste Sort

***Use this worksheet if you need a more detailed profile of the amounts and types of waste generated at your facility than a records review or facility walk-through can provide.***

This worksheet provides step-by-step instructions for sorting, weighing, and recording data on the waste your company generates.

Two different types of sampling methods can be used during a waste sort. The first method is to collect and sort all the waste generated during the day. This is the most practical method for smaller companies. The second method is to use a representative sample of approximately 50 pounds of waste from each collection container (i.e., dumpster) at the company. This is more appropriate for larger companies.

If you elect to analyze a representative sample, be sure your sorting sample is truly representative. Waste generation and waste components can vary significantly from day to day, season to season, and year to year. In addition, periodic events such as holiday parties and special orders can affect your company's waste stream. If you suspect that the waste sample being sorted is not truly representative of your company's waste-generating practices, consult with your trash collection or operations manager for input on the accuracy of the data. Make a note on this worksheet of any results you believe are not accurate. When sorting a sample, you will still need to weigh or estimate one day's worth of waste in order to extrapolate annual estimates for each waste category.

Determine the size and location of the area in which you will sort the waste. For smaller companies, it might be easiest to sort the sample in a large indoor room after business hours. If large quantities of waste will be sorted, a large, flat area such as a parking garage or shipping and receiving area is preferable. It is advisable to sort in a sheltered area to provide cover from adverse weather. Be sure to consider health and safety issues as well. All members of the waste reduction team should wear protective clothing (such as leather or thick rubber gloves, heavy-duty shoes, safety glasses, and coveralls), and precautions should be taken to ensure that the waste does not come in contact with food or drink.

You will need several containers for holding the sorted wastes and a scale for weighing the samples. The size of the containers depends on the amount of waste to be sorted. Office wastebaskets might work well for small sorts. For larger companies, 30- to 50-gallon plastic containers, garbage cans, or large corrugated cardboard boxes will be needed. If there are no large scales at your facility, they often can be rented. In addition, you also will need shovels or pushbrooms, a clipboard, labels, pens, and a first aid kit.

A three- or four-person waste reduction team in a small- to medium-size facility can probably complete the sorting and weighing in a few hours. Waste sorts at a larger facility will take longer, depending on the size of the team and the amount of waste to be sorted.

# D Waste Sort Instructions

## 1 Beginning the Waste Sort

- A.** Assemble the waste sample to be sorted, using either one day's worth of waste or an otherwise representative sample of waste from your facility.
- B.** Weigh the empty containers that the sorted wastes will be placed into and record these weights on a label on each container.
- C.** Sort the waste sample by major component (paper, plastics, glass, metal, compostable organics, other).
- D.** If needed, further sort each major waste component into more specific component subcategories (e.g., glass into clear, green, amber, or other).
- E.** Place the sorted materials into separate labeled containers.

## 2 Calculating Net Component Weights

- A.** Weigh each filled waste container and subtract the weight of the container (from 1-B) to obtain the net component weight. Record the net component weight on the spaces provided on the Waste Sort Form. If you did not sort these waste components into component subcategories, proceed to Step 2-C.
- B.** If you sorted the waste components into component subcategories, add their net weights and record the total waste component weight on the Waste Sort Form.
- C.** Add all the total waste component weight figures to determine the total sample weight and record this total on the Waste Sort Form.

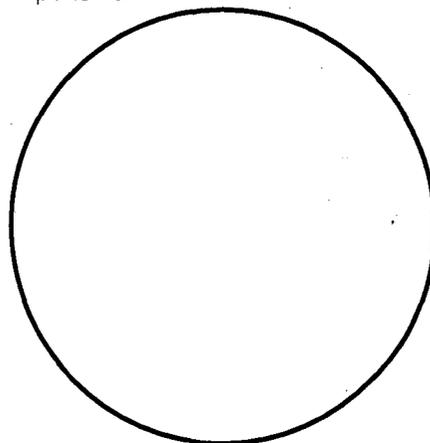
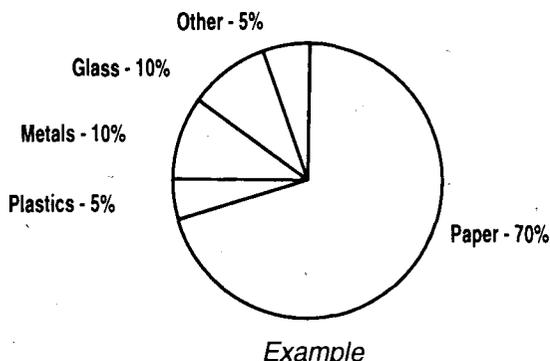
## 3 Calculating Percent of Total Sample Weight

- A.** Use the following formula and the figures recorded in the Net Component Weight column of the Waste Sort Form to compute the percentage each waste component constitutes the total weight of the sample. Repeat the calculation for each waste component under consideration and record the results in the Percent of Total Sample Weight column on the Waste Sort Form. (Note: If you sorted the waste components into component subcategories, you also may choose to calculate the percentage of the sample occupied by each waste component subcategory, depending on the level of information you are interested in.)

$$\frac{\text{Net component weight}}{\text{Total sample weight}} \times 100 = \boxed{\text{Percent of Total Sample Weight}} \%$$

# D Waste Sort Instructions

**B.** Use the data listed in the Percent of Total Sample Weight column on the Waste Sort Form to create a pie chart to help compare the percentages of the different waste components.



## 4 Calculating Weight of Waste Generated Annually

**A.** If you sorted one day's worth of waste, calculate the weight of waste generated for each waste component using the following formula:

$$\frac{\text{Net component weight}}{\text{Number of working days per year}} \times \text{Number of working days per year} = \text{Weight of Waste Generated Annually}$$

**B.** If you sorted a representative sample, first weigh or estimate all of the waste generated by your company that day. Calculate the amount of waste generated annually for each waste component using the following formulas:

$$\frac{\text{Total component weight generated/day}}{\text{Total sample weight (all components)}} = \text{Multiplier}$$

$$\text{Net component weight} \times \text{Multiplier} \times \text{Number of work days per year} = \text{Weight of Waste Generated Annually}$$

**C.** Repeat the appropriate calculation for each waste component under consideration and record the figures in the Weight of Waste Generated Annually column on the Waste Sort Form. (Note: If you sorted the waste components into component subcategories, you may choose to calculate the amount of waste generated annually by each waste component subcategory, depending on the level of detail you are interested in obtaining.)

# D Waste Sort Form



<b>Date of Waste Sort:</b>	<b>Department:</b>
<b>Source of Sample (if different from department):</b>	
<b>Sample Collected Over:</b> <input type="checkbox"/> <b>One Day</b> <input type="checkbox"/> <b>Two Days</b> <input type="checkbox"/> <b>Other Technique (specify)</b> _____	
<b>Sample Collected:</b> <input type="checkbox"/> <b>All Waste at Source</b> <input type="checkbox"/> <b>Representative Sample (specify weight)</b> _____	
<b>Team Members Conducting Waste Sort:</b>	
_____	
_____	
<b>Factors Affecting Representativeness of Sort:</b>	
_____	
_____	

	<b>Waste Component</b>	<b>Net Component Weight</b>	<b>Percent of Total Sample Weight (all components)</b>	<b>Weight of Waste Generated Annually</b>
<b>Paper</b>	High-Grade			
	Low-Grade			
	Computer Printout			
	Newsprint			
	Corrugated Cardboard			
	Magazines/Glossy			
	Other			
	<b>Total Component Weight</b>			
<b>Plastics</b>	PET (1)			
	HDPE (2)			
	PVC (3)			
	LDPE (4)			
	Polypropylene (5)			
	Polystyrene (6)			
	Other (7)			
	<b>Total Component Weight</b>			

# D Waste Sort Form

Waste Component		Net Material Weight	Percent of Total Sample Weight	Weight of Waste Generated Annually
<b>Glass</b>	Clear			
	Green			
	Amber			
	Other			
	<b>Total Component Weight</b>			
<b>Metal</b>	Aluminum			
	Other Non-Ferrous Metal			
	Tin-Coated Steel			
	Other Ferrous Metal			
	Bi-Metal			
	Other			
	<b>Total Component Weight</b>			
<b>Compostable Organics</b>	Yard Trimmings			
	Food Scraps			
	Scrap Wood			
	Other			
	Other			
	Other			
	<b>Total Component Weight</b>			
<b>Other</b>	Textiles			
	Rubber			
	Leather			
	Inorganic (e.g., ceramics, mixed materials)			
	Copier Toner Cartridges			
	Other			
	<b>Total Component Weight</b>			
<b>Totals</b>				

**E****Identifying Potential Waste Reduction Options**

***Use this worksheet to list and screen the potential waste reduction options that have emerged from your waste assessment.***

**This worksheet enables you to list all the potential waste prevention, recycling, composting, and purchasing options that might be feasible for your waste reduction program. Information needed to fill out this worksheet will come from your records review, facility walk-through, and waste sort, as well as from your general working knowledge about your company and its operations. At this point, the team might want to meet to discuss the results of the waste assessment and to brainstorm potential options for the program.**

**Once you have listed the potential options, use this worksheet to help you quickly identify those options that are most feasible based on economic, operational, and other criteria. This process serves to screen out those ideas that are least feasible, enabling you to concentrate on a select set of options for further analysis in Worksheet F.**





# **F** Economic and Operational Feasibility

***Use this worksheet to evaluate the economic and operational feasibility of the waste reduction options under consideration.***

The tables in this worksheet will enable you to examine more closely the potential waste reductions options that passed your initial screening in Worksheet E. Much of the information requested on this worksheet involves business judgments concerning such factors as the effect each option is likely to have on productivity and the ease of implementation. You may want to consult with department managers on some issues. Certain questions may not be applicable to all waste reduction options.

For the economic evaluation sections of this worksheet, refer to purchasing records, disposal records, waste sort or facility walk-through data, and interviews with company employees, as well as information recorded on earlier worksheets. Consult company purchasing officials, financial advisors, or department managers as necessary.

Fill out a separate worksheet for each waste reduction option to be evaluated, copying the forms as needed. Use the last page of this worksheet to summarize the economic, operational, and intangible factors associated with the waste reduction options under evaluation.

# **F Economic and Operational Feasibility**



**Waste Reduction Option** \_\_\_\_\_  
\_\_\_\_\_

## **1 Operational Factors**

**A.** Could this option improve or reduce product or service quality? How?

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**B.** Could this option improve or reduce productivity? How?

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**C.** Will additional staff or time be required to implement, operate, or maintain this option? How many? What would additional staff be required to do?

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# **F Economic and Operational Feasibility**



**D.** Can the option be implemented within the existing facility setup, or are adjustments needed (such as additional space or a change in layout) to accommodate the option? If so, what?

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**E.** Will any new equipment be needed? If so, what?

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**F.** Are there companies willing to purchase collected recyclable materials? List area buyers or haulers willing to collect material.

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**G.** Can reusable materials be donated to a local community group or listed with a materials exchange?

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# F Economic and Operational Feasibility

## 2 Economic Factors

### A. Capital Costs for This Option

Equipment Purchased (e.g., baler, containers)

	\$ _____
	\$ _____
	\$ _____

Facility/Storage Preparation (e.g., grading a site for composting)

\$ \_\_\_\_\_

Installation/Utility Connection (for equipment such as compactors)

\$ \_\_\_\_\_

Initial Staff Training

\$ \_\_\_\_\_

Initial Promotional and Educational Materials

\$ \_\_\_\_\_

Other (specify)

	\$ _____
	\$ _____
	\$ _____

\$ \_\_\_\_\_

**Total Capital Costs**

### B. Annual Operating Costs for This Option

Materials and Supplies

\$ \_\_\_\_\_/year

Operation & Maintenance

\$ \_\_\_\_\_/year

(e.g., labor, equipment, storage space, service contracts, utility charges)

Transportation

\$ \_\_\_\_\_/year

Ongoing Staff Training

\$ \_\_\_\_\_/year

Ongoing Promotion and Education

\$ \_\_\_\_\_/year

Other (specify)

	\$ _____/year
	\$ _____/year
	\$ _____/year

\$ \_\_\_\_\_

**Total Annual Operating Costs**

# F Economic and Operational Feasibility

**C. Avoided Waste Removal Costs for this Option**

Use the table below to calculate the annual avoided removal costs for this waste reduction option. Using data from the waste sort, purchasing records, and interviews with personnel as a starting point, estimate the annual amount of waste this option will reduce. If necessary, use the conversion factors listed in Appendix C to convert the amount of waste material being reduced (Column 3 below) to the same unit of measure (e.g., cubic yards or tons) as your waste removal cost.

Waste Reduction Activity	Waste Material Being Reduced	Amount of Waste Reduced per Time Period	Annual Amount of Waste Reduced	Waste Removal Cost	Annual Avoided Removal Cost
			<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>X Annual Multiplier =</b> </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>X</b> </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> <b>=</b> </div>
Replace single-use plates with dishes in cafeteria	Single-use plates	5 cubic yards per week	260 cubic yards per year	\$3 per cubic yard	\$780

**D. Avoided Purchase Costs for this Option**

If the waste reduction option under consideration will result in the opportunity to purchase fewer supplies or materials, use the formula below to calculate the annual avoided purchase costs for this option.

Type of Material \_\_\_\_\_

$$\begin{array}{c}
 \underline{\hspace{10em}} \\
 \text{Annual reduction in purchasing} \\
 \text{[In same unit of measure} \\
 \text{as the unit price]}
 \end{array}
 \times
 \begin{array}{c}
 \underline{\hspace{10em}} \\
 \text{Unit price}
 \end{array}
 =
 \$
 \begin{array}{c}
 \underline{\hspace{10em}} \\
 \text{Annual Avoided} \\
 \text{Purchase Costs}
 \end{array}$$

**E. Annual Revenues for this Option**

Use the formula below to estimate annual revenues for this option (if any).

$$\begin{array}{c}
 \underline{\hspace{10em}} \\
 \text{Sale of recyclable} \\
 \text{materials}
 \end{array}
 +
 \begin{array}{c}
 \underline{\hspace{10em}} \\
 \text{Sale of items in a} \\
 \text{materials exchange}
 \end{array}
 +
 \begin{array}{c}
 \underline{\hspace{10em}} \\
 \text{Sale of compost}
 \end{array}
 =
 \$
 \begin{array}{c}
 \underline{\hspace{10em}} \\
 \text{Total Annual} \\
 \text{Revenues}
 \end{array}$$

# F Economic and Operational Feasibility

**F. Net Savings for This Option**

Use the formula below to calculate the total annual savings for this option.

$$\begin{array}{ccccccc}
 \underline{\hspace{2cm}} & + & \underline{\hspace{2cm}} & + & \underline{\hspace{2cm}} & = & \$ \underline{\hspace{2cm}} \\
 \text{Annual avoided} & & \text{Annual avoided} & & \text{Annual revenues} & & \\
 \text{removal costs} & & \text{purchase costs} & & \text{[from Step 2-E]} & & \\
 \text{[from Step 2-C]} & & \text{[from Step 2-D]} & & & & \text{Total Annual} \\
 & & & & & & \text{Savings}
 \end{array}$$

**G. Net Annual Cost or Savings for This Option**

Subtract the total annual operating costs from the total annual savings to arrive at the net annual cost or savings resulting from this waste reduction option (exclusive of capital costs).

$$\begin{array}{ccccccc}
 \underline{\hspace{2cm}} & - & \underline{\hspace{2cm}} & = & \$ \underline{\hspace{2cm}} \\
 \text{Total annual savings} & & \text{Total annual} & & \\
 \text{[from Step 2-E]} & & \text{operating costs} & & \\
 & & \text{[from Step 2-B]} & & \text{Annual Net} \\
 & & & & \text{Costs or Savings}
 \end{array}$$

**H. Interpreting Net Costs**

If the figure arrived at in 2-F is positive, proceed to 2-I.

If the figure arrived at in 2-F is negative, this option will cost more to implement than it will save. First, review the numbers to ensure you have accounted for all potential costs and savings. If the result is the same, you will need to determine whether this option belongs in your waste reduction program. If this option has other intangible benefits (such as improved public relations and employee morale), you might consider including it. In addition, be sure to consider the program as a whole. This option might make sense if the other components of your program will result in large enough savings to offset the costs of this option, resulting in overall program savings.

If you decide it should not be included in your waste reduction program at this time, you might want to make a note to revisit this option if conditions change. For example, if the market for a recyclable material improves significantly or equipment costs decline due to technological advances, this option might become cost-effective.

# F Economic and Operational Feasibility

**I. Payback Period for This Option**

Payback period is one of many ways of measuring the economic feasibility of the options under consideration. The payback period measures the amount of time needed for the cumulative revenues or savings resulting from the waste reduction program to equal the initial investment. (This calculation is only relevant when annual savings or revenues exceed annual costs.) If your company uses other measures of investment worthiness (internal rate of return, net present value, etc.) you may wish to use one of these methods instead of calculating the payback period.

Calculate the payback period using the formula below.

$$\frac{\text{Total capital costs [from Step 2-A]}}{\text{Annual net savings [from Step 2-F]}} = \text{Payback Period (Years)}$$

Note: If the payback period is longer than the useful life of any of the equipment purchases listed in 2-A, add the costs of replacing this equipment to 2-A and recalculate the payback period.

## 3 Other Factors

Aspects of the options that cannot easily be expressed using the Economic and Operational Feasibility tables and formulas may be explained below. (These intangible factors include improved working environment, corporate image, employee and customer satisfaction, community relations, and recognition.) List the intangible advantages and drawbacks associated with implementing this option.

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# G Monitoring and Evaluation

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***Use this worksheet to analyze your waste reduction program once it has been fully implemented and in place long enough to be evaluated.***

Program monitoring and evaluation is a critical element of any waste reduction program. This worksheet will help you gauge the effectiveness of your waste reduction program by estimating 1) how much waste your company is reducing, 2) avoided waste removal costs, 3) avoided purchasing costs, and 4) revenues.

Be aware, however, that this worksheet does not calculate *net* costs or savings of the program. To do this, you would need to consider any capital and operating expenses incurred as a result of the program, as listed in Worksheet F. Now might be a good time to revisit that worksheet.

Also, factors other than your program could be affecting the amount of waste your company is generating, its waste removal and purchase costs, and any savings being realized. Consider if any extenuating factors (such as a reduction in your workforce) are contributing to these measures of success.

Finally, keep in mind that costs are not the sole indicator of a program's success. Be sure to consider the intangible benefits of waste reduction, such as improved corporate image and employee morale, when ascertaining the success of your program.

# G Monitoring and Evaluation



<b>Name of Reviewer:</b>	<b>Date of Review:</b>
<b>Building:</b>	<b>Department:</b>
<b>Name of Contact:</b>	<b>Telephone Number:</b>

## 1 Amount of Waste Reduced

Use the following tables to quantify the annual amount of waste that is being reduced as a result of your company's waste reduction efforts. When recording the amount of waste prevented, use whatever time period (e.g., weeks or months) is easiest for you to measure. Multiply these figures by the appropriate annual multiplier to come up with an estimate of the amount of waste reduced per year. Then, in the last column of each table, convert this amount to either weight or volume. (If you are charged for waste removal based on weight, convert the amount of waste reduced to tons. If you are charged for waste removal by volume or per pull, convert this amount to cubic yards).

### A. Waste Prevention

Activity	Type of Waste Prevented	Amount of Waste Prevented (units/time period)	Annual Amount of Waste Prevented	Conversion to Tons or Cubic Yards*
			X Annual Multiplier =	
<i>Double-sided copying</i>	<i>White office paper</i>	<i>12 reams per week</i>	<i>624 reams per year</i>	<i>21 cubic yards per year</i>
<i>Donate wooden pallets</i>	<i>Pallets</i>	<i>10 pallets per week</i>	<i>520 pallets per year</i>	<i>10.4 tons per year</i>
<b>Total</b>				

\* See Appendix C for conversion tables.



# G Monitoring and Evaluation

## 2 Avoided Waste Removal Costs

Avoided waste removal costs will be calculated differently, depending on how your company is charged for waste hauling. Companies may be charged by weight (2-A), volume (2-B), container pull (2-C), or a combination (2-D) of these. Complete as many of the following tables as appropriate for your company's waste hauler billing system(s).

### A. Avoided Waste Removal Costs (if charged by weight)

<b>Activity</b>	<b>Total Annual Amount of Waste Reduced</b> (in tons) <i>[from Worksheet G-1]</i>	<b>Waste Removal Cost</b> (per ton) <i>[from Worksheet B-2]</i>	<b>Annual Avoided Removal Costs</b>
		<b>X</b>	<b>=</b>
Waste Prevention			
Recycling			
Composting			
<b>Total</b>			

### B. Avoided Waste Removal Costs (if charged by volume)

<b>Activity</b>	<b>Total Annual Amount of Waste Reduced</b> (in cubic yards) <i>[from Worksheet G-1]</i>	<b>Waste Removal Cost</b> (per cubic yard) <i>[from Worksheet B-2]</i>	<b>Annual Avoided Removal Costs</b>
		<b>X</b>	<b>=</b>
Waste Prevention			
Recycling			
Composting			
<b>Total</b>			

# G Monitoring and Evaluation

**C. Avoided Waste Removal Cost (if charged by container pull)**

If your facility is charged by container pull, use the following table to show how many fewer pulls could have resulted from your waste reduction activities.

Activity	Total Annual Amount of Waste Reduced (in cubic yards) <i>[from Worksheet G-1]</i>	Volume of Hauling Container	Container Pulls Avoided	Cost per Pull (in dollars) <i>[from Worksheet B-2]</i>	Annual Avoided Waste Removal Costs
	÷		=	x	=
Waste Prevention					
Recycling					
Composting					
<b>Total</b>					

**D. Total Avoided Waste Removal Costs**

If your company is charged in a combination of ways for waste removal services, and you have filled out two or more of the above tables, use the following formula to calculate your total avoided removal costs.

$$\begin{array}{r}
 \underline{\hspace{2cm}} \\
 \text{Total annual avoided} \\
 \text{waste removal costs} \\
 \text{by weight [from 2-A]}
 \end{array}
 +
 \begin{array}{r}
 \underline{\hspace{2cm}} \\
 \text{Total annual avoided} \\
 \text{removal costs by} \\
 \text{volume [from 2-B]}
 \end{array}
 +
 \begin{array}{r}
 \underline{\hspace{2cm}} \\
 \text{Total annual avoided} \\
 \text{waste removal costs} \\
 \text{by container pull} \\
 \text{[from 2-C]}
 \end{array}
 =
 \begin{array}{c}
 \$ \underline{\hspace{2cm}} \\
 \text{Total Annual} \\
 \text{Avoided Waste} \\
 \text{Removal Costs}
 \end{array}$$

# G Monitoring and Evaluation

## 3 Revenues and Avoided Purchase Costs

### A. Revenues

Use the following table to calculate the revenues received from collected recyclable or exchanged materials.

Activity	Amount Collected per Time Period	Annual Amount Collected	Unit Price	Estimated Annual Revenue
		<b>X Annual Multiplier =</b>	<b>X</b>	<b>=</b>
<i>Glass recycling</i>	<i>55 pounds per week</i>	<i>2,860 pounds per year</i>	<i>\$0.08 per pound</i>	<i>\$229</i>
<b>Total</b>				

If your company receives additional revenues from other measures such as materials exchanges or the sale of compost, use the formula below to calculate total annual revenues from your waste reduction program.

$$\begin{array}{r}
 \underline{\hspace{2cm}} \\
 \text{Revenues from recycling}
 \end{array}
 +
 \begin{array}{r}
 \underline{\hspace{2cm}} \\
 \text{Revenues from materials} \\
 \text{exchanges, compost sales, etc.}
 \end{array}
 =
 \begin{array}{r}
 \boxed{\hspace{2cm}} \\
 \$ \\
 \text{Total Annual Revenues}
 \end{array}$$

# G Monitoring and Evaluation

**B. Avoided Purchase Costs**

Use the following table to calculate the annual savings from avoided purchase costs resulting from all waste reduction activities (waste prevention, composting, recycling, materials exchange).

<b>Activity</b>	<b>Material</b>	<b>Amount of Material Not Purchased per Time Period</b>	<b>Unit Price</b>	<b>Total Avoided Purchase Cost</b>	<b>Annual Avoided Purchase Cost</b>
			<b>X</b>	<b>=</b>	<b>X Annual Multiplier =</b>
<i>Double-sided copying</i>	<i>White office paper</i>	<i>12 reams per week</i>	<i>\$3 per ream</i>	<i>\$36 per week</i>	<i>\$1,872</i>
<b>Total</b>					

# G Monitoring and Evaluation

**C. Total Revenues and Avoided Purchase Costs**

Calculate the total annual revenues and avoided purchase costs using the following formula:

$$\begin{array}{c} \text{_____} \\ \text{Total annual revenues} \\ \text{[from 3-A]} \end{array} + \begin{array}{c} \text{_____} \\ \text{Total annual avoided} \\ \text{purchase costs [from 3-B]} \end{array} = \$ \begin{array}{c} \text{_____} \\ \text{Total Annual Revenues} \\ \text{and Avoided Purchase} \\ \text{Costs} \end{array}$$

## 4 Gross Annual Waste Reduction Savings

Use the following formula to calculate the gross annual savings resulting from your waste reduction program. If an estimate of your program's net savings is desired, use Step 2-B in Worksheet F to estimate operating costs for each of your waste reduction measures. Then, subtract these costs from the gross savings calculated below.

$$\begin{array}{c} \text{_____} \\ \text{Total annual avoided} \\ \text{waste removal costs} \\ \text{[from Step 2-D]} \end{array} + \begin{array}{c} \text{_____} \\ \text{Total annual revenues and} \\ \text{avoided purchase costs} \\ \text{[from Step 3-C]} \end{array} = \$ \begin{array}{c} \text{_____} \\ \text{Gross Annual Waste} \\ \text{Reduction Savings} \end{array}$$

## 5 Purchases of Recycled Products

Use the following table to track your purchase of products with recycled content.

Recycled Content Product	Annual Quantity Purchased	Unit Price	Annual Purchase Cost
		X	=
Recycled corrugated cardboard boxes	2,000 units	\$.10 per unit	\$200

# **G Monitoring and Evaluation**



## **6 Other Factors**

Consider other significant factors that may have influenced any changes in cost or savings. For example, did your number of employees increase or decrease?

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## **7 Summary**

Summarize the success of your waste reduction program and describe any drawbacks. Indicate ways to address these drawbacks.

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# Volume-to-Weight Conversion Table

The volume-to-weight conversion table presented on the following pages is a compilation of several sources. Materials converted from volume to weight include paper (high-grade and other), glass, plastic, metals, organics, and other materials (e.g., tires and oil).

It is important to note that although the weight (density) figures presented here are useful for determining rough estimates, they will not be as useful when precise measurements are required. Differences in the way a material is handled, processed, or in the amount of moisture present can make substantial differences in the amount a particular material weighs per specified volume. Because of these differences, it will be important to actually sort and weigh materials in your program whenever precise measurements are needed (e.g., recycling contract agreements).

<b>Category</b>	<b>Material</b> (u/c = uncompacted/ compacted & baled)	<b>Volume</b>	<b>Estimated Weight</b> (in pounds)
<b>High-Grade Paper</b>	<i>Computer Paper:</i>		
	Uncompacted, stacked	1 cu. yd.	655
	Compacted/baled	1 cu. yd.	1,310
	1 case	2800 sheets	42
	<i>White Ledger:</i>		
	(u)stacked/(c)stacked	1 cu. yd.	375-465/755-925
	(u)crumpled/(c)crumpled	1 cu. yd.	110-205/325
	Ream of 20# bond; 8-1/2 x 11	1 ream = 500 sheets	5
	Ream of 20# bond; 8-1/2 x 14	1 ream = 500 sheets	6.4
	White ledger pads	1 case = 72 pads	38
	<i>Tab Cards:</i>		
	Uncompacted	1 cu. yd.	605
	Compacted/baled	1 cu. yd.	1,215-1,350

<b>Category</b>	<b>Material</b> (u/c = uncompacted/ compacted & baled)	<b>Volume</b>	<b>Estimated Weight</b> (in pounds)
<b>Other Paper</b>	<i>Cardboard (Corrugated):</i>		
	Uncompacted	1 cu. yd.	50-150
	Compacted	1 cu. yd.	300-500
	Baled	1 cu. yd.	700-1,100
	<i>Newspaper:</i>		
	Uncompacted	1 cu. yd.	360-505
	Compacted/baled	1 cu. yd.	720-1,000
	12" stack	—	35
	<i>Miscellaneous Paper:</i>		
	Yellow legal pads	1 case = 72 pads	38
	Colored message pads	1 carton = 144 pads	22
	Self-carbon forms; 8-1/2 x 11	1 ream = 500 sheets	50
	<i>Mixed Ledger/Office Paper:</i>		
	Flat (u/c)	1 cu. yd.	380/755
	Crumpled (u/c)	1 cu. yd.	110-205/610
<b>Glass</b>	<i>Refillable Whole Bottles:</i>		
	Refillable beer bottles	1 case = 24 bottles	14
	Refillable soft drink bottles	1 case = 24 bottles	22
	8 oz. glass container	1 case = 24 bottles	12
	<i>Bottles:</i>		
	Whole	1 cu. yd.	500-700
	Semi-crushed	1 cu. yd.	1,000-1,800
	Crushed (mechanically)	1 cu. yd.	1,800-2,700
	Uncrushed to manually broken	55-gallon drum	300

<b>Category</b>	<b>Material</b> (u/c = uncompacted/ compacted & baled)	<b>Volume</b>	<b>Estimated Weight</b> (in pounds)
<b>Plastic</b>	<i>PET (Soda Bottles):</i>		
	Whole bottles, uncompacted	1 cu. yd.	30-40
	Whole bottles, compacted	1 cu. yd.	515
	Whole bottles, uncompacted	gaylord	40-53
	Baled	30" x 62"	500-550
	Granulated	gaylord	700-750
	8 bottles (2-liter size)	—	1
	<i>HDPE (Dairy):</i>		
	Whole, uncompacted	1 cu. yd.	24
	Whole, compacted	1 cu. yd.	270
	Baled	32" x 60"	400-500
	<i>HDPE (Mixed):</i>		
	Baled	32" x 60"	900
	Granulated	semi-load	42,000
	<i>Odd Plastic:</i>		
	Uncompacted	1 cu. yd.	50
	Compacted/baled	1 cu. yd.	400-700
	<i>Mixed PET and HDPE (Dairy):</i>		
	Whole, uncompacted	1 cu. yd.	32
	<b>Metals</b>	<i>Aluminum (Cans):</i>	
Whole		1 cu. yd.	50-75
Compacted (manually)		1 cu. yd.	250-430
Uncompacted		1 full grocery bag 1 case = 24 cans	1.5 0.9
<i>Ferrous (tin-coated steel cans):</i>			
Whole		1 cu. yd.	150
Flattened		1 cu. yd.	850
Whole		1 case = 6 cans	22

<b>Category</b>	<b>Material</b> (u/c = uncompacted/ compacted & baled)	<b>Volume</b>	<b>Estimated Weight</b> (in pounds)
<b>Organics</b>	<i>Yard trimmings*:</i>		
	Leaves (uncompacted)	1 cu. yd.	200-250
	Leaves (compacted)	1 cu. yd.	300-450
	Leaves, vacuumed	1 cu. yd.	350
	Grass clippings (uncompacted)	1 cu. yd.	350-450
	Grass clippings (compacted)	1 cu. yd.	550-1,500
	Finished compost	1 cu. yd.	600
	<i>Scrap Wood:</i>		
	Pallets	—	30-100 (40 avg.)
	Wood chips	1 cu. yd.	500
	<i>Food Waste:</i>		
	Solid/liquid fats	55-gallon drum	400-410
	<b>Other Materials</b>	<i>Tires:</i>	
Car		1 tire	12-20
Truck		1 tire	60-100
<i>Oil (Used Motor Oil)</i>		1 gallon	7

\*Density of yard trimmings is highly variable depending on moisture content.

## Conversion Table Sources

Brown University Summer Internship Program, *Guide for Preparing Commercial Solid Waste Reduction and Recycling Plans*, prepared for Ocean State Cleanup and Recycling (OS-CAR), Providence, Rhode Island, 1988.

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

Fenedick, Al Jr., Kimberly Henderson, and Jay Birgamini, *Office Recycling Handbook*, Region 5, USEPA and General Services Administration, 1990.

Hunt, Robert, Franklin Associates, personal communication, April 18, 1991.

New Jersey Department of Environmental Protection, Office of Recycling. *Steps in Organizing a Municipal Recycling Program*, 1988.

New York State Department of Environmental Conservation, *Recycling: A Planning Guide for Communities*, Division of Solid Waste, January 1990.

Reynolds, John, *Business Waste Reduction Audit Handbook*, Spokane Regional Council, Spokane, Washington, February 1989.

R.W. Beck and Associates, *Commercial Waste Reduction Audit Manual*, prepared for the City of Seattle Solid Waste Utility Under the Environmental Allowance Program, January 1989.

Scheinberg, Anne and Dee Cotherman, *Business Recycling Manual*, prepared for Westchester County Association, Inc., White Plains, New York, November 1989.

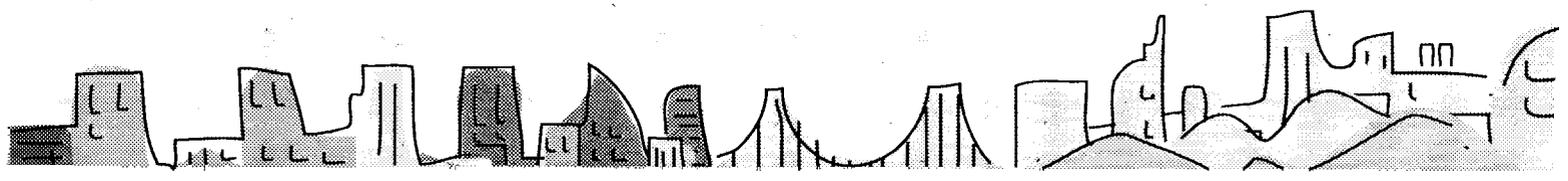
Conversion factors are adapted from information in: "Recycling is Everybody's Business", Morris County Municipal Utilities Authority, April 1989 and "Recycling Manual: Oneida and Herkimer Counties Solid Waste Management Project", William F. Cosulich Associates, 1988.

# Appendix D

## Reference Section

### Available Publications:

- *Food for Thought, Restaurant Guide to Waste Reduction and Recycling*, developed by the City and County of San Francisco, adapted by the California Integrated Waste Management Board (CIWMB).
- *Waste Reduction for Business and Industry*, CIWMB.
- *Don't Throw Your Profits Out with the Trash*, how companies affected their "bottom line" by establishing waste management programs, CIWMB.
- *Grasscycling, Send Your Grass Back to its Roots*, saving time, money, and valuable landfill space by leaving grass clippings on the lawn when mowing, CIWMB.
- *Discussions on Waste Prevention Barriers and State Actions to Overcome Them*, CIWMB.
- *Composting, Nature's Way to Recycle*, tips on backyard composting, CIWMB.
- *A Guide to State Assistance for Recycling Based Manufacturing*, Division of Recycling (DOR).
- *Preferred Packaging Procurement Guidelines*, a voluntary program to promote purchasing of packaging which will reduce waste, Washington Retail Association.
- *Recycling Education Package*, DOR.
- *Funding Opportunities for Recycling Business Enterprises*, DOR.
- *Hotel/Motel Recycling Manual*, DOR.
- *Info Cycle*, brochure on DOR's electronic bulletin board.
- *A Guide to Starting a Recycling Business*, DOR.
- *NonProfit Recycling Manual*, DOR.
- *Recycling at Work*, pamphlet, DOR.
- *Resource Center Guide*, DOR.
- *Resource Guide to California's Recycling Companies Serving Restaurants and Bars*, DOR.
- *California Recycling Review, Technical Bulletin*, DOR.
- *Summary of Source Reduction Efforts Nationwide*, Gainer & Associates, et. al.
- *Source Reduction Now*, Minnesota Office of Waste Management.
- *Great Canadian Hotels with Great Environmental Ideas*, Canadian Pacific Hotels & Resorts.
- *INFOPAC: Paper Reduction Project*, Nissan Motor Corporation.
- *Handbook for Environmentally Responsible Packaging in the Electronics Industry*, R<sup>3</sup>P<sup>2</sup>.
- *CALMAX Business Reuse and Recycling Catalog*, a bimonthly catalog to advertise free or low cost items available or wanted.



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King County Solid Waste Division, *Business Waste Reduction and Recycling Handbook*.

San Jose Office of Environmental Management, *Commercial/Industrial Recycling Implementation Plan*.

Portland Metro Recycling Program, *How to Get Rid of Your Company Paperwork*.

Contra Costa Council Waste Management Task Force, *1991 Waste Management and Recycling Guidebook for Business*.

California Integrated Waste Management Board, *Encouraging Commercial Sector Participation in Waste Diversion Programs*, February 1992 Resource Manual.

The Sacramento Business Journal, *Business and the Earth - Global Ideas for Local Solutions*.

Washington State Department of Ecology, *Reducing Waste in Your Business*.

Washington Retail Association, *Preferred Packaging Procurement Guidelines*.

Northeast Maryland Waste Disposal Authority, *Guide to Commercial & Institutional Recycling*.

