



**Seeing Green
Through Waste
Prevention**

A Guide

for School

Districts

**California
Integrated
Waste
Management
Board**



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Rio Linda Union Elementary School District

Placerville Union Elementary School District

San Jose Unified School District

Introduction

The California Integrated Waste Management Board (Board) was established in 1990 as the state's lead agency for managing solid waste in California. The mission of the Board is to protect public health and safety and the environment through waste prevention, waste diversion, and safe waste processing and disposal. The Board accomplishes this mission by:

Educating the public about the value of resource conservation and the economic and environmental costs of waste disposal;

Facilitating the development of markets for recyclable materials and the treatment of solid waste as a resource;

Aggressively enforcing environmental regulations;

Developing effective relationships with local governments and private industry to develop and implement integrated waste management programs;

Conducting focused research in support of the waste management hierarchy.

Developing cost-effective, economically feasible, and environmentally safe approaches to waste management; and

Facilitating the development of facilities required to divert waste from disposal and provide disposal capacity for materials that cannot feasibly be diverted.

The Board is part of the California Environmental Protection Agency.

Waste Prevention Reduces Waste, Saves Resources and Money!

Although nearly everyone is familiar with recycling, few people have looked seriously at waste prevention, also called source reduction. Think about it. If you don't create waste, you don't have to store, collect, and haul it to a landfill. Waste prevention also saves resources by encouraging more efficient use of materials, and it reduces pollution associated with extracting raw materials, manufacturing excess items, and disposing of waste. So by practicing waste prevention, you can help the environment and cut costs simultaneously.

If waste prevention is so beneficial, then why aren't more people practicing it? The answer is easy. We are all used to doing things a certain way, and preventing waste means we have to make changes. Purchasing more durable products, items with less packaging, and repairing and reusing items are the types of changes that reduce waste. To find out where waste prevention opportunities exist in your school district, ask these basic questions:

- Where can we eliminate or reduce the amount or toxicity of material we use?
- Are there other products we could purchase that are more repairable, refillable, reusable, or durable than ones we are currently using?
- Are there products that come without packaging, or with less packaging?
- Are there yard trimmings, or other organic materials, that could be composted?

Table 1 shows several types of waste prevention activities. Notice that some waste prevention activities do a better job of saving resources than others. Waste prevention suggests

changing from one action which generates waste to another that generates less waste. You can think of preventing waste in phases, where each phase saves more resources. For instance, purchasing sports equipment, such as basketballs, with minimal packaging is good, but eliminating the packaging all together is better for the environment, provided the integrity of the item is not harmed. Another waste prevention example is bagging grass clippings and sending them to the landfill which generates more waste than leaving grass clippings on the lawn. The grass clippings on the lawn decompose naturally. Taking it a step further, planting slow growing grasses and using less fertilizer result in even greater waste prevention. As you can see, there are many different levels of waste prevention. It is an ongoing process to find better ways to utilize our resources efficiently through waste prevention, thereby creating less waste.

This guide illustrates waste prevention practices that others have found effective in reducing waste and, with few exceptions, in cutting costs. This does not mean that all the practices listed will be appropriate for your school district. Clearly, there are tradeoffs that must be considered. Typically these tradeoffs focus on time and labor, storage needs, cost of alternative equipment and supplies, and local health and

What is Waste Prevention?

Any action undertaken by an individual or organization to eliminate or reduce the amount or toxicity of materials before they enter the municipal solid waste stream. This action is intended to conserve resources, promote efficiency, and reduce pollution.

safety requirements. As you use this guide and learn more about waste prevention, look for ideas that will work for you. Use this guide to create your own waste prevention practices. The ideas contained in this guide are intended

to help you get started — to prevent waste, save resources, and save money!

Table 1:
Waste Prevention

Sample of Waste Prevention Approaches and Resources Used

Resources Used						
Waste Prevention						Recycling Off-site Composting
Eliminate	Reduce					
Eliminate items	Manage organic materials on-site	Accomplish a task with less material or less toxicity	Improve product longevity	Use products more than once	Collect, process, and reuse item	Collect transport, and process goods into new raw material, then use in new product
Eliminating straws	Grasscycling	Using both sides of paper	Purchasing longer lasting light bulbs	Using washable cups and plates	Using refillable bottles	Processing organic materials at centralized composting facilities
Using solar calculator instead of battery operated	Composting yard trimmings on school grounds	Purchasing goods with minimal packaging (in bulk or concentrated form)	Purchasing items that are easy to repair	Reusing envelopes	Donating unneeded items	Collecting recyclables
Stopping junk mail	Setting up classroom worm composting bins		Maintaining equipment	Using reusable air filter frames	Using refinished furniture	Making new products from recovered materials
Purchasing goods without packaging						

Note: Table 1 is intended to show overall resource use with various options. Specific examples may use more or less resources than what is suggested above.

Getting Started

Form A Team

Planning a successful waste prevention program requires recruiting a team that can tackle all aspects of the project and can devote energy, ideas, and time to developing the program for the district. The team should represent all areas within the district and reflect the diversity of staff responsibilities. Team members can include purchasing, maintenance and operations, food services, administration, teachers, and students — each person can play a significant role in the project. The level of time commitments will vary depending upon each member's role; however, a core group should be delegated to follow up on tasks and ensure the project progresses on schedule.

By encouraging broad participation from within the district, the program will benefit from: 1) allowing staff and students to take ownership of the program and sharing their commitment with peers, 2) providing the opportunity to share tasks, 3) allowing a forum for staff and students to generate ideas throughout the process, 4) reinforcing the message that the district is aware of and committed to preventing waste and conserving natural resources, and 5) emphasizing to students that their environmental concerns are shared by the district.

 **Tips:** Sometimes the best ideas for preventing waste come from a fresh perspective.

Secure Management Support

Critical to the success of getting the waste prevention program off the ground and “institutionalized” is receiving management’s support. Invite key management, such as the superintendent and board members, to attend planning meetings or special events. Their input will be invaluable to the program’s success.

Both the district and school board need to establish and communicate a commitment to waste prevention, thus enabling the team to go forward with their ideas. This “blessing” can be in the form of a policy statement outlining the district’s objectives, or an authorization for staff to set aside time to work on the project.

 **Tips:** Providing regular progress updates through memos or presentations will facilitate buy-off for the program.

Know Your Waste

One of the first steps in identifying waste prevention opportunities is learning how and where waste is being created. This can be as simple as evaluating daily activities which generate waste to weighing and identifying types of materials which are discarded. "Understanding your garbage" will help you obtain an overall picture of your waste stream.

To see the "whole picture," you will need to identify and bring together the various pieces which make up your waste stream. The process of analyzing your waste stream is called a waste composition survey. The survey consists of evaluating qualitatively and quantitatively the types of waste which are created and the activities involved in producing waste. The survey generally consists of interviewing employees and students, conducting a walk-through of each site in the district, reviewing purchasing records, conducting "dumpster peeks," and documenting the survey through charts and photos.

OOPS! What's this in our trash?

During the survey you may notice large amounts of colored ledger paper are used then thrown out. What can be done? You may propose adding colored paper to the materials collected in your recycling program; or if your current recycling program excludes colored paper, you may suggest purchasing primarily white paper. In addition, you might implement a "maximize paper use" campaign in your waste prevention program to encourage staff to use both sides of the paper.

Depending on the size of your district, the number of sites you survey, staff schedules, and the level of detailed results you may need, the length of time needed to conduct the survey will vary. Plan on scheduling from one to five days for the survey. You may also choose to modify the model survey to suit your needs.

The survey may also provide insight on modifying your recycling and/or procurement programs. As you conduct the survey, keep a record of ideas which arise regarding recycling or procurement, and incorporate them later.

Assessing the waste produced in the district is an enlightening educational and program targeting tool. One school district realized cost savings by not purchasing notepads. After conducting interviews, the district discovered staff were more than happy to use pads made from paper used on one side.

The assessment will also give you a baseline for starting your waste prevention program, thus enabling you to provide feedback on the impact of the program. As waste prevention is practiced in the district, everyone will be able to see the success of their efforts!

Waste Composition Survey

Step by Step

Interviewing Employees and Students

Critical to achieving useful information for the survey is interviewing key “Waste Preventers/Producers.” Information gathered from the interview generally should cover how waste is generated, where inefficiencies occur, and what can be done to reduce waste. Schedule interviews with representatives from each department and site. Typically, the director of each department can provide an overall picture of staffs’ activities. Reserve approximately one-half to one full hour for each interview.

To understand how waste potentially could be prevented, the following general questions should be addressed during the interview. In addition, Appendix A contains specific interview questions you may wish to ask the various “Waste Preventers/Producers.” These questions have been tested in the field and tend to stimulate the brainstorming process during the interview. During the interview try to ascertain what types of “informal” waste prevention practices are now in place, as this will allow you to identify practices which could be instituted throughout the district, and recognize

people for their efforts (even if they did not know they were already helping to prevent waste).

General Questions:

- What type of activities take place in this department?
- Does this department generate waste? What types?
- What is being disposed of at the time of the survey?
- Are other discards usually generated in this location?
- What activity, product(s) or service(s) generate waste; e.g., maintenance, food preparation, reprographics?
- What materials, supplies, and equipment are purchased?
- How are they packaged; e.g., are food products shipped in cardboard with shrink wrap?
- Is this a normal or abnormal, daily or periodic situation?
- What comments do employees in the department have about their waste (quantity, toxicity, necessity)?

Waste Preventers/Producers

DISTRICT:

Business Services Director
Maintenance & Operations Director
Food Services Director
Purchasing Director
Other

SCHOOL:

Principal
Office Manager
Custodial/Grounds Supervisor
Food Services Manager
Teachers
Students
PTA
Other

Tips: While conducting interviews seek input, ideas, suggestions, and observations from management, staff, and students.

- Have a team of at least two people conduct the survey. This will facilitate the survey process by allowing one person to take notes while the other asks questions.
- Prior to the meeting, provide interview questions, purpose of the meeting, and anticipated results. This will better prepare the interviewees.

Keep in mind "What if"

- What if this material could be reused?
- What if this material could be packaged differently?
- What if this material was no longer purchased?
- What if the activity could be altered to prevent waste?

Walk-Through At Each Site In The District

Conduct a walk-through of each site and observe all waste-generating activities and equipment. If the director is unavailable to take you on a tour of the department, request a representative be available to explain why things are done in a particular manner, and whether activities can be altered to prevent or reduce waste. Schedule one to three hours for the site tour. Prior to the site tour, ask the director to inform staff ahead of time that you will be observing, asking questions, and seeking feedback. You may also want to emphasize this is not a performance evaluation, but an opportunity to come up with workable ideas for preventing waste and conserving resources.

Although you should try to evaluate all waste producing activities at each site, be sure to focus attention on activities which tend to generate the largest amount of waste, such as copying areas, food service areas, offices, and

maintenance yards. There are certain themes for a walk-through. At each point, observe and ask:

- What type of work is done in this area?
- What activities produce waste?
- What type of waste is produced?
- What waste is/has been prevented?

It is important to identify waste which is/has been prevented, as you will be able to give people an overview of the great things they are already doing. Surprisingly, many good ideas are not widely practiced. Perhaps the person doing them assumes everyone else is doing the same thing. Sharing these ideas will be very important to the success of your program.

Walk-through

District offices	Maintenance yard
Warehouse	Kitchens
School offices	Classrooms
Lounge	Custodial supply rooms
Reprographics	Library

In Appendix B, you will find the “Facility Walk-Through - Worksheet #1.” This worksheet is designed to help you think of waste prevention options as you tour the site.

Worksheet #2, in Appendix B, can be used to record the types of materials being discarded. This information will be useful when evaluating waste prevention options. An example for using this worksheet follows:

Site: Warehouse						
Discarded Materials	Relative Amounts & Location	Potential Waste Reduction Options				
		Eliminate	Reduce/Reuse	Materials Exchange	Recycle	Compost
Foam Peanuts	Minor component of incoming shipments (fills one 30-gallon can each month)		X	X	X	
Sports balls (soccer, etc.) individually wrapped in plastic	Plastic wrap fills one 30-gallon can every six months	X	X			
Stockpiled computers	Ten each year		X	X (Auction)		

Worksheet #3, in Appendix B, can be used to record the types of waste producing activities or equipment. An example for using this worksheet follows:

Site: Warehouse				
Waste Producing Activity or Equipment	Waste Material Produced	Estimated Amount of Waste Produced per Week	Current Waste Reduction Activities (If Any)	Potential Waste Prevention Option
Receiving Shipments	Cardboard boxes	Approx. 50	Recycling	Supplier backhauls boxes to be re-packed
Receiving Shipments	Foam Peanuts	Approx. 10 gallon can	None	Reuse by local companies (e.g., Mailboxes Etc., UPS)
E-mail	Office paper	100 sheets	Recycling	Read messages off the monitor or use a paper tray with draft (paper used on one side) to print messages

No matter how familiar you are with the operation, the key to the walk-through is seeing and understanding each activity/operation through the eyes of a waste preventer. Think of the different activities/operations as waste generating stations. Look in the waste baskets at peoples' desks and the garbage dumpsters at each site. Classify the materials as to how they are generated and why they are generated in a particular manner. Consider whether the wastes you see are basic to the operation or whether the operation could be performed in a way to create less waste or no waste at all.

 **Tips:** Avoid scheduling the walk-through on special events or holidays as wastes may not be representative of normal operations/activities.

Reviewing Purchasing Records

Reviewing purchasing records is helpful in figuring out expected costs or savings (e.g., when switching from one product to another). A review of purchasing records can assist in documenting waste prevention progress. For example, if staff make a concerted effort to reuse manila envelopes, the purchasing agent may be able to document this by noting a decrease in the use of new envelopes. Meet with purchasing staff to determine types of materials purchased. Keep in mind "What if" questions to assess potential options for waste prevention.

 **Tips:** Schedule the walk-through at the warehouse in conjunction with the purchasing interview. This will enable you to compare the items in the purchasing records to the items in the warehouse.

Conducting "Trash Peeks"

It is helpful to identify what types of waste are generated and the relative amounts. At each site, visit the dumpster. Upon observing the collective waste, make note of its contents and estimate the amount of each material. You should be able to get a feel for materials being thrown away by visually inspecting the dumpster.

Remember the dumpster peeks are only a snapshot in time, but comparing the information gleaned from the interviews will help provide a more complete picture.

 **Tips:** If possible, schedule the dumpster peek just before garbage pickup to allow a sufficient amount of waste to accumulate. You may need a step ladder to get a good view of the dumpster contents.

Benefits of Knowing Your Waste

Case 1

Dixon Unified had planned to purchase additional ditto fluid; Vacaville Unified was phasing out their ditto machines. The two districts embarked on a materials exchange. The net result is Dixon did not have to purchase ditto fluid and Vacaville saved thousands of dollars in hazardous waste disposal costs.

Case 2

San Jose Unified was gearing up to pay hazardous materials disposal costs for 160 gallons of white and off-white paint that they could not use. Dixon Unified came to the rescue and used the paint.

Documenting Findings

A picture is worth a thousand words. Take photos of activities or products which generate waste or are examples of waste prevention. In the warehouse, for example, document products which appear to be over-packaged. The documentation can be used later by purchasing agents as they negotiate with suppliers. You can also take videos of waste and use them for educating top management and staff about how and what waste is generated.

From the waste composition survey answer the following questions, then transfer the information to the charts in Appendix C.

- What materials predominate in the waste stream?
- What would be easiest to eliminate, reduce, or reuse?
- What actions could be changed immediately?
- Which actions would administration, staff, and students be most receptive to?

Appendix D contains waste prevention ideas which have been successful in other school districts. With this information and your survey results, you are ready to design your waste prevention program.

 **Tips:** It may be easier to take extensive notes during the interviews and walk-throughs, and then enter the information into the charts for evaluating later.

Brainstorm Waste Prevention Options

No doubt you have collected a number of waste prevention ideas while getting to know your waste. At this point you may also want to brainstorm new ideas with your waste prevention team. This step is one of the best ways to identify why waste is generated and what can be done about it. The group dynamics of brainstorming is known to have a synergistic effect that can result in creative and innovative solutions. Try to keep sessions small (fewer than ten people) and have an assigned facilitator to guide the process. This may also provide an opportunity for bringing the team up to speed on the progress of the project, as well as securing buy off for proposed waste prevention options.

 **Tips:** Conduct brainstorming sessions for one to two hours. This allows enough time to get something done, but isn't so long that participants "burn out."

Evaluating Waste Prevention Options

There are several evaluation methods that can help you decide which waste prevention options to pursue. After calculating potential costs and savings, some options are likely to become more appealing than others. In fact, some options probably won't make sense to pursue any further. This chapter offers ideas for evaluating options. Evaluation criteria often considered are:

Costs and Savings

- amortized purchase price
- labor
- utility costs (energy, water and sewer)
- waste hauling and disposal

Environmental

- waste generation
- toxicity
- air emissions
- water contamination

Health and Safety

Ease of Implementation

- storage space
- change of procedures
- time

School administrators need to understand the costs and savings of an option before providing support. Fortunately, waste prevention approaches often cut costs, especially purchasing costs. This means it is worthwhile to document expected gains.

Along with assessing costs, waste prevention efforts should reduce waste, while not increasing other forms of environmental degradation. Sometimes this is not easy to determine, and even the experts disagree. However, by asking a few basic questions you can avoid environmentally negative actions. Another topic that arises is health and safety, particularly when handling food discards. Your local health agencies can help you understand local requirements. And finally, it makes sense to start with something easy, then tackle the longer term projects that may reap larger benefits, but involve more effort and time. Now let's get into a bit more detail about each of these criteria.

Waste prevention from a shredder/chipper

Sierra School in Placerville started recycling and reduced their waste by about half. This cut their trash bill from \$586 to \$293 per month. The school used these savings to justify the purchase of a \$1,400 Mighty Mac shredder with capability to chip materials which are less than two inches in diameter. School custodians shred or chip leaves and branches to create mulch which is used as a ground mulch or is placed in their compost bin. They also save money because they no longer need to purchase mulch or top soil for school projects. (See Worksheets 2a-7 for cost savings.)

Evaluation Criteria

Determining costs and savings There are several different types of costs you can consider in your evaluation and use them in "financial tests." Sound scary? It isn't. First, we will explain some of the costs you will need to consider and then we will go over examples of how to use this information to perform financial tests. And for those of you who do this every day as part of your job, you may just want to skim over this section.

1. Purchase Cost

The purchase cost of one product times the number needed in a year gives the cost for each year. For example, if product A cost \$0.35 each and 365 are used each year, the purchase cost is \$128 each year. Similarly, if product B cost \$80 and lasts 2 years, one-half of the product is used each year resulting in an amortized purchase cost of \$40 each year. Also include the cost of other items that would be used together. For example, reusable items may require soap for cleaning and disposable items may require additional trash bags.

2. Labor Costs

To assess labor requirements, estimate time required to order, stock, service and dispose of comparative products. With known labor costs and time requirement for each activity, labor costs can be effectively estimated. Note: Labor costs do not actually change for a facility unless staff hours are either subtracted or added to payroll as a result of the action. In other words, if existing staff can integrate work into their current schedules, labor costs do not change.

3. Utility Cost

Compare product efficiency and assess the need for energy and water. Also, find out if any rebates are available. For instance, washing reusable dishes requires energy and water. The costs of these resources should be added to the cost of the product. Purchase of an energy- or water-efficient dishwasher may qualify for a rebate, affecting costs.

4. Waste Hauling and Disposal Cost

The combined impact of several waste prevention actions may decrease the level of waste removal services (e.g., number of bins, weight of bins, or frequency of pickups) your school needs. You can renegotiate waste removal contracts when they expire or if stated in the contract, you may be able to reduce the level of service at any time. This results in cost savings referred to as avoided disposal cost. Keep in mind that avoided cost savings can only be realized when there is a downsize in waste removal service. A single waste prevention effort may not eliminate the need for a bin, but several efforts may.

Environmental Factors

It is important that changes implemented to reduce solid waste do not increase the toxicity of waste generated or emitted into air and water. Does the product contain toxic substances? Does the product require special ventilation or masks to use safely? Must it be treated as a hazardous waste? Information on product toxicity is available in the Material Safety Data Sheet (MSDS), required by law to be provided from the manufacturer. Furthermore, environmental impact could be used to justify a switch in purchasing materials. For example, changing to a non-toxic bulk cleaning agent might be a waste prevention option.

Health and Safety

Waste prevention approaches, particularly when dealing with food, must be handled in certain ways to protect public health. For instance, some localities require rodent resistant compost bins when composting food scraps. Federal and state requirements exist for food scraps used to feed animals. In many instances, the requirements are not difficult to practice so don't let this stop your efforts. Simply check with your local health department to learn what they are, so you can meet them.

Ease of Implementation

Some changes are so simple they can be done immediately or with minimal effort. Others require significant analysis and may take years to fully implement. For instance, if a major piece of equipment is needed, you will need time to purchase it. Another factor to consider is storage space. Is it available where you need it? Also consider if procedures will change significantly. Will school personnel and students easily adapt to the change? Will they need special training?

Basic Number Crunching

Do you cringe at the thought of number crunching? Lots of people do, but it is important for showing potential costs, savings, and expected waste reduction. To make number crunching a bit easier, we have included some worksheets to help you organize your information and perform a few simple financial tests. This will make it easy to compare options. Below we will work through the worksheets with two examples. Worksheets 1a-b compare options dealing with napkins and straws. Worksheets 2 through 7 take you through evaluating options for mulching yard waste. In Appendix E you can find clean copies of the worksheets to fill in with your own numbers. Once you have identified an option that will result in cost savings and waste reduction, it will be much easier to convince others that the option is worth pursuing.

Simple process change saves napkins

Rio Linda Unified School District found that by simply moving napkin dispensers from tables where students eat, to where they pick up utensils, students wasted fewer napkins. Napkin use decreased by about half and the custodian reports fewer napkins end up on the floor.

Worksheet 1a: Avoided Purchase Cost (Savings from purchasing less)

Purpose: To calculate the annual savings in purchasing costs that results from using something more efficiently (like paper) or eliminating some item all together.

When to use: When you are going to stop purchasing an item or start using a product more efficiently and you want to know the savings in purchasing costs. Note that the item is not being replaced by an alternative product.

Worksheet 1a

Avoided Purchase Costs

Activity	Product being used more efficiently	Amount reduced each year	Unit price	Annual avoided purchase costs
Napkins at end of serving line rather than each table	Napkins	8.4 cases (10,000 napkins per case)	\$22.55	\$189.42
Stopped purchasing straws (litter problem)	Straws	3.6 cases (25,000 straws per case)	\$46.65	\$167.94
Total				\$357.36

Assumptions

Napkins: There are 600 students in the school. About 56 percent or 336 students eat school lunches. These students used about two napkins each day when they were at the table. When napkins are at the end of the serving line, many students no longer take them or only use them when they need to wipe up a spill. This cut use by about one third.

Straws: About 500 students received milk with their lunch or bought it each day and were using straws. This means 500 fewer straws were used each day when the school stopped buying them.

If the school district made these same changes in 20 similar schools, the total cost savings is about \$7,000! Perhaps you will be able to use the cost savings here to justify the costs of other great ideas you have!

Worksheet 1b: Avoided Waste Generation

Purpose: To show the amount of waste that is avoided each year by using something more efficiently (like paper) or eliminating some item all together.

When to use: When you are going to stop purchasing an item or start using a product more efficiently and you want to know how much waste is reduced.

Worksheet 1b: Avoided Waste Generation						
Activity	Product being used more efficiently	Number of units no longer purchased each year	Volume of one unit	Weight of one unit	Annual avoided waste	
					Volume (cubic yards)	Weight (lbs)
Napkins at end of serving line rather than each table	Napkins	8.4 cases	36" x 30" x 30 = 32,400 cubic inches/case 6,656 cubic inches/cubic yard = .69 cubic yards/case Note: This is the shipping volume and represents a very conservative estimate because napkins take up more space when they are thrown out.	22.5 lbs Note: This is a conservative estimate because napkins weigh more after use.	5.8	189
Stopped purchasing straws (litter problem)	Straws	3.6 cases	.69 cubic yards/case	11 lbs	2.48	39.6
Total					8.28 cubic yards	228.6 lbs

Note: Figures for volume and weight are rough estimates. The school we contacted did not measure avoided waste generated because these changes were done to cut costs and reduce litter, before the school started looking for alternatives to waste disposal. As part of a waste prevention program, you will want to make these calculations.

* See Appendix F for measurement conversion chart

Worksheet 2a: Amortized Capital Costs

(cost of equipment, new buildings, remodeling, etc.)

Purpose: To determine the cost of one-time large expenditures, like buildings and equipment, in terms of cost per year. This means taking into consideration how long the item will last.

When to use: When an option requires a large one-time expenditure and you need to determine the annual savings or payback period (in combination with the worksheets that follow). You will probably want to consider several options at the same time.

Worksheet 2a:

Amortized Capital Costs

	Current approach Option 1	Option 2	Option 3
	Throw branches and leaves in trash bin	Turn branches and leaves into mulch with a Mighty Max shredder/chipper. Use mulch in compost bin and on grounds	Rent chipper and shredder. Use mulch in compost bin and school grounds
Purchase price of product or equipment	0	\$1,400	0
Total interest payment (if applicable)	none	none	none
Site preparation and installation	none	none	none
Other:			
Total capital costs	0	\$1,400	0
Amortized capital costs (Total capital costs divided by the number of years the equipment will service)	0	\$1,400 divided by 10 years = \$140	0

Worksheet 3a: Volume of Current Waste Removal

Purpose: To determine how much waste is generated at a specific site such as a school, cafeteria, or classroom.

When to use: The information generated from this worksheet is helpful in several ways. First, you will need it to complete the worksheets that follow. If this isn't compelling, then use it for a baseline. Over time the amount of waste generated per student should decrease due to your waste prevention efforts and you will want to measure your success.

Worksheet 3a:				
Volume of Current Waste Removal				
Site	Number of containers	Size of container (cubic yards)	Number of pick-ups per month	Totals Yd ³
Sierra School	2 (each day)	1.5	20	60 (per month)
Total cubic yards collected each year				60 X 12 = 720 (per year)

Note: You can also use this information as a baseline by calculating cubic yards of waste per student (divide answer above by average number of students enrolled in the same month). Then make the same calculation over time to see changes in waste generation.

Worksheet 3b: Average Waste Hauling and Disposal Costs

Purpose: To assign a cost per cubic yard of waste disposal services.

When to use: This calculation is needed to complete the next worksheet, which compares disposal costs of various options.

Worksheet 3b:	
Average Waste Hauling and Disposal Costs	
(Use the same units in all your calculations, such as cubic yards or lbs.)	
Average monthly cost (from waste removal bills)	\$586
	÷
Average cubic yards of waste collected each month	60 cubic yards
	=
Waste removal cost/cubic yard (divide top row by second row)	\$9.77 for each cubic yard

Worksheet 3c: Comparing Disposal Costs

Purpose: Comparing the cost of disposal services for various options.

When to use: When the various options being considered result in different amounts of waste generation.

	Option 1 (Current Approach)	Option 2 (Purchase chipper/ shredder)	Option 3 (Rent chipper/ shredder)
Waste generated per year in cubic yards* (from worksheet 3a)	720 cubic yards	633.6 cubic yards***	633.6 cubic yards***
Waste removal cost/cubic yard (from worksheet 3b)	\$9.77	\$9.77	\$9.77
Total Waste Removal Costs (Waste generated per year times waste removal cost)**	\$7034.40	\$6190.27	\$6190.27

* When you complete this worksheet, describe any assumptions made in determining waste generation.

** Note that disposal costs will not decrease unless the level of service is reduced. You may have to combine the waste reduction from several activities to eliminate a bin or use a smaller one.

***In this example the custodians estimated that yard trimmings are about 12 percent of total waste stream. This will vary from school to school.

Worksheet 4: Annual Operating Costs

Purpose: To determine operating costs for each year. Operating costs are those costs you keep paying all the time, like electricity, labor, waste disposal, etc.

When to use: This is a very important worksheet and gets used all the time. It is needed for any option where there are changes in operating costs.

We are almost to the final steps of this financial analysis. Hang in there!

Worksheet 4:			
Annual Operating Costs			
	Current approach (Option 1)	Option 2	Option 3
Material and supply costs		Use scrap lumber to make compost bins — no cost	Use scrap lumber to make compost bins — no cost
Labor (stocking, washing, trash removal, etc.)		No change in staffing	No change in staffing
Maintenance and service contacts	None	None	None
Electricity/gas	None	10 gals. at \$1.20/gal = \$12 each year	10 gals. at \$1.20/gal = \$12 each year
Water	None	Minimal amounts applied to compost bins	Minimal amounts applied to compost bins
Waste disposal (from worksheet 3c)	\$7034.40	\$6190.27	\$6190.27
Other: Top soil and mulch	\$90.00		
Cost of renting chipper/shredder			\$125/day for 7 days per year = \$875
Total Annual Operating Costs	\$7124.44	\$6202.27	\$7077.27

Worksheet 5: Combined Average Annual Costs **(Amortized capital costs + Annual operating costs)**

Purpose: To compare the full costs of each option.

When to use: This is one worksheet you won't want to miss. Now you can see which option is least expensive. In our example, Option 2 appears to be the winner. But remember, this is just a financial test, there is more than money to consider.

Think about the evaluation criteria listed. We need to consider three other major factors:

1. Environmental

Will the chipper/shredder pollute air or water? In our example, the chipper/shredder is gas operated so there is some air pollution. But on the other hand, there is air pollution from hauling materials to the landfill. Adding organic materials or mulch to the landscape helps control soil erosion and slows water evaporation. Overall, the environmental factors affecting this situation appear balanced.

2. Health and Safety

Who will operate the chipper/shredder? Are they responsible and reliable? Clearly, safety is a concern around machines that cut and shred. At Sierra School the custodians learned how to properly operate the chipper/shredder. This was not a critical factor.

3. Ease of Implementation

Who will do the work? Do they want to do it? Once again at Sierra School this was not a critical factor. The custodians were very willing; in fact, it was their idea to get a chipper/shredder in the first place. Usually, if people are interested in making something work, implementation obstacles can be overcome. If staff are just not interested, it may be hard to implement an idea regardless of how good it is. We'll get into these issues later when we talk about implementation.

In terms of logistics, there was space for a worm composting bin away from students and plenty of flower beds and plantings that could use mulch. Also, there is space to store debris between chipping days.

Worksheet 5:

Combined Average Annual Costs

	Option 1 (current approach)	Option 2 (purchase chipper/shredder)	Option 3 (rent chipper/shredder)
Amortized capital costs (from worksheet 2a)	0	\$140	0
	+	+	+
Total annual operating costs (from worksheet 4)	\$7124.44	\$6202.27	\$7077.27
	=	=	=
Total average annual costs	\$7124.44	\$6342.27	\$7077.27

Describe below other factors to consider (environmental, health and safety, ease of implementation):

Environmental: Options 2 and 3 appear to cause some air pollution, but so does hauling waste to the landfill. Mulch and compost should reduce water pollution from soil erosion and decrease irrigation needs. Waste disposal is being reduced which in turn conserves landfill space.

Health and Safety: Options 2 and 3 require safe operation of equipment. Operators should be required to wear safety glasses during operation.

Ease of Implementation: The custodians are very willing. Space is available for compost bins (no unsupervised student access) and there is a place to store yard trimmings between chipping days.

Overall preferred option: Option 2

Worksheet 6: Annual Savings

Purpose: To show the annual savings from the preferred option, provided it is not the current approach (option 1).

When to use: You have come this far, so why not make this next calculation? It is optional, but a fun number to report.

Worksheet 6:

Annual Savings

Total annual costs for Option 1 (from worksheet 5)		Total annual costs for other options (from worksheet 5)		Annual savings
\$7124.44	-	\$7124.44 (current)	=	\$0.00
\$7124.44	-	\$6342.27 (option 2)	=	\$782.17
\$7124.44	-	\$7077.27 (option 3)	=	\$47.17

Worksheet 7: Payback Period

Purpose: To see how long it will take to pay back the cost of your initial investment — the chipper/shredder in this example.

When to use: This is optional, but a common financial test. It can only be used if there was a capital expenditure. It could not be used for option 3, the rental option, because no equipment was purchased.

The shorter the payback period, the better. In this example the payback period is less than two years, which is extremely palatable. The payback period would go down if the chipper/shredder were used more. This could be achieved if several schools used one chipper/shredder or if the school had higher volumes of yard trimmings to manage.

Worksheet 7:		
Payback Period (optional)		
	Option 2	Option 3
Total capital costs (from worksheet 2a)	\$1,400	
	÷	÷
Annual Savings (from worksheet 6)	\$782.13	
	=	=
Payback period (in years)	1.79 years	Does not apply because equipment was rented

You made it! You just got through the driest material in this guidebook. Remember, there are clean copies of these worksheets in Appendix E. After you have implemented an option, you may find it helpful to refer back to the worksheets to calculate actual cost savings and waste reduction. Just complete them with actual information instead of estimates. Happy number crunching!

Making a Commitment: Your Waste Prevention Strategy

The main reason for developing a strategy or plan is to commit your team to accomplishing your goals. Generally, plans contain an overriding statement of purpose, a mission statement, and key priorities described in goals and more descriptive activities. A plan should state:

- What you aim to accomplish and why,
- Who is responsible, and
- When a task should be completed.

Some plans describe barriers that must be overcome and information about the current situation. If people reading your plan will need to know this type of information, include it. Also, a plan should indicate that activities will be evaluated and if needed, modified. This sets the stage for making changes to your plan if a new piece of critical information becomes available.

Keep in mind that if your waste prevention effort is voluntary, it is especially important to make waste prevention a bit fun. Avoid spending so much time planning that you have lost the energy to make it happen.

Goals can be structured in several different ways. Sometimes there are specific completion

dates, other times they are more general. It is up to you and your waste prevention team to decide. In the example below there is an overall completion date. Usually there should be no more than six or seven goals, otherwise activities are not focused. Under each goal, identify key activities and who will be responsible for completing the activity. Remember, these are just guidelines, there are no hard and fast rules to follow when it comes to developing goals and activities.

Sample Mission

Establish a waste prevention program that reduces waste generation by twenty-five percent by 1995 and fifty percent by 2000. Emphasis will be placed on reducing cafeteria waste; using supplies more efficiently, especially paper; seeking reductions in packaging waste; and turning yard trimmings into compost or mulch.

Many regard the process of devising a plan just as important as the plan itself. It should be a means to build consensus and give participants a feeling of ownership. Plan a few meetings with a volunteer facilitator and giving everyone an opportunity to contribute. It is very important to involve key players who will make your effort a success.

Sample Goal

All yard trimmings will be turned into compost or mulch by 1994.

Key activities

- Select site for compost bin
- Build compost bin
- Research chipper/shredder options
- Purchase/rent/borrow chipper/shredder
- Store yard trimmings until chipped or shredded
- Use chipped and shredded material in compost bin or as mulch
- Educate students about materials that can be placed in the compost bin

Person responsible

- U. R. Smart
- S. Goforth
- I. Dedit
- S. Goforth
- U. R. Smart
- U.R. Smart
- S. Goforth

Implementing Your Waste Prevention Program

Now that you have your plan, the next step is to implement it. Key to your success is getting people motivated, involved, and keeping them so. Below are a few tips to get you started.

Get Support From the Top

This is obvious, but it is too important not to mention. The stronger the support from the top, the easier it will be to implement waste prevention options. Sometimes it takes awhile to convince key individuals that a good idea is worth pursuing. Fortunately, after all the number crunching you have done by now, you will have selected viable options and have the numbers to support them!

Measure Your Success

Saving resources and money, just making the world a bit better, makes people feel good. Keeping track of this information can help motivate them too. Besides, it is a good way to impress your school board, superintendent, principal or PTA. But you won't know what you are saving unless you measure it.

As you begin to think about how you will implement an option, build in ways to measure success. For one, complete the worksheets in Appendix E (the same ones used to evaluate waste prevention options), but now use actual data from purchasing records, waste hauling bills, or record actual waste volumes or weights.

In addition, track the amount of waste generated per student per month or year. Over time you will be able to see your accomplishments. Tracking can be done for a specific item in your waste stream, like white paper; or for total waste

generated. For example, to determine savings from using paper more efficiently, determine how much paper was used per person in one year and compare it to the year after introducing a paper reduction effort. Schools within the same district could even have their own little competition — think about that!

State the Problem — “Why Should I Care?”

Many people do not easily embrace change, particularly if they don't understand why it is important. Realistically, some people could not care less about waste prevention. These are reasons why you will need to build support for your program. Information from your waste assessment will help describe what is wasted and how. You may also want to inform people about the current landfill dilemma — we create more waste while landfill space is shrinking, and new ones are difficult to site. How much landfill capacity remains in your city or county?

Many people are also unaware that when we use materials more efficiently, a number of polluting activities are eliminated. Pollution that occurs from extracting raw materials, producing products and disposing of them is reduced.

Two Way Communication

Have you ever been left in the dark about new changes? Perhaps you saw that a new procedure was totally impractical. Drove you nuts, right? Avoid this type of situation by keeping the right people informed and soliciting feedback.

Regarding specific activities, everyone affected by a change will need to know:

- What is happening and why,
- What each person is expected to do,
- When the change will occur, and
- Who to contact for more information or to provide feedback.

In some cases, this information can be conveyed in training courses or seminars.

Other ways to convey information are through presentations, electronic mail (for the schools that have it), a central bulletin board or through whatever means works in your school district.

To solicit new ideas you may want to set up a suggestion box, if you don't have one already. Another common way to acquire feedback is to conduct a random survey.

Reconsider Your Waste Disposal Needs

After you have implemented several waste reduction options, see if you can lower the cost of waste disposal services. Are the bins full? Could you use a smaller one? Could pick-ups occur less frequently? If you can downgrade waste disposal service and your contract with your waste hauler allows it, you will achieve a cost savings!

Make It Fun!

After all, we're talking about waste. It really is a topic that allows many opportunities for a little fun and lots of creativity. Educational campaigns reminding students to not waste food, paper, or some other item can be especially fun. Announce a poster contest where only scrap materials are used. Or, have a special event like a zero waste lunch (ie., there will be no waste generated at lunch. All material will be reduced or recycled.)

Find New Ways To Reduce Waste

After implementing waste prevention options, evaluate them to seek improvements. Did you learn anything that you would like to share with others? The CIWMB would like to facilitate information exchange between schools. That way someone else can build off your experience and you can do the same from other peoples' ideas. Please contact the CIWMB School Section, 8800 Cal Center Drive, Sacramento, CA 95826 with any information you can share with others. Likewise, if you need some help, give us a call at (916) 255-2385. We are here to serve you!

Now comes time to celebrate your success, but don't stop. Continue to seek new ways to prevent waste!

Appendix A

Waste Prevention Interview Questions

Sample Letter To Give To Interviewees In Advance Of Interviews

Dear :

Thank you for agreeing to participate in our waste prevention effort. Although nearly everyone is familiar with recycling, few people have looked seriously at preventing waste at the source, called waste prevention or source reduction. What is waste prevention? Purchasing more durable products, repairing or cleaning items to reuse them, or completing any task with fewer materials are the types of changes that result in less waste. Waste that isn't created doesn't have to be managed, meaning less waste has to be stored, collected, and hauled to a recycling facility or landfill. Resources will be conserved and landfills will last longer. Waste prevention is a real opportunity to help the environment and cut costs.

To help identify waste prevention opportunities in your (describe work area) we have an appointment scheduled for _____ at ____ AM/PM in _____. If you have any questions about the interview or need to reschedule, please contact me at _____ . To save money you may have already come up with your own waste prevention ideas. In this case, we would like to document these ideas so we can share them with others. Be assured that this is not a performance evaluation.

Before our interview, if time permits, think about how waste is generated.

- Where can we be more efficient?
- Are there alternative products we can reuse over and over?
- Are there other products we could purchase that are more repairable, refillable or durable than ones we are currently using?
- Are there products that come with too much packaging?
- Are there any school or district policies that are barriers to waste prevention?
- What wasteful activities have you noticed?

If you have time, please write down what type of waste is generated in your work area.

Thanks for your help!

Appendix A: Questions

General Questions:

What type of activities take place in this department?

Does this department generate waste? What types?

What is being disposed of at the time of the survey?

Are other materials usually generated in this location?

What activity, product(s) or service(s) generate waste; e.g., maintenance, food preparation, reprographics?

What materials are brought in to generate the product/service?

How are they packaged; e.g., food products are shipped in cardboard with shrink wrap?

Is this a normal or abnormal, daily or periodic situation?

What comments do employees in the department have about their waste (quantity, toxicity, necessity)?

Keep in mind "What if"

- What if this material could be reused?
- What if this material could be packaged differently?
- What if this material was no longer purchased?
- What if the activity could be altered to prevent waste?

I. Superintendent

What efforts have been taken in your school district to prevent waste generation?

Are you satisfied with these efforts?

What ideas do you have to prevent waste that you would like us to look at?

What barriers exist that must be overcome to implement these ideas?

How are purchasing decisions made in the district?

Would you support a change in your purchasing policy to promote waste generation, such as asking suppliers for minimum packaging, seeking equipment that is durable and easy to repair (of course specific language would need to be developed and approved)?

Would you support a waste prevention program by making an announcement to all personnel?

How would you like to be involved?

II. Principal

What efforts have been taken in your school to prevent waste generation?

Are you satisfied with these efforts?

What ideas do you have to prevent waste that you would like us to look at?

What barriers exist that must be overcome to implement these ideas?

How are purchasing decisions made in your school?

Do new products have to be approved by anyone?

Who must approve any changes in the way food is served, particularly in terms of the way it is packaged from central kitchens?

Would you support a waste prevention program by making an announcement to all personnel?

How would you like to be involved?

Who should we include in our waste prevention effort? (Explain who you already plan to involve.)

Do you have suggestions for how school personnel could reduce waste? (Your suggestions will be kept confidential.)

III. Purchasing Agents

Who decides what is purchased? Can these people be advised of less wasteful alternatives?

What are the main supplies purchased? (In terms of amount, toxicity, and cost)

What disposable products are purchased?

What supplies, if any, contain warning labels?

What additional products could be purchased in bulk?

What products could be purchased in concentrated form (e.g., cleaning solutions, paints)?

Can products be acquired from non-conventional sources, such as local businesses, materials exchanges or thrift shops?

How would quality of the product have to be verified?

Does the department have forms that could be shortened or eliminated?

Can vendors be asked to take back packaging (included in bid specifications)?

What warranties come with equipment? Length of time? Available repair service?

What payback period would you need to buy equipment that will save money in the long run?

Who would have to make a decision about purchasing cost-saving equipment or supplies?

What materials/products do you throw away?

What equipment has to be replaced on a regular basis?

How do you try to reduce waste, besides recycling?

Do you have suggestions for how other school personnel could reduce waste? (Your suggestions will be kept confidential.)

Follow-up

Can we contact you again to ask further questions?

Would you be willing to try new approaches that cut waste?

IV. Office Manager

How can paper use be cut?

- Can copiers make 2-sided copies reliably?
- Can laser printers make 2-sided copies?
- Are short messages printed on small pieces of paper?
- Could smaller fonts be used?
- Could paper printed on just one-side be reused?
- Can the district purchase and install an electronic mail system?

Can colored paper be recycled in your area? If not, have you considered ways to eliminate or reduce its use?

Can any forms or reports be shortened or eliminated? Who must approve these changes?

Are rebuilt toner cartridges used in laser printers? Are typewriter ribbons re-inked?

Do you receive much unwanted mail?

Could you call or send postcards asking to be removed from their mailing list?

What documents are printed regularly? Could they be shortened? Could fewer copies be printed?

What disposable items do you use? Do reusable alternatives exist?

Are extra copies regularly printed? If so, why does this happen and could the extra copies be avoided (e.g., extra notices for students to take home)?

What equipment has to be replaced on a regular basis?

How do you try to reduce waste, besides recycling?

Do you have suggestions for how other school personnel could reduce waste? (Your suggestions will be kept confidential.)

Follow-up

Can we contact you again to ask further questions?

Would you be willing to try new approaches that cut waste?

V. Food Service Director

Where is food prepared?

What food service related wastes are generated at the school? Estimate quantity.

How is milk served (individual carton or pouch, bulk dispenser and cups, refillable bottle)?

What disposable items are used to serve food and beverages? Can any of these items be eliminated, replaced by a reusable item, or recycled?

- trays
- plates/bowls
- utensils
- beverage containers
- aprons or hats
- napkins
- straws

How do you know how many lunches need to be served each day?

What happens to unserved food? Is food saved and served later? Could it be used by some charity group?

Can waste be source separated (food waste separated from paper and plastics)?

Would it be possible to compost fruit and vegetable scraps with yard waste on school property?

Are there any farmers in the area who could use fruit and vegetable scraps to feed animals?

Do you have suggestions for how other school personnel could reduce waste?

What equipment has to be replaced on a regular basis?

How do you try to reduce waste, besides recycling?

Follow-up

Can we contact you again to ask further questions?

Would you be willing to try new approaches that cut waste?

VI. Custodian

What materials/products do you throw away?

What cleaning supplies do you use (purpose, brand name)?

Who decides what cleaning supplies to buy?

Have you considered purchasing

- cleaning solutions in concentrated form?
- cleaning solutions in bulk?
- less toxic products?
- one cleaning solution that can be used for a variety of purposes?
- cleaning supplies only as you need them, so they are not wasted?

Who determines when and how cleaning is done?

What type of air filters does the building use? If they are disposable, have you considered reusable filters (either a reusable frame and disposable insert or completely reusable)?

Do you use washable cleaning rags? If not, is that a feasible alternative?

Where are incandescent light bulbs used? Could any of these be converted to fluorescent lighting?

How can waste generation be reduced at special events (sports events, celebrations, concerts, etc.)?

Do you have suggestions for how other school personnel could reduce waste? Your suggestions will be kept confidential.

What equipment has to be replaced on a regular basis?

How do you try to reduce waste, besides recycling?

Waste generation

If available, what is the average monthly quantity of waste disposed? What is the average monthly cost?

What waste materials are self-hauled (such as construction materials)?

Follow-up

Can we contact you again to ask further questions?

Would you be willing to try new approaches that cut waste?

VII. Groundskeeper

What materials/products do you throw away?

Are grass clippings left on lawns to decompose?

How are yard trimmings managed? Do they go to a landfill?

About how much yard waste is generated each month?

Could yard waste be composted on school grounds?

What local agencies would have to be consulted about setting up a compost site?

Is a chipper available?

Are plantings selected on the basis of the amount of waste they generate or water they need?

How are pests controlled?

Are you familiar with integrated pest management?

Do you have suggestions for how other school personnel could reduce waste? (Your suggestions will be kept confidential.)

Follow-up

Can we contact you again to ask further questions?

Would you be willing to try new approaches that cut waste?

VIII. Teachers

NOTE: In particular, seek participation of teachers interested in waste reduction and teachers whose classes generate significant wastes in terms of amount or potential toxicity (e.g., shop, art, biology, chemistry, automotive).

What materials/products do you throw away?

Would you and your classes be willing to research different waste prevention options to determine if they are practical and cost effective for your school?

Would you be willing to implement waste prevention activities or events in your classroom?

What type of support would you need to implement these activities (e.g., support from school administrators, parents, students, financial support, technical support)?

What are your suggestions for encouraging others to prevent waste?

How can waste generation be reduced at special events (sports events, celebrations, concerts, etc.)?

Do you have suggestions for how other school personnel could reduce waste? Your suggestions will be kept confidential.

What equipment has to be replaced on a regular basis?

How do you try to reduce waste, besides recycling?

Follow-up

Can we contact you again to ask further questions?

Would you be willing to try new approaches that cut waste?

IX. Students actively involved in waste reduction programs or other student leaders

What things do you throw away?

Are most students aware of landfill and natural resource issues?

What barriers must be overcome to prevent waste?

What are your suggestions for encouraging others to prevent waste:

- students?
- teachers?
- other school personnel?

How can waste generation be reduced at special events (sports events, celebrations, concerts, etc.)?

What environmental clubs are at school? If none, would the students be interested in starting one?

Are you familiar with the Student Environmental Action Coalition? (P.O. Box 1168, Chapel Hill, N.C. 27514-1168; 919-967-4600, handbooks are available for high school students.)

Follow-up

Can we contact you again to ask further questions?

Would you be willing to try new approaches that cut waste?

Appendix B: Facility Walk-Through - Worksheet 1

As you conduct the walk-through, use this worksheet as a guide to help you think about waste prevention options. You may find it easier to record your notes on the worksheet for each site or just refer to the questions and record your information on a separate sheet. As you discuss ideas, you may think of additional questions.

1. What type of work is done in this area?
2. What activities produce waste?
3. What type of wastes are being generated here (e.g., cardboard, plastic wrap)?
4. What materials/supplies are used by employees?
5. How can we change activities or procedures to produce less waste?
6. Are supplies/materials being used efficiently?
7. Can any materials be re-used or re-built either in-house or by outside groups?
8. Can we use less toxic substances (inks, cleaners) or replace them with non-toxic alternatives?
9. What types of waste have been prevented?

Appendix D

Waste Prevention Ideas for the Classroom

This list of waste prevention ideas from other schools is intended to help you jump start your waste prevention efforts. Brainstorming with others is bound to result in more ideas!

It is essential to educate students on waste prevention issues and options. The California Integrated Waste Management Board has supplementary materials which you can use in your classroom (see the order form at the back of this guide).

Reduce paper use wherever possible:

- Allow students to submit homework on the back side of used paper.
- Duplicate handouts using both sides of paper.
- Approach school administrators about purchasing a copy machine that makes duplex copies, if your current copier doesn't.
- Avoid printing extra handouts.
- Keep a box for various types of scratch papers (single-sided, construction, etc.).
- Bind scrap paper to use for taking notes.
- Maximize use of overhead projector and blackboard to minimize use of dittoed information.
- Place worksheets in plastic sleeves. Have students write with crayon and erase with carpet squares.
- Use erasable lap boards for classroom work.
- Place wall decorations directly on walls or bulletin boards without paper linings. Reuse wall decorations or exchange them with other teachers.

Collect scraps of construction paper, fabric, wood and other items to use for projects. Ask local businesses to donate materials they intend

to discard or provide a list of wanted items. Also, some communities have material exchanges for art supplies where schools can get cheap or free materials. Contact your county or city recycling coordinators for information. Also contact CALMAX, California's material exchange program to learn about free or low cost materials that may be available in your area. (See page 63 for a list of resources, contacts, and telephone numbers.)

Start up special projects that reduce waste inside or outside the classroom:

- Write letters to manufacturers asking them to use less packaging and design products that are more durable, repairable, and reusable.
- Designate a "no waste day" to see how much waste can be reduced. Teach students how to bring a zero-waste lunch.
- Investigate the feasibility of composting yard debris and cafeteria fruit and vegetable trimmings.

Making Lapboards

You can make lap boards from masonite boards, roughly 12" x 18". Paint these with two coats of chalkboard paint, "cured" by rubbing chalk across the board, and washed with a wet cloth. The rule-of-thumb on chalkboard paint is one pint per classroom. Students can use old socks or carpet squares for erasers. The amount of paper saved could justify purchasing the materials. (Students could estimate the amount of paper saved over a specified period of time).

- Set up a worm bin in the classroom (See Appendix D to order information).
- Conduct a waste prevention poster contest. Specify that posters must be made from used materials.

When purchasing items, consider the following:

- Purchase products that are easy to repair.
- Purchase durable goods.
- Purchase refillable products (e.g., pens and pencils).
- Purchase products in concentrate or bulk form (these often have less packaging per unit of product than unconcentrated or individually wrapped items).
- Purchase products made with recycled materials.¹

Purchase or make reusable displays. Borrow or trade displays with other teachers.

Bring lunch in reusable containers, e.g., use a thermos and cloth lunch bag or lunch box. Encourage students to do the same!

Use reusable dishware for class parties.

Consider having each student keep their own cup, plate, and utensils for parties.

Alternatively, select party foods that don't need to be served on dishware.

Set up a table at the end of semesters for students to place unwanted pencils, notebooks, etc. Bring the materials out at the beginning of the next semester for students to use.

¹ Buying products with recycled content is not considered a waste prevention option, but is important because it is the last step in the recycling loop. Purchasing goods made from recycled materials creates demand for the recyclables collected in your community and elsewhere.

Waste Prevention Ideas for Food Service and Cafeteria

This list of waste prevention ideas from other schools is intended to help you jump start your waste prevention efforts. Brainstorming with others is bound to result in more ideas!

There are many factors to consider when implementing waste prevention changes. This is especially true in the food service area because of local health and safety requirements. For this reason, check with local health officials if you are uncertain whether a new practice is allowable in your area.

Serving Food

- Use reusable dishes, trays, cups, and utensils.

In your analysis of this option consider factors such as, water and energy use, additional labor to wash dishes versus labor to order/stock disposables, equipment needs, and solid waste generated.

- Remind students to use utensils and napkins sparingly.
- Set napkin dispensers in a central location rather than at each table. Students will likely use fewer napkins and only when they need them.
- Eliminate straws or serve straws from dispensers rather than using pre-wrapped ones.
- Eliminate sporkette packets, as the plastic wrapper is not readily recyclable and tends to cause a large portion of the lunchroom litter.
- Purchase beverages in bulk or concentrated form and serve them from a beverage gun or dispenser.
- As alternatives become available and recycling options improve, purchase individual beverages in refillable or recyclable containers.
- Use refillable condiment bottles and refill them from condiments purchased in bulk.

Keeping it Clean

- Use cloth towels rather than paper towels.
- Purchase cleaning supplies in bulk and concentrate form. Dilute solutions on-site and

dispense them from refillable spray bottles. It is important also to purchase only as much as you need. Determine the amount needed for the job over a certain timeframe to prevent waste.

- Consider using and reusing hair nets instead of disposable hats.
- Minimize excess use of trash bag liners by emptying the cans only when they are full.

Preventing Food Waste

- An offer versus serve program can potentially reduce food waste. By using a salad bar students can select their items and oftentimes the leftovers can be saved and rotated into the next days lunch. When an item runs out, the staff adds another tray of food to the salad bar. Students find a salad bar appealing because they have more choices and it seems to be more “healthy/low cal.”
- Remind students to only take the food they will eat or involve students in a campaign to reduce food waste.
- Serve fruit halves and allow students to take two.
- Set up a “sharing corner” for students’ uneaten foods, such as whole fruit. Alternatively, collect uneaten food and donate it to a charitable organization.
- Send uneaten food home with students so parents are aware of what their children eat or don’t eat.

- Buy non-perishable food supplies in bulk.
- Arrange your refrigerated and dry storage areas to facilitate easy product access and rotation.
- Rotate perishable stocks at every delivery to minimize spoilage.
- Keep refrigerators in good running order to prevent unnecessary spoilage.
- Store raw vegetables and other perishables in reusable airtight containers to prevent unnecessary dehydration and spoilage.
- Wrap freezer products tightly and use in a timely fashion, to minimize waste due to freezer burn. Code-date all products stored in the freezer.
- Donate extra food to a food bank or soup kitchen.
- Adjust inventory levels of perishables to minimize waste.
- Plan menus to use vegetable and meat trimmings for soup stock and to make good use of leftovers.
- Evaluate and adjust the size of your meal portions if they are consistently unfinished.
- Collect vegetable and fruit trimmings in the kitchen and compost them on school grounds, if space is available. Alternatively, arrange to have a farmer collect non-meat food scraps for pigs. Note: Please follow Department of Food and Agriculture guidelines.
- Set up a rendering service for your waste grease, fat, or used cooking oil.

Adapted, with permission, from the “San Francisco Restaurants’ Guide To Waste Reduction And Recycling.”

Waste Prevention Through Purchasing

School administrators may consider policies to help guide purchasing decisions.

Purchasing Policy ²

- State in bid packets that the district is committed to the environment and encourage suppliers to participate in waste prevention and recycling.
- Review existing purchasing policies to be certain they do not exclude the use of recycled materials and/or products designed to be reused or recycled.

Buying recycled products typically does not mean sacrificing quality or performance. However, some existing standards may be overly specific, preventing purchasers from buying perfectly acceptable recycled products. In addition, some procurement standards directly prohibit the purchase of recycled products, based on a misconception that they are always of lower quality.

- Modify purchasing policies to promote procurement of products which: 1) are designed to last long (e.g., have long warranties and available repair services), 2) can be reused or recycled, 3) are made from recycled materials, and 4) have minimal packaging, if any.

This can be accomplished by:

- Providing a policy statement to purchasing agents.
- Allowing a price preference for durable, reusable, repairable and recycled products. A price preference is a way to recognize that many kinds of virgin materials receive tax breaks and other incentives which drive down the prices of their products. Consider using cost savings from waste reduction activities to pay for more expensive, but less wasteful products.
- An alternative to price preferences is to use “set-asides,” that is, requiring that a certain portion of the purchasing requirement for a given commodity be satisfied with products meeting waste reduction standards. Also, many durable products compare more favorably if a longer pay-back period is considered.

² A comprehensive purchasing policy should encourage waste prevention and recycling. For this reason, this section includes suggestions to enhance both of these approaches.

Waste Prevention Through Purchasing

(for purchasing agents)

This list of waste prevention ideas from other schools is intended to help you jump start your waste prevention efforts. Brainstorming with others is bound to result in more ideas!

You may have tried some of the ideas below and suppliers were unwilling to provide less wasteful goods with minimal packaging. Slowly, more and more suppliers are changing. Keep asking and eventually you will get what you want!

Seek Minimal Waste Products

- Buy equipment that is well-built and easy to repair. Look for long warranties and readily available repair services. Consider the total cost of a product, including the cost of maintaining it.
- Purchase copiers and printers that make two-sided copies effectively. Maintain these machines on a regular basis to reduce paper jams.
- Purchase rebuilt or refilled toner cartridges. These generally are much cheaper than new ones. Check with several vendors because quality varies.
- Purchase fax machines that use plain paper.
- Purchase printers that do not discharge unused sheets of paper. If your current printers discharge unused paper, check the manual to see if they can be programmed not to do so.
- Purchase products that don't need batteries or that use solar energy (e.g., solar powered calculators). Alternatively, use rechargeable batteries.
- Purchase refillable products, e.g., pens, pencils.
- Purchase reusable air filters. Some have a disposable filter insert while others are completely reusable, but must be cleaned. Some schools have a commercial filter service replace inserts on schedule.
- Purchase longer lasting light bulbs. Incandescent light sockets in exit signs can be converted to fluorescent. Check out availability of rebates from your electric company.
- Purchase products without packaging, minimal packaging, or reusable packaging. Look for products in concentrate or bulk form.
- Ask vendors to sell products that are more durable, reusable, repairable and recyclable. Also, ask suppliers not to over-package orders. (You may have to keep asking over and over!)
- Request that deliveries be shipped in returnable containers, if possible.
- Ask vendors to take back packaging. In some cases they may be able to reuse it.
- Save and reuse packaging materials. Offer excess packaging materials to firms that may be able to use them (e.g., firms providing mail services).
- Purchase products that contain recycled material.
- Use recycled paint when appropriate (it may be available free or at a low cost through your county's Household Hazardous Waste Program or CALMAX, the State of California's material exchange program).

For more information call (916) 255-2369

Waste Prevention In Administrative Offices and Teachers' Lounge

This list of waste prevention ideas from other schools is intended to help you jump start your waste prevention efforts. Brainstorming with others is bound to result in more ideas!

Cut paper use where possible:

- Make two-sided copies.
- Use bulletin boards, electronic mail and/or voice mail to convey or exchange information.
- Print forms on paper which has been used on one side, such as faculty/student messages and homework requests.
- Post memos and general bulletins next to teachers' mailboxes instead of making individual copies.
- Set up boxes to collect paper used on one side only. Reuse blank sides of paper in laser printers or as scratch pads.
- Use centralized files for hard copies instead of individual file systems.
- Reuse manila envelopes/file folders.
- Reformat faxes to omit the cover sheet.
- Circulate magazines rather than buying multiple subscriptions.
- Use a half sheet of paper for short messages and memos.
- When sending notes to parents, send one per family rather than one with each student.
- Before printing, double check the number and type of copies you need (e.g., example double-sided and collated).
- Establish a policy that it is acceptable to have a few hand corrected typos on internal messages and memorandums so that copies don't have to be redone.
- Reuse packaging and packing materials.
- Use rebuilt or refillable toner cartridges, and send used toner cartridges to a company that will rebuild or refill them.
- Use permanent tape dispensers.
- Use refillable pens and pencils.
- Send typewriter ribbons to a firm that re-inks them.
- Send postcards or call to remove your name from mailing lists.
- Buy sugar, coffee, and tea in bulk. Use reusable coffee filters (metal or cloth) or ones made from unbleached paper.
- Drink from reusable mugs. Set up storage rack for mugs.
- Bring lunch in reusable containers.
- Bring in magazines to share with colleagues.
- Keep reusable dishware on hand to use for lunch or parties.

Waste Prevention Ideas from Custodians

(also see suggestions for Cafeteria, Procurement, and Grounds Keeper)

This list of waste prevention ideas from other schools is intended to help you jump start your waste prevention efforts. Brainstorming with others is bound to result in more ideas!

- Use cleaning supplies that come in bulk and concentrate form. Note: Determine the amount you will actually need so the supplies will not have be wasted.
- Dispense cleaning solutions in refillable containers like pump spray bottles.
- Use non-toxic cleaners. (See Request Form for more information)
- Convert incandescent light sockets to fluorescent.
- Use reusable air filters or air filter frames.
- Use washable rags.
- Prior to recycling or disposing, check to see if anyone can reuse packaging materials. Cardboard and polystyrene may be used for art projects. Some mail companies are willing to reuse packaging (e.g., check with Mail Boxes, Etc).

Grounds Keeping:

- Compost yard trimmings and use them as a topsoil amendment.
- Chip tree trimmings and use as mulch.
- Plant drought tolerant plants that produce less debris.
- Leave grass clippings on the lawn and allow them to decompose naturally.
- Return plant containers to vendors or give them to teachers for use in student projects

Waste Prevention At Special Events

This list of waste prevention ideas from other schools is intended to help you jump start your waste prevention efforts. Brainstorming with others is bound to result in more ideas!

- Avoid giving away “junk” prizes that break easily or will be thrown away.
- Design decorations that can be reused.
- Make displays and decorations from used items and design them so they can be reused.
- Exchange decorations with other groups so they are “new.”
- Don’t release balloons into the environment. The balloons can cause problems for wildlife.
- Select a menu that eliminates the need for serviceware. For example, serve sandwiches, fruit, cookies, and other finger foods.
- Use reusable table cloths, plates, cups, and utensils, if practical.
- Have everyone label their cups so they can keep track of them.
- Post agendas or program information.
- Collect programs after an event and use them again (e.g., band concert).
- Print programs and other materials using recycled paper and vegetable-based inks.
- Ask attendees to share programs or handouts.
- If name tags are needed, select ones that can be reused. Collect the tags at the end of the event and use them again. Recycle paper inserts.
- Set out clearly labeled reuse or recycling bins at an event. Arrange to reuse or recycle waste that is generated.
- Use both sides of poster board before recycling.

- Inform public about “greenness” of event and how they can contribute (e.g., bring your own plate).

Other Waste Prevention Ideas

- Waste prevention activities need support from the top! Top administrators should have a waste reduction resolution or policy that provides support for waste prevention and recycling practices to be implemented at the school.
- Provide staff training on waste prevention. Educating staff on cost savings/benefits will empower them to identify alternatives.
- Award or recognize waste prevention efforts.
- Set up monthly “No Waste Days” where the object is to create as little waste as possible. Eventually, the event may turn into habit.
- Create PTA positions for waste prevention and recycling.
- Sponsor the sale of reusable lunch bags or lunch boxes to cut down on disposable lunch bags. Send a letter home or present information at a PTA meeting, encouraging parents to give students “no waste” lunches.
- Check to see if your area has a materials exchange for art supplies, furniture, books, or other materials. Some regions have material exchanges that sell goods inexpensively or donate them to schools. Contact the CIWMB for more information on KidMax.
- Set up swaps to exchange goods.
- Set up a waste display to educate students and faculty.

Appendix E Evaluation Worksheets

Worksheet 1a: Avoided Purchase Cost (Savings from purchasing less)

Purpose: To calculate the annual savings in purchasing costs that result from using something more efficiently (like paper) or eliminating some item all together.

When to use: When you are going to stop purchasing an item or start using a product more efficiently and you want to know the savings in purchasing costs. Note that the item is not being replaced by an alternative product.

Worksheet 1a: Avoided Purchase Costs				
Activity	Product being used more efficiently	Amount reduced each year	Unit price	Annual avoided purchase costs
Total				

Perhaps you will be able to use the cost savings here to justify the costs of other great ideas you have!

**Worksheet 2a: Amortized Capital Costs
(cost of equipment, new buildings, remodeling, etc.)**

Purpose: Determining the cost for one-time large expenditures like buildings and equipment in terms of cost per year. This means taking into consideration how long the item will last.

When to use: When an option requires a large one-time expenditure and you need to determine the annual savings or payback period (in combination with the worksheets that follow). You will probably want to consider several options at the same time.

Worksheet 2a: Amortized Capital Costs			
	Option 1 Current approach	Option 2	Option 3
Purchase price of product or equipment			
Total interest payment (if applicable)			
Site preparation and installation			
Other:			
Total capital costs			
Amortized capital costs (Total capital costs divided by the number of years the equipment will service)			

Worksheet 3b: Average Waste Hauling and Disposal costs

Purpose: To assign a cost per cubic yard of waste disposal services.

When to use: This calculation is needed to complete the next worksheet, which compares disposal costs of various options.

Worksheet 3b: Average Waste Hauling and Disposal Costs	
Average monthly cost (from waste removal bills)	
	÷
Average cubic yards of waste collected each month	
	=
Waste removal cost/cubic yard (divide top row by second row)	

Worksheet 3c: Comparing Disposal Costs

Purpose: Comparing the cost of disposal services for various options.

When to use: When the various options being considered result in different amounts of waste generation.

Worksheet 3c: Comparing Disposal Costs			
	Current Approach (Option 1)	Option 2	Option 3
Waste generated per year in cubic yards* (from worksheet 3a)			
Waste removal cost/cubic yard (from worksheet 3b)			
Total Waste Removal Costs (Waste generated per year times waste removal cost)**			

*When you complete this worksheet, describe any assumptions made in determining waste generation.

**Note that disposal costs will not decrease unless the level of service is reduced. You may have to combine the waste reduction from several activities to eliminate a bin or use a smaller one.

Worksheet 5: Combined Average Annual Costs

(Amortized capital costs+Annual operating costs)

Purpose: To compare the full costs of each option.

When to use: This is one worksheet you won't want to miss. Now you can see which option is least expensive. But remember, this is just a financial test, there is more than money to consider.

Consider environmental and health and safety concerns, and ease of implementation, too.

Worksheet 5: Combined Average Annual Costs

	Option 1 (Current Approach)	Option 2	Option 3
Amortized capital costs (from worksheet 2a)			
Total annual operating costs (from worksheet 4)			
Total average annual costs			

Describe below other factors to consider (environmental, health and safety, ease of implementation):

Environmental (pollution to air, water, land):

Health and Safety:

Ease of Implementation (space needs, time, logistics, etc.):

Overall preferred option:

Worksheet 6: Annual Savings

Purpose: To show the annual savings from the preferred option, provided it is not the current approach (option 1).

When to use: You have come this far, so why not make this next calculation? It is optional, but a fun number to report.

Worksheet 6: Annual Savings				
Use only use if the preferred option is different than the current approach (option 1)				
Total annual costs for Option 1 (from worksheet 5)		Total annual costs for alternative options (from worksheet 5)		Annual savings
	-		=	
	-		=	
	-		=	
	-		=	

Worksheet 7: Payback Period

Purpose: To see how long it will take to pay back the cost of your initial investment.

When to use: This is optional, but a common financial test. It can only be used if there was a capital expenditure. The shorter the payback period the better.

Before measuring ask yourself:

Worksheet 7: Payback Period (optional)		
Shows how long it will take to recover money from investment in an equipment purchase		
	Option 2	Option 3
Total capital costs (from worksheet 2a)		
	÷	÷
Annual Savings (from worksheet 6)		
	=	=
Payback period (in years)		

Appendix F

Measuring Success

Measuring the impact of waste prevention efforts will provide you with information to help promote your program and find ways to improve it. Also, by sharing results, you can help others get started with their own efforts.

- What needs to be measured?
- How accurate do the measurements have to be?

Usually there is a trade-off between the degree of accuracy and how much effort it takes to make the measurement. At your school, it will probably make sense to compare discards generated over a time period (e.g. calendar year, school year, same month in different years). Often it is easiest to measure results activity by activity or product by product. You can also measure results for your entire school district or school.

Measure by Volume or Weight?

Waste is typically billed in cubic yards — your hauler probably has an agreement to pick up certain sized bins so many times each week. This means it will probably be more practical to measure success in terms of cubic yards or volume, instead of weight. You can select whatever unit is easiest, just be consistent and use the same units in your calculations. Some groups report results from waste prevention efforts in terms of both volume and weight. In the future, more haulers may charge by weight because it is not affected by compaction and tipping fees often are charged by weight.

Product-Specific Measurement

Every product that leaves your school, classroom, or work area has a measurable volume and weight. The waste produced through the use of any two products designed to do the same job can be compared.

There are a number of factors that need to be considered when making your calculations such as:

- What if a waste compactor is used?

If all waste is compacted, use the compacted volume.

- What if food waste is sent through a garbage disposal instead of trash cans?

Transferring discards from land to the sewer system is not considered waste prevention.

Measuring Volume

Length x Height x Width = cubic inches
(inches) (inches) (inches) of rectangle

$3.14 \times (\text{radius})^2 \times \text{Height} = \text{cubic inches}$
(inches) (inches) of cylinder

46,656 cubic inches = 1 cubic yard

Likewise, burning trash to reduce its volume is not waste prevention. These approaches simply transfer a problem, they do not remove it.

- Can I use the shipping volume or weight to determine the disposal volume or weight?

Measuring Volume Through Water Displacement

The water displaced represents the volume of the product.

Volume = $3.14 \times \text{cylinder radius}^2 \times \text{water height change}$.

or you can weigh the displaced water,

1 gram = .061 cubic inch.

They are often different. For instance, disposable cafeteria trays come neatly stacked inside the shipping box. At Alysson Elementary in Rio Linda, student volunteers restack the trays into the original shipping boxes. Even with careful stacking, a few trays won't fit in. If these trays were not stacked at all, they would use up considerably more space.

Likewise, the weight of some products changes a lot after it is used. Consider paper napkins before and after wiping up a spill. Obviously, used napkins weigh more than new ones because they absorb moisture.

Weight Conversions

- 10 grams = 0.3527 ounce
- 16 ounces = 1 pound
- 1 kilogram = 2.2046 pounds
- 2000 pounds = 1 ton

- What if the products being measured have irregular shapes?

Irregularly shaped objects can be measured through water displacement. Place the product

Product A:	Product B:
Volume of one unit discarded	Volume of one unit discarded
Weight of one unit discarded	Weight of one unit discarded
Cost of one unit	Cost of one unit
Number used/year	Number used/year
Volume, weight and cost/year	Volume, weight and cost/year

in a thin plastic bag and submerge it in a volume-calibrated water-filled cylinder.

Facility-Specific Measurement

School-wide measurements can be taken over time for the whole school district or school. The longer the time period, the more dependable the figure. Record total discards along with recyclables collected and estimates of yard trimmings composted. This will provide the total amount of waste generated. You can also

include liquid waste in these calculations. A drop in the total amount of waste generated may be due to waste prevention, but you will need to look a bit further.

Waste generation is affected by the number of people in an organization. To isolate this influence, calculate waste generation per person. This is done by taking the average total waste generated in a time period (e.g., year, month, day) and dividing it by the average number of people in the school in the same time period.

School-wide measurements can also be taken for energy use, water use, or other factors that are important.

Also consider any special activities that occurred in the time period. Remodeling, a carnival or some special event can distort your waste generation calculations. You may need to adjust your calculations to get a fair picture of changes in waste generation. However, don't disregard waste from special events; it needs to be reduced too!

<p>Average amount of waste generated each day/ average number of people per day</p> <p style="text-align: center;">=</p> <p>Average amount of waste generated per person per day</p>
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