

C&D Recycling Plans and Policies:

A Model for Local Government Recycling and Waste Reduction

Overview

A major opportunity exists for meeting the State's waste diversion goals by recycling construction and demolition (C&D) debris. Mixed C&D recycling facilities in the state are routinely recovering 60 to 90 percent of all the materials brought to them. Literally hundreds of reuse, recycling, and composting businesses are available to process source-separated materials from C&D throughout the state.

The California Integrated Waste Management Board (CIWMB) recognizes the importance of C&D recycling in meeting the State's 50 percent waste diversion goal. In November 1997, the CIWMB adopted C&D recycling as one of four major initiatives in its strategic plan to achieve the requirements of the California Integrated Waste Management Act of 1989 (AB 939, Sher, Chapter 1095, Statutes of 1989 as amended [IWMA]).

C&D materials originate in the construction and demolition of buildings, roads, homes, tenant improvements, landscaping, hardscaping (non-organic materials used in landscaping design), and site clearing activities. This waste stream includes, among other items: concrete, asphalt, soils, gypsum, wood, ferrous and non-ferrous metals, brick, corrugated cardboard, soils, trees, shrubs, and many miscellaneous and composite materials.

Approximately 11.6 percent of solid waste disposed in California is C&D debris. This amounts to more than 4 million tons of waste disposed every year.

Community C&D Recycling Plans

Community C&D recycling plans provide information on how local governments can encourage companies hauling C&D materials to reduce their disposal in landfills. They can also encourage reduction and reuse of wastes at the source of generation.

Local governments have adopted a wide variety of policies and programs to divert C&D debris from

landfills. This model study highlights the process of developing a comprehensive C&D recycling plan and some of the policies and programs that could be included in such plans.

In 1999, for the first time, two communities in California developed comprehensive C&D recycling plans. In May 1999, the County of Santa Barbara found that 14 percent of the total waste deposited at the county's landfill was C&D debris.

The City of Hawthorne, Calif., also developed and adopted a community C&D plan on October 1, 1999.

C&D practices are changing rapidly, creating many opportunities to increase C&D diversion. The best plans use a variety of tools and strategies that are effective regardless of the success or failure of any one program component.

C&D processing facilities that extract recyclables from mixed waste are beginning to emerge throughout the state. Cities are adopting a wide range of initiatives to encourage and/or require C&D recycling, including mandates that set minimum recycling requirements on haulers and contractors. These efforts allow better tracking of local C&D practices.

Tools and Strategies for C&D Plans

Communities can reduce C&D debris using the following tools and strategies:

- Promotion, education, and technical assistance.
- Planning requirements (for example, by contractors and project developers for waste management).
- Reporting requirements (results of the waste management plans).
- Diversion requirements.
- Deconstruction requirements (for example, allow for deconstruction before demolition).

- Pre-processing requirements (processing of all C&D debris before landfilling).
- Pre-approved sites (sites arranged before the need for managing diverted materials arises; especially useful as part of disaster plans).
- Economic tools (for example, deposits and franchise fees that decrease as recycling rates increase).
- Market development (for example, create demand through buying recycled building products for projects).

C&D plans allow communities to determine the tools and strategies that best apply to local economic conditions, political realities, and individual projects. These tools and strategies may be applied to those initiating or involved in the project: city agencies and departments, franchised/non-franchised haulers, recyclers, construction contractors, demolition contractors, builders, developers, permit applicants, and/or homeowners or property owners.

How a community uses a tool or strategy might depend on the type of project, such as those in the following categories: municipal only, private only, projects of a particular dollar amount or size, or all construction and demolition activities within the city.

Sample ordinances, permit language, and additional materials are available from the C&D technical assistance staff of CIWMB at www.ciwmb.ca.gov/ConDemo/. These can be useful when considering, adopting, and implementing any of these tools and strategies as part of a C&D planning process.

Following is a summary of some of the C&D program planning tools.

Promotion, Education and Technical Assistance

Most communities recognize the value and importance of promotions, education, and technical assistance. Throughout the state, cities and counties have developed directories of reuse, recycling, and composting businesses, either individually or together with other communities in a region. Many communities are now developing specialized C&D directories to highlight reuse, recycling, and composting businesses that can assist C&D contractors and developers. The

CIWMB provides an excellent base, with more than 500 such businesses listed by county on its Web site at www.ciwmb.ca.gov.

In addition to producing such directories, communities are holding brief training sessions, facility tours, and meetings with service providers and contractors to build bridges between the different disciplines and industries at work. Regional or countywide staffs that are knowledgeable about C&D practices and services in the area can provide invaluable technical assistance to C&D contractors and project developers to assist them to voluntarily increase reuse, recycling, and composting of materials from the C&D waste stream.

In Alameda County, a good example of a voluntary effort was the Citation Homes project in Union City. In 1999, Citation Homes completed the first phase of the Inspirations at Foothill Glen project, a development of 95 large single-family homes ranging in size from 1,875 to 2,300 square feet. In partnership with its recycling subcontractor, Citation was able to recover and recycle more than 1,000 tons of materials during the construction phase—86 percent of all waste generated on the project.

Rather than paying to haul construction waste materials, and then paying to dispose them at the landfill Citation Homes contracted with Green Waste Recovery to collect and transport the excess wood, asphalt, concrete, gypsum, and metals from the job site for recycling. Leftover wood became mulch or fuel for co-generated power. Sheetrock scraps were turned into a gypsum soil amendment. Concrete and asphalt were ground and used as road base. Recycling efforts provided added value to the project by keeping the construction site picked up on a daily basis, which made work more efficient and safer.

Planning requirements

Many communities are requiring contractors and project developers to plan for how they will reuse, recycle, compost, and/or dispose of their wastes. These requirements can be included as conditions of permits or mitigation plans in environmental review of projects. Often plans required are only a page or two, with the applicant identifying the types and amounts of wastes to be produced and how they plan to handle those materials (for

example, identifying whether they will reuse, recycle, compost, or landfill those materials, and where they will take those materials to accomplish that).

One of the key factors that varies by location is the threshold level (or who is required to submit plans). The threshold level may vary based on the number and size of average C&D projects in the community. It may also depend on the amount of staff available to review plans and reports that may be required. Local economic conditions will often determine the threshold levels that are appropriate—a high threshold level is not appropriate if most C&D is created from individual homeowners and small commercial businesses remodeling projects.

Examples of different thresholds are highlighted below:

Oakland. The city requires C&D contractors for all city C&D projects to meet planning and reporting requirements where project costs exceed \$150,000.

ACWMA Model Ordinance. The Alameda County Waste Management Authority (ACWMA) has prepared a model ordinance for all cities within the county to adopt. In that model ordinance, ACWMA recommends that all construction, demolition, and renovation projects within the city exceeding \$50,000 total costs comply with the planning and reporting requirements.

Applicants for projects whose total costs are less than \$50,000 are encouraged to divert at least 50 percent of all project-related construction and demolition debris. The ACWMA model ordinance offers two options for all city-sponsored construction, demolition, and renovation projects: either to require them to comply “regardless of cost” or only if the project’s “total costs are equal to or greater than [\$50,000],” with a number to be determined at the local level. ACWMA offers an option for the threshold to be set for all construction, demolition, and renovation projects within the city that are 1,000 square feet or greater.

Hawthorne, Calif. The Hawthorne C&D recycling resolution requires all private construction or demolition projects over 10,000

square feet in gross floor area to comply, as well as all city projects.

Palo Alto, Calif. Projects over 10,000 square feet involving construction, remodeling, or demolition must submit recycling plans and reports.

City of Sacramento, Calif. A “Statement of Recycling Information” is required for each new commercial, office, industrial, public/quasi-public, and multifamily residential development consisting of five or more units prior to issuance of a building permit. A statement of recycling information may also be required from each existing business.

The City of Sacramento statement of recycling information must include:

- A diagram showing the flow of recyclable material from each portion of the development to the recycling and trash enclosure(s), including location of receptacle(s), frequency of collection, who is responsible for collecting and transporting recyclable materials, and specific materials targeted for recycling.
- A site plan with location and design specifications of recycling and trash enclosure(s) and receptacle(s) that meet city volume and material requirements.
- A construction plan specifying any recycled material to be used in the construction of the proposed development.
- A demolition plan to specify any proposed recycling of reusable or recyclable building material in the demolition of any structure on the subject site.
- An education/public relations program to instruct users of the development about the benefits of recycling and how to recycle.

The Sacramento requirements and similar planning requirements in Palo Alto and Oakland are all available on the CIWMB Web site at www.ciwmb.ca.gov/ConDemo/. The Palo Alto and Oakland requirements—and the ACWMA model ordinance—include sample short forms for the contractors to fill out. These three cities all require contractors to submit reports as well after the project is completed (see below).

Reporting Requirements

Communities could require reports on what happens to C&D wastes together with plans, or they could require only the reports.

Hawthorne requires only reports of the quantities diverted and disposed upon completion of the project in a format approved by the city, either directly or through the local franchised hauler. Hawthorne did not require a plan to be submitted initially by contractors because city staff time available to review such plans is limited. The requirement of reports would be sufficient to inspire contractors to increase C&D recycling significantly.

Palo Alto, Oakland, and the ACWMA model provide forms for contractors to fill out. The reports document the types and amounts of materials generated at the construction or demolition site and how much was reused, recycled, composted, salvaged, or landfilled.

Diversification Requirements

Many communities require some level of diversion as part of their new C&D recycling requirements.

Hawthorne requires private projects to divert the “maximum feasible amount of construction and demolition materials.” Hawthorne also set a goal of achieving a 50 percent diversion for all C&D materials collected by the franchised hauler for calendar year 2000, to be revisited after that.

In Palo Alto, the city requires that contractors recycle materials when there is a viable recycling company available. In the ACWMA model ordinance, it expects contractors to divert at least 50 percent of all C&D debris generated by the project.

Deconstruction Requirements

Communities could require contractors to contact firms specializing in deconstruction before issuing demolition permits to determine if there is enough salvageable material to warrant the labor involved.

The City of Cotati requires that prior to any public or private demolition, all materials that can be reused or recycled shall be made available for salvage. Any entity seeking to demolish a structure within the City of Cotati is required to make known publicly its intent to demolish the structure and the availability of potentially salvageable materials by:

- Placing an advertisement in a newspaper of general circulation with the address of the site and the hours and dates that the materials will be available for salvage, making such materials available for at least 10 days.
- Mailing or delivering a written notice to all parties on file at the City of Cotati wishing to receive such notice with the address of the site and the hours and dates that the materials will be available for salvage.

In addition, the city may choose to take the above actions in the place of the entity wishing to demolish the structure.

Pre-Processing Requirements

Communities could require that all C&D materials be delivered to reuse, recycling, or composting facilities for pre-processing prior to landfilling.

The Hawthorne C&D plan recommends that the franchised hauler reuse, recycle, or compost all C&D materials to the maximum extent possible. No greater than 10 percent of C&D materials collected under the exclusive franchise should be taken directly to a landfill by the franchised hauler or by an intermediary for disposal or use as alternative daily cover in a landfill.

Instead, to the fullest extent possible all C&D materials collected under the exclusive franchise should be processed to recover all reusable, recyclable, and compostable materials. In no event should less than 90 percent of C&D materials be taken to a facility for preprocessing for reuse, recycling, or composting. Processing residue may be used as alternative daily cover (ADC) and, as a last resort, landfilled.

Hawthorne felt comfortable in adopting this requirement. Their research had found more than 100 businesses that reuse, recycle, or compost C&D materials. The city found four different sites (within a reasonable commute distance) that could receive mixed C&D debris for recycling.

Pre-Approved Sites

Local governments could arrange sites in advance for reuse, recycling, or composting of C&D materials, or certify facilities that might be eligible for different economic incentives (see below). This approach is particularly useful for disaster plans.

After the Northridge earthquake, the City of Los Angeles arranged for sites to accept C&D debris for recycling. The city also coordinated reimbursements for staff services at those sites by the Federal Emergency Management Administration (FEMA). Field inspectors directed contractors to the closest recycling site to maximize the diversion of C&D debris from the earthquake. This encouraged private operators of the recycling sites to invest FEMA monies into equipment that has enabled them to continue to provide excellent C&D recycling services to the area ever since.

Economic Tools

Some communities have experimented with different types of economic tools to provide price signals to generators, haulers, and landfill operators to maximize waste diversion. Some of the key tools used are rates, fees, and taxes; deposits; and advance recycling fees. These economic tools are described below.

Rates

The rate structures adopted by communities for franchised hauler collection services, transfer stations, and landfill gate fees could have significant economic impact on the operations of C&D contractors. If C&D hauling is under an exclusive franchise, then cities could make sure that the rates charged for such services were less than recycling services from that hauler.

Two leading economists for solid waste and recycling, Skumatz Economic Research Associates (SERA) and Sound Resource Management Group (SRMG) have both found that the proper structuring of rates can increase reduction and recycling rates dramatically. SRMG reported in 1999 that proper rate structures have reduced waste by as much as 25 percentage points, holding other factors constant.

In some areas (for example, Del Norte County), the contract requires recycling rates to be no more than 75 percent of the rates charged for similar disposal services.

In San Jose, the permit for the Zanker Road Landfill written by the city local enforcement agency required Zanker to offer lower rates for source-separated materials than for mixed loads. This provides waste generators with an economic incentive to keep their loads clean and more

recyclable. This is one of the factors that help the Zanker Road Landfill achieve a 94 percent waste diversion rate for the last five years.

Fees and Taxes

Local governments have established a wide variety of solid waste fees and taxes in California. Section 41901 of the IWMA authorized local governments to establish IWMA fees to directly cover the costs of preparing, adopting, and implementing programs in its source reduction and recycling element or county integrated waste management plan.

Many communities have established franchise fees on exclusive or non-exclusive franchised collectors. The structure of these franchise fees can be used to encourage haulers to maximize waste diversion—including C&D debris—if included in the franchise.

Santa Clara has established a system where the franchised hauler pays a lower franchise fee if it meets certain recycling requirements detailed by the city. In Monrovia, the franchise fee for non-exclusive franchised haulers is reduced directly proportional to the level of recycling achieved (that is, up to 24 percent recycling, the franchise fee is 16 percent; at 25 to 49 percent recycling, the franchise fee is 12 percent; and over 50 percent recycling, the franchise fee is 8 percent).

Business taxes or surcharges on landfills can also be powerful economic incentives for waste diversion. Waste haulers (including C&D contractors) are more motivated to decrease their wastes as the costs for disposal increase. Alameda County enacted a \$6 per ton landfill surcharge in 1990 via a public referendum to pay for aggressive recycling programs throughout the county. San Jose enacted a disposal facility tax (DFT) of \$13 per ton as a major revenue generator for the city.

In the structure of the DFT, San Jose exempted materials recycled by the landfill operators. This exemption played another important role in stimulating landfill operators to recover as much material as possible, rather than just burying it in the landfill.

Deposits

A number of communities have enacted financial deposits as part of the implementation of C&D programs. Generally they are a nominal amount to

encourage applicants to submit their plans and to report on the amount of materials recycled.

The town of Atherton, Calif., has a creative structure for the deposit. The town requires a deposit of \$50 per ton for all waste required to be recycled. Atherton's ordinance No. 506 requires that 50 percent of waste from construction, remodeling, re-roofing, and demolition projects be recycled and/or reused.

At completion of the project, the contractor must show that it has recycled at least 50 percent of the waste generated. If the contractor meets the 50 percent goal, the full deposit is refunded. If less than 50 percent is recycled, the town keeps \$50 for each ton below the 50 percent goal that was not recycled.

In Cotati, a \$200 deposit is required to be posted, and it is refunded after proof of reuse, recycling, or attempts thereof. In the ACWMA model ordinance, a deposit of the lesser of 3 percent of total project cost or \$10,000 is required. Acceptable forms of this deposit include the following: performance bonds, surety bonds, money orders, letters of credit, and certificates of deposit.

The City of San Jose has proposed a C&D deposit for diversion (CDDD). The city proposes to collect a deposit when a building permit is issued for construction, demolition, and alteration projects. The deposit is to be paid by the project's general contractor or property owner based on the type and quantity of C&D waste to be generated. The deposit will be set at a level sufficient to encourage generators to take their loads to certified recycling facilities.

To have their deposits returned, contractors will have to provide receipts or records showing that the project's C&D waste has been accepted by a city-certified recycling facility or diverted by other means, including reuse. As part of the program, the city will provide to contractors a list of certified recyclers and information on how to keep C&D waste out of landfills.

Market Development

Communities need to create demand for recycled-content building products as part of their comprehensive C&D recycling programs. Communities could help increase the demand for

these products through direct city purchases and contract requirements for publicly funded projects. Communities should document the results of these actions and promote them widely, to encourage other public and private organizations to follow their lead.

A range of recycled-content products is available on the market that can be included in specifications for city buildings and private developments. More than 3,000 such products are now listed in the Harris Directory, which is accessible free on the CIWMB Web site. Many products are fully tested, meet building codes, are available locally, and are cost-competitive. Starting from the ground up, they include materials such as recycled road base, rubber-modified asphalt pavement, recycled plastic site furnishings, carpeting, wallboard, insulation, paint, and ceiling tiles.

Communities could obtain lists of recycled-content building products, specifications, and samples of products to promote their use locally. The goal should be for the city to be its own best customer. In addition, communities should maintain current lists of publications on recycled-content building products available throughout the United States and locally. City staff could display those materials at permit counters and in work sessions with developers and contractors prior to awarding of permits. Such documents should also be maintained regularly in public view as a library for residents and contractors alike.

C&D Recycling Plan Process

Community C&D recycling plans need to be recognized as part of an evolving process to collect additional data and to test the recommended approaches. The process should also evaluate the strengths and weaknesses of what has been proposed and what actually gets implemented. Although a plan may be adopted at one moment in time, to be truly effective it needs to recommend ongoing processes and implementation steps that will inevitably lead to the desired outcomes of the plan. C&D plans will be successful if they provide strategies to harness the forces of the marketplace to maximize waste diversion. They must also document that success for the local government to share with the State.

National Building-Related C&D Debris

Source (1996)	Tons (000s)	Percent
Residential		
Construction	6,560	11
Renovation	31,900	55
Demolition	19,700	34
Subtotal	58,160	100
Nonresidential		
Construction	4,270	6
Renovation	28,000	36
Demolition	45,100	58
Subtotal	77,370	100
Total		
Construction	10,830	8
Renovation	59,900	44
Demolition	64,800	48
Total	135,530	100

Source: Characterization of Building-Related Construction and Demolition Debris in the United States, U.S. EPA, June 1998, EPA530-R-98-010, page ES-3.

Following are some of the key steps that should be taken in the development of a C&D recycling plan.

Step 1: Identify C&D Debris Generated Locally

This is one of the more difficult aspects of C&D planning in most communities. C&D debris varies by season and year, as construction and demolition projects vary from year to year.

Building-related C&D debris is generated from a wide variety of construction, renovation, and demolition activities. Figure 1 highlights the relative percentages of building-related C&D debris.

In addition to building-related C&D debris, substantial amounts of C&D debris are produced from road, bridge, and land clearing activities that are managed by the same processors and landfills that manage building-related C&D debris.

Information may be obtained from homebuilders, homeowners, remodelers, commercial developers, building contractors, highway and street contractors, bridge builders, pavement contractors, site grading contractors, demolition contractors, roofing contractors, drywall specialists, and excavation specialists.

C&D debris may be produced from many types of projects, including:

- Site clearance (brush, soil, trees, and stumps).
- Excavations (earth, fill, and rock).
- Roadwork (concrete slabs, concrete and asphalt chunks, asphalt millings, scrap metal).
- New construction, renovation, remodeling, or repair (wood, sheetrock, metals).
- Demolition, wrecking, implosion, dismantling, and deconstruction (all of the above).
- Disaster debris (all of the above).

The amount of C&D debris will vary based on the general economic conditions of the region, weather, major disasters, special projects and local regulations.

Data Projections. Some of the best sources of information to base future projections are zoning changes, community development plans, and building permits issued in a community. Building permits are the best barometers for identifying major projects that will impact a community in the coming year. Zoning and community development plans may provide some insights into the potential for future construction and demolition activities in the area.

C&D recycling planners should contact their community development, redevelopment, and building departments to obtain information about these anticipated changes and locate historical records. If historical records can be provided for the past two to three years, then some analysis can be made of that data to project what might be expected, on average, for the next two to three years.

If hard data is available regarding the types and nature of buildings that are expected to occur, then estimates of C&D debris expected from such activities can be calculated. In the U.S. Environmental Protection Agency (U.S. EPA)

landmark report “Characterization of Building-Related Construction and Demolition Debris in the United States,” Franklin Associates provides the following suggestions for such calculations:

Residential Construction Debris. Types of houses, building practices, and regulations vary widely. U.S. EPA used an average of 4.38 pounds per square foot (ppsf) of floor space for their estimates.

Nonresidential Construction Debris. Nonresidential buildings vary even more widely than residential structures. U.S. EPA used an average generation rate of 3.89 ppsf.

Residential Demolition Debris. Assuming an average of 1,600 square feet for single-family houses and 1,000 square feet for multifamily houses, EPA used 61 ppsf for single-family and 115 ppsf for multifamily houses.

Nonresidential Demolition Debris. Assuming an average building size of 13,300 square feet for buildings built between 1920 and 1969, EPA used 155 ppsf for nonresidential buildings.

Renovation/Remodeling Debris. EPA analyzed the amount of material produced by major remodeling projects and the number of those projects expected each year from the housing stock. EPA found that 68 percent of renovations were for improvements and 32 percent were for repairs. After extensive calculations, the total of residential and non-residential debris approximately equaled the amount of demolition debris estimated. A rough estimate of remodeling debris could be obtained by using such a calculation.

The combination of all these factors yielded a total of 2.8 pounds per capita per day (pcd) for all C&D debris, not including roadway and bridge construction/demolition or land clearing debris. This could be used as a check on the numbers calculated above.

Historical Analysis. A check and comparison of data projections are analyses of historical data in the area. Data may be obtained from existing waste haulers, recyclers, landfill operators, and regulators of those operations. Historical data should be compared to economic data for the community to determine if the economy was comparable during the past several years

compared to local economic projections for the future.

Once an estimate has been made of the amount of C&D debris that is projected for the future, then the plan can assess the need for additional collection and processing capabilities in the area.

Step 2: Collection Analysis

The second step is an evaluation of the collection infrastructure. If a waste hauler collects C&D debris on an exclusive basis, that hauler should have much of the data needed to evaluate current operations and assess future needs. If multiple haulers collect C&D debris on an open competitive basis, a local government may need to contact each of the haulers to obtain the data desired, possibly on a confidential basis.

Information should be obtained from C&D waste haulers on the equipment and services they have available and the rates for those services. A survey could be sent to haulers serving your area requesting the following information:

- Types of trucks available (for example, front loaders, rollovers).
- Types of containers available (for example, 1-2- and 3-cubic-yard bins and 10-, 20-, 30-, and 40-cubic-yard debris boxes).
- Rates for collection, based on size of container and frequency.

Conditions of rates (for example, whether there are base tonnages assumed per box, and more weight is done for a surcharge, or whether collection charges on a volume basis are separate from disposal fees on a weight basis).

In addition, similar information should be obtained from independent and franchised haulers serving other cities within a 25 to 50-mile radius to compare the costs of service and the structure and types of services available. The comparative analysis should provide sufficient information to gauge the full range of services needed or desired in the area.

Also, as part of the collection analysis, similar information should be obtained from reuse, recycling, and composting businesses in the area. There are many types of businesses that reuse, recycle, or compost source-separated or mixed C&D debris.

Recyclers generally fall into the following categories:

- General
- Asphalt
- Concrete
- Brick
- Appliances
- Flooring
- Wood
- Drywall/Sheetrock
- Metal
- Paint
- Plastic
- Other

A statewide listing of C&D recyclers, processors, and receivers is included on the CIWMB Web site at www.ciwmb.gov/ConDemo/. In addition, in a few communities, there are other businesses that specialize in deconstructing buildings, taking them apart by hand to preserve materials to be used again for their original purpose (for example, lumber, doors, windows, and plumbing fixtures).

Other businesses also are involved in salvaging or reuse activities. Often these can be found by looking in the Yellow Pages. Deconstruction contractors usually advertise under “demolition contractors” and include references in advertisements to “hand wrecking,” “selective demolition” or “used building materials.” Some of these may also be found in reuse and recycling guides prepared by other nearby local governments, particularly by the larger cities in the area.

For reuse, recycling, and composting companies, questions should also include:

- Is there a fee for services provided? Is there a payment for the sale of recycled materials?
- Is there a minimum quantity of materials to be collected?

Are there specifications for the amount of contamination allowed? What happens if there is more contamination?

A review of the types of mixed C&D recycling businesses available within a reasonable distance of your community is also important. This could determine which of the tools and strategies you choose to ensure the maximum waste diversion from C&D wastes.

In addition to talking to service providers, it is helpful to contact a representative sample of different types of C&D waste generators—including major businesses—contractors, developers, and public agencies involved in construction and demolition activities.

A review of city contracts, ordinances, and permits related to C&D collection and processing activities is also important to understanding the existing collection system.

Step 3: Evaluation of Tools and Strategies

Once you obtain background information for your area, you should evaluate the tools and strategies noted above. The full range of options noted above should be presented to key stakeholders and decision-makers for their review and comments on the best approaches to implement in your area. You may want to obtain more detailed background information from one or more of the sources referenced above, either by downloading information from the CIWMB Web site or by contacting other communities directly to obtain their firsthand comments on what worked best for them.

The analysis of the most appropriate options is primarily based on your availability of staff resources, an understanding of local economic conditions, and an assessment of local political realities. The more involved the requirements, the more staff time necessary to review, monitor, and enforce those requirements.

Establishing the “threshold level” for your community depends on local economic conditions and how much C&D material is created by different types of projects. High thresholds are appropriate if most of the C&D work anticipated is from commercial, institutional, and industrial projects. A lower threshold—but simpler—process is more appropriate if the majority of C&D debris anticipated will be from individual homeowners and small commercial business remodeling projects.

Finally, you may find it easiest to establish requirements on city projects only. Or you may find that stakeholders and decision-makers don't mind these extra requirements being imposed on them, if they understand the need for them and know that they will be implemented fairly and with the minimum of red tape.

Step 4: Recommendations, Budget, and Timeline

Once you have identified which of the tools and strategies will work best for your community, they should be drafted in a coherent, clear plan for adoption by local decision-makers. The recommended plan should be presented with a budget and timeline for implementation. The budget should provide sufficient resources for education and training of involved city staff and all the stakeholders who were involved in the planning process. The timeline should outline particularly what will happen in the first year, because during that time many details may need to be addressed for a smooth implementation.

The city council, board of supervisors, or the city manager/county executive could adopt the plan. Regardless of how the plan is adopted, many of the requirements of the plan will require one or more ordinances to implement. Once adopted, local staff should inform all those who are affected about the new program and offer training materials and presentations to ensure a good understanding of all facets of the program.

Case Study: Hawthorne C&D Waste Minimization Plan

The C&D waste minimization plan for the City of Hawthorne was part of the city's response to complying with the 50 percent waste diversion goals of the IWMA.

Project Approach

The City of Hawthorne recognized that this plan needed to build on decisions that had been made (for example, the structure of the existing franchise and city ordinances) and existing operations in the area. Also, there were limitations on the amount of construction and demolition data that could be obtained in the time allotted. This was particularly true because of the lack of quantitative reporting on local disposal and recycling activities in the past.

The city's consultants first obtained as much information as possible from the city and the city's franchised hauler, H&C Disposal. The city also sought the perspective of other businesses in the city, including waste haulers, recyclers, contractors, waste generators, and developers. The city's consultants contacted city departments to identify some businesses that may be impacted by the new franchise. The consultants made a presentation at the local Kiwanis club to solicit additional input. The city prepared a flyer about the franchise requirements for distribution by city building and planning departments and sought input from many other contacts in the area.

The City of Hawthorne updated the Los Angeles C&D recycling directory for use by H&C and city contractors and worked to evaluate any particular constraints about operating within the City of Hawthorne, given the city ordinance and exclusive franchise. The city also contacted many other cities in the Los Angeles region to update information on their policies, practices, and rates and fees. Based on other successful programs, the city confirmed the best practices for C&D recycling, reporting, and monitoring.

The city also reviewed city documents related to the terms of the city's solid waste franchise and contract agreement. Municipal code language related to solid waste and recycling activities permitted in the city was also reviewed, as well as current reporting practices and requirements for H&C and other haulers and recyclers.

The terms of the franchise agreement with H&C and the municipal code limit the city's ability to require H&C to provide information on existing solid waste costs, tonnages landfilled, and tonnages and types of material recycled. However, H&C cooperated by providing information about their operations and by meeting with the city.

The City of Hawthorne tried to identify the amount of C&D activity in Hawthorne over the past year. Unfortunately, there was insufficient data available in Hawthorne to properly determine how much material was collected, diverted, and disposed of over the past several years.

After local research was completed, the city evaluated C&D programs based on their practicality, cost effectiveness, and potential diversion impacts. The City of Hawthorne was

particularly concerned with the cost impacts of recommendations, both short-term and long-term. The city also wanted to protect itself against likely major cost increases from projected disposal cost increases.

Since the primary impetus for the development of the C&D plan was compliance with the 50 percent diversion mandate, there was an overriding need to maximize waste diversion and meet State reporting requirements. By building a sustainable infrastructure for policies, programs, and reporting on C&D debris recycling, the city was able to understand and control future costs. Throughout the plan, the City of Hawthorne adopted incremental steps to be taken to accomplish individual tasks to reach the desired objectives.

H&C Disposal Exclusive Franchise for C&D

The city chose to award an exclusive right to collect and dispose of C&D debris to its franchised hauler, H&C Disposal. The city directed H&C to implement recycling programs for C&D debris they exclusively collect, and to report to the city the amounts of C&D materials recycled and disposed.

H&C had been the franchised hauler for residential and commercial wastes in Hawthorne for more than 40 years. On May 24, 1999, the City of Hawthorne approved an amendment to the agreement for refuse collection services between the city and H&C to provide H&C an exclusive right to collect, transport, and dispose of the following materials in Hawthorne:

- Construction and demolition debris.
- Discarded appliances and furniture and other similar goods.

Not included in this exclusive authority are the following exceptions:

- C&D debris hauled by contractors in their own or leased vehicles from their own job sites when the hauling is an incidental rather than a primary part of the contractor's services.
- Carpeting, furniture, appliances, white goods, or similar goods hauled by persons or entities delivering new goods, when the hauling is an incidental part of the delivery of new goods.
- Scrap lumber incidentally included in yard waste hauled by gardeners or landscapers,

when the hauling is an incidental part of the gardening or landscaping services.

- Recyclable materials sold or donated to someone other than H&C Disposal, if the materials have been separated at the source and the hauler was not paid by the waste generator for collecting, processing, or transporting those materials, or a consulting fee for recycling services.
- Appliances and white goods hauled by utility companies as part of a rebate or buyback program.
- C&D debris generated by any public project of the City of Hawthorne.
- Materials excepted by the city manager due to special circumstances.

H&C agreed to pay the city a 10 percent billing fee and a 15 percent franchise fee for all C&D wastes collected.

The city council determined in its adoption of the exclusive franchise for C&D debris for H&C disposal, that:

“CONTRACTOR represents and warrants to City that it has the experience and qualifications to conduct recycling programs for the recovery of recyclables from construction and demolition debris, discarded appliances, discarded furniture and other similar goods, to provide City with information sufficient to meet the City's reporting requirements under AB939 [the IWMA], to arrange to collect, transport and recycle or dispose of these materials in a safe manner which will minimize the adverse effects of collection vehicles on air quality and traffic.”

Based on these determinations, the C&D plan noted that it was incumbent upon H&C to detail its plans to provide C&D recycling services to the satisfaction of the city in a comprehensive C&D operations plan (see below).

City C&D Recycling Resolution: Requirements for C&D Recycling Reporting

The IWMA requires the City of Hawthorne to develop a diversion requirement and reporting system to document the amount of construction and demolition waste diverted from landfills, along with the total amount disposed. The reporting systems outlined for C&D waste are

critically important for the city to more accurately project the need for C&D services in the future. The report data also serves as a guide to set rates that are fair to both ratepayers and the franchised hauler and to provide incentives for recycling services. These can be evaluated on an ongoing basis by city staff.

City staff recommended a council resolution that established a policy to require the reuse, recycling, and/or composting of C&D waste and the documentation of C&D waste recycling by all the key participants in Hawthorne.

The resolution adopted by the city council on September 13, 1999:

- Required all city departments and H&C Disposal to implement a construction and demolition debris recycling program.
- Required the city manager to complete and begin to implement a comprehensive C&D waste minimization plan by October 1, 1999, that details activities by city departments, H&C Disposal, and all private sector C&D projects in Hawthorne to increase the reuse, recycling, and composting of C&D materials.
- Required the chief of general services and public works to include a specification for construction and demolition waste management in contract documents for all public works construction, including:
 - Guidelines and requirements for reuse, recycling, and/or composting of C&D materials from city construction and demolition projects.
 - Submittal of a C&D waste management plan and quantitative reports for C&D materials generated by all contractors for City of Hawthorne construction and demolition projects as a condition of approval of progress payments to be paid by the city.
- Required all private construction or demolition projects over 10,000 square feet in gross floor area to divert the maximum feasible amount of construction and demolition materials.
- Required all private developers, construction and demolition contractors, waste haulers, and others handling these materials to report the quantities diverted and disposed to the city

upon completion of the project in a format approved by the city, either directly or through H&C Disposal.

- Established detailed measures for monitoring and enforcing the reporting requirement on private construction, demolition, or land clearing projects over 10,000 square feet in gross floor area by:
 - Requiring submittal of quantitative reports for C&D materials generated as a condition of issuance of building or demolition permits.
 - Requiring a \$250 deposit with building permit fees from private contractors when they obtain building or demolition permits. The deposit is to be returned at project completion if contractors demonstrate that they have supplied the C&D reports.
 - Requiring that satisfactorily completed C&D reports are received by the city before issuance of a certificate of occupancy for new construction projects.
- Required H&C to submit quarterly reports to the city on the amount of C&D materials collected by material type, the destination to which each of those materials were taken, and the amount of diversion documented to have been achieved at each of those facilities.

Principal Findings of C&D Plan

The C&D plan was adopted by the city manager on October 1, 1999, as directed by the city council. The City of Hawthorne found that there were many opportunities to increase C&D diversion in Hawthorne. Key findings included:

1. Construction and demolition contractors in Hawthorne are already recycling some C&D materials, particularly inert material and metal, but those activities have not been well documented. Similarly, salvaging of reusable material and selected recyclables is also taking place, although harder to quantify. A considerable amount of inert material is crushed and processed on site for use in the construction process, and this activity has also not been documented. Reporting requirements can capture this information.
2. Many contractors already meet the definition of “self-haul” and will continue to haul their

own material. Reporting requirements for all public and private projects can capture this information.

3. A large amount of recyclables from C&D debris in Hawthorne is still going to disposal facilities. The city believes that contractors and haulers in Hawthorne can still recycle far more C&D material with minimal impacts on costs or operating efficiencies. These could be stimulated through price incentives, city policies and requirements, additional hauling service options, technical assistance to contractors, and H&C subcontracting or joint venturing with recyclers.
4. City staff is already implementing many recycling practices through their day-to-day functions, including imposing recycling and recycled-content requirements in contracts. However, these practices are not widely recognized. A more formal monitoring system and better reporting would help to document these activities.
5. City staff is in a position to help educate contractors about service options through the distribution of literature at their service desks. The staff can also collect data by requiring reporting with permit and EIR requirements and by implementing clear enforcement of these requirements (for example, withholding signoff or deposits).
6. H&C appears open to many different strategies that would allow them to use recycling facilities that are competitive in price with their current transfer station tip fees. Nearly all C&D rolloff materials are delivered at transfer stations at this time.
7. In addition to H&C, approximately 100 independent companies are currently able to provide reuse, recycling, and composting services in Hawthorne for any materials donated or sold by waste generators. The materials must be kept separate for reuse, recycling, or composting.
8. The city prepared a construction and demolition debris recycling directory that provides detailed information on all those companies, including contact information, types of materials accepted/processed,

specifications that need to be met for materials accepted, services offered, and end-products made. The Hawthorne directory is adapted from a directory developed over many years by the City of Los Angeles, modified for Hawthorne policies and programs.

9. Of particular note are the service providers that can accept loads of mixed C&D materials. While these service providers may vary in their recycling processes, capacity, diversion rates, specifications, reporting, and collection services, they offer a starting point to help H&C supplement source separation practices and achieve high rates of diversion at prices competitive with current transfer station fees.
10. Mixed C&D processing capacity in the region is expected to continue to increase substantially in the coming 12 to 24 months. At least one new facility will open before the end of 1999. The State is currently in the final stages of adopting regulations that will monitor and oversee these new types of recycling facilities. Currently, processors of mixed C&D materials are:
 - American Waste Industries, Los Angeles.
 - Bradley Landfill and Recycling Center, Sun Valley, Calif.
 - Community Recycling and Resource Recovery Transfer Station, Sun Valley, Calif.
 - Looney Bins, Sun Valley, Calif.

Mixed C&D processors provide a particularly important service as a clear alternative to disposing of C&D debris in landfills, even if the C&D debris is mixed together.

11. Rates to recycle C&D materials are now competitive with local transfer station rates. Although there may be a small incremental cost in some cases to recycle mixed C&D at reuse, recycling, or composting facilities by H&C when compared to landfilling, that is offset by the need to comply with State recycling mandates.
12. Clear cost savings opportunities (for example, recycling concrete and scrap metal) combined with incremental cost increases for mixed

C&D disposal should provide an aggregate cost savings to H&C. With the risk of \$10,000 per day fines under the IWMA considered by the city, it is also clearly in the city's interest to maximize the amount of materials diverted from C&D. Recommendations were made in this C&D plan on how to accomplish that.

13. Interviews with contractors, Hawthorne businesses, hauling companies, and recycling companies showed a very broad range of prices for disposal and recycling services. There was considerable concern about costs increasing and less recycling occurring as a result of the additional city franchise and billing fees required as part of the C&D franchise. C&D practices vary, with some contractors using H&C and others self-hauling. Many use other hauling and recycling companies, and some contractors and businesses using the services of small companies that combine clean-out services with recycling and hauling.

C&D Plan Recommendations

H&C Disposal

The C&D plan recommended that H&C detail its plans to the satisfaction of the city to provide the services that are reasonably anticipated to be required to fulfill their exclusive franchise for C&D. To this end, the city required H&C to:

1. Submit a C&D operations plan to the city.
2. Report monthly to the city a summary of how many tons of material overall is being diverted through the C&D program. H&C should report to the city monthly for the first year and quarterly thereafter, in a format approved by the city, on the amount of materials collected, disposed, and diverted, the facilities to which those materials were taken, and types of materials which were recycled.
3. H&C must make available for review backup data at H&C that can be inspected by a city or CIWMB representative in order to verify the data included in the H&C monthly and quarterly reports. The backup data was recommended to be consolidated in a form that is designated by the city and that allows the city representatives to easily verify, on a monthly basis, the aggregate data in the H&C reports to the city.
4. Develop, print, and distribute promotional flyers in the city at all points of public contact, and pay for advertisements in the local newspaper regarding the types of C&D recycling services that H&C offers.
5. Reuse, recycle, or compost all C&D materials to the maximum extent possible. No greater than 10 percent of C&D materials collected under the exclusive franchise should be taken directly to a landfill by H&C, or by an intermediary, for disposal or use as alternative daily cover in a landfill. Instead, to the fullest extent possible, all C&D materials collected under the exclusive franchise should be processed to recover all reusable, recyclable and compostable materials. In no event should less than 90 percent of C&D materials be taken to a facility for preprocessing for reuse, recycling, or composting. Processing residue may be used as ADC, and as a last resort, landfilled.
6. Set a goal of achieving a 50 percent diversion for all C&D materials for calendar year 2000. After the first six months begin reviewing data. By the end of calendar year 2000, set goals for calendar year 2001 and beyond based on the first year's experience and data on diversion rates, cost markets, and operational issues.
7. H&C should require all reuse, recycling, and composting facilities they use to provide H&C with weight tickets. The facilities should maintain auditable records (weight tickets) of all C&D materials received and recycled from H&C and provide H&C with overall facility diversion reports quarterly. H&C should also require all transfer and disposal facilities they use for C&D materials to maintain weight slips documenting disposal and recycling.
8. Pay the city franchise and billing fees only for C&D materials collected under their exclusive franchise that are landfilled (from residue at reuse, recycling, or composting facilities). Any C&D materials H&C collects on a source-separated basis for recycling without a fee for service that are not considered part of the exclusive franchise should be exempt from

charges and payments of such city franchise and billing fees. Any C&D materials that H&C collects for recycling with a fee for service should be exempt from charges and payments required by the city billing fees as an additional incentive to recycle those materials.

The C&D plan further recommended that the city should conduct an annual survey of C&D rates in the region for independent and franchised haulers for all the major categories of services charged by H&C. The City should not allow H&C to charge C&D collection rates above the average found in that survey for non-franchised independent haulers and recyclers. The city could make an exception if additional financial justification provided by H&C warrants.

Diversion of C&D from City Activities

1. **Separation and Consolidation of Materials at Public Works Yard.** The public works yard can be used for placement of bins for source-separated material generated by city employees and some city contract activities (for example, street sweepings, green waste, concrete, asphalt) to be consolidated for subsequent removal and delivery to recycling facilities.
2. **Continue and Expand Recycling Requirements in Public Works Contracts.** Add formal reporting requirements so that the city can quantify diversion. As highlighted in the C&D resolution, include a recycling specification in city public works contract documents that require contractors to reuse, recycle, and/or compost C&D materials. The contract should also require reports on the amount diverted as a condition of approval of contractor progress payments.
3. **Reporting As a Condition of Building Permits.** Private contractors of projects over 10,000 square feet should report the quantities of construction and demolition materials diverted and disposed under the work of the project. Reporting would be a condition of obtaining a building or demolition permit and a \$250 deposit would be required with the permit fees (refundable when the contractor submits C&D reports). C&D reports would be required to have been submitted before a

project could obtain a certificate of occupancy from the city.

4. **EIR Requirements.** Expansion of existing mitigation measures in environmental impact reports for major developments should consider including clear, quantifiable requirements for diversion of a broad range of materials with set diversion goals. These should be in addition to the reporting requirements in the C&D resolution. A waste management and recycling plan that includes detailed goals for maximizing diversion of C&D debris should be required for major projects. The planning and redevelopment department should ensure the measurement and enforcement of such recycling plans. The city should develop a written policy for the oversight of this solid waste mitigation measure.
5. **Recycled-Content Building Products.** The city should create demand for recycled-content materials through direct city purchases and contract requirements and document the results of these actions. A range of recycled-content products is available on the market that can be included in specifications for city buildings and private developments. There are many products that are fully tested, that meet building codes, that are available locally, and that are cost-competitive. Starting from the ground up, they include materials such as recycled road base, rubber-modified asphalt pavement, recycled plastic site furnishings, carpeting, wallboard, insulation, paint, and ceiling tiles.

The City of Hawthorne obtained a list of materials, specifications, and samples of products that can be included in local projects so the city can be its own best customer. In addition, the city obtained a list of publications on recycled-content construction products available throughout the United States and locally; private developers and contractors can obtain that. City staff makes those publications available for public review at the counters in the planning and community development and building and safety departments.

C&D Education, Training, and Technical Assistance

As with any recycling program, key to the program's success is the understanding and cooperation of all involved in generating the wastes. The C&D plan recommended that a wide variety of education, training, and technical assistance tools be used to communicate the goals of the plan. It also highlights ways everyone can benefit by more carefully exploring their reuse, recycling, and composting options. Tools include, but are not be limited to, the following:

1. The city can issue news releases and notices to the public and C&D contractors and developers to highlight the adoption of the C&D plan and C&D resolution.
2. The city manager can issue a memorandum and guidelines to city staff outlining recommendations of the C&D plan and requirements of the C&D resolution.
3. Building/safety and planning and community development departments can provide C&D recycling information and brochures about the city's policies and programs and other resources to C&D contractors and project planners. This information will assist them in finding reuse, recycling, and composting businesses. City staff can include the City of Hawthorne Construction and Demolition Debris Recycling Directory, a bibliography of resources, C&D recycled product guides, product samples, the State Green Building Guide (and similar documents), and model specifications at all city public counters and the library.
4. The city can organize internal training for code enforcement inspectors about the C&D plan and resolution and about how to help contractors handle materials correctly.
5. City inspectors and public information counter staff could attend quarterly training seminars regarding C&D during the first year to get them up to speed with what other communities and haulers are doing and to connect with the network of public officials who are working on similar issues.

Budget and Timeline

The city budgeted a total of \$50,290 for administration and program development for C&D, tires, and wood waste programs. The city estimated that the costs that will be required to implement the recommendations of the C&D plan will fall within that budgeted amount. A timeline with key milestones to implement the C&D plan was attached.

References

CIWMB Publications

Many CIWMB publications are available on the Board's Web site at: www.ca.gov/Publications/.

To order hard copy publications, call 1-800-CA-Waste (California only) or (916) 341-6306, or write:

California Integrated Waste Management Board
Public Affairs Office,
Publications Clearinghouse (MS-6)
1001 I Street
P.O. Box 4025 (mailing address)
Sacramento, CA 95812-4025

The CIWMB has published a series of fact sheets, case studies, and resource lists on construction and demolition recycling. Publications of particular interest are:

[Construction and Demolition Recyclers—Processors and Receivers](#)
(Publication #431-96-017).

[Construction and Demolition Recycling Program](#)
(Publication #431-97-030).

[Integrated Waste Management Disaster Plan](#)
(Publication #310-97-006).

[Military Base Closure Handbook: A Guide to Construction and Demolition Materials Recovery](#)
(Publication #433-96-074).

[Designing With Vision: A Technical Manual for Material Choices in Sustainable Construction](#)
(Publication #431-99-009).

[Recycled-Content Building Construction Products](#)
(Publication #431-96-018).

Other Publications

Residential Construction Waste Management: A Builder's Field Guide, NAHB at www.nahbrc.com/builders/green/WASTEPUB.

Constraints and Opportunities: Expanding Recovery in the Demolition Industry, Community Environmental Council. (805) 963-0583, grccom@rain.org.

Contacts

Office of Local Assistance, CIWMB. (916) 341-6199.

National Association of Home Builders (NAHB). (301) 249-4000, www.nahbrc.com/builders/green.

Bill Turley, Construction Materials Recycling Journal. (630) 548-4510, turley@xsite.net.

Julie Rhodes, Reuse Development Organization. (317) 631-5395, info@redo.org, www.redo.org.

Christine McCoy, National Recycling Coalition, 1727 King Street, Suite 105, Alexandria, VA 22314-2720. christineM@nrc-recycle.org, www.nrc-recycle.org.

J. Taylor, San Diego County, Local Enforcement Agency, 9335 Hazard Way, San Diego, CA 92129. (858) 694-3377.

Rick Anthony, Urban Conservation Corps, (re: San Diego MRO), P.O. Box 84060, San Diego, CA 92138. (619) 523-2828, Ext. 302, RicAnthony@aol.com.

Laura Wright, City of Pittsburg, Waste Reduction Office, Public Services Department, 65 Civic Avenue, Pittsburg, CA 94565. (925) 252-4114.

Ken Wells, Director, Sonoma County Waste Management Agency, 575 Administration Drive, Room 117A, Santa Rosa, CA 95403. (707) 565-3579, jfish@sonic.net.

John Zinner, Zinner Consultants (re: Playa Vista Project), 824 Harvard Street, Santa Monica, CA 90403. (310) 828-6051, JSZinner@aol.com.

Kelly Ingalls, KMI & Associates, (re: Playa Vista Project), 2418 Bywood Drive, Glendale, CA 91206-4703. (818) 548-8996, kmibldg@earthlink.net.

Sheila Davis, Materials for the Future Foundation (re: Electronics Recycling), P.O. Box 29091 San Francisco, CA 94129-0091. (415) 561-6528, mff@igc.org.

Ed Cooney, Town of Atherton, 91 Ashfield Road, Atherton, CA 94027. (650) 752-0525 or (650) 375-7403, edc10000@yahoo.com.

Stephen Bantillo, San Jose Solid Waste Program, 777 North First Street, San Jose, CA, 95111. (408) 277-5533, Stephen.Bantillo@ci.sj.ca.us, www.sjrecycles.org.

Debra Kaufman, City of Berkeley, 1201 Second Street, Berkeley, CA 94710. (510) 644-6276, Ext. 224, dek1@ci.berkeley.ca.us.

Kay Martin, Strategic Recycling, Darkhorse Press, 1996. (805) 654-2472, Kay.Martin@mail.co.ventura.ca.us.

Gary Liss and Associates, 4395 Gold Trail Way, Loomis, CA 95650. (916) 652-7850, gary@garyliss.com.

John Moore, Law Offices of Stone and Moore, 4 Embarcadero Center, Suite 510, San Francisco, CA 94111. (415) 956-3400, recyclmoore@earthlink.net

Joan Edwards, J. Edwards & Associates, 10840 Charnock Road, Los Angeles, CA 90034. (310) 253-9790, jerecycl@aol.com.

Karen Swarbrick, Community Environmental Council, Santa Barbara, Calif. (805) 963-0583, Ext. 155, karincs@rain.org.

Stephen MacIntosh, Santa Barbara County, Calif., Department of Public Works, Solid Waste & Utilities Division. (805) 882-3609, SMacInto@co.santa-barbara.ca.us.

Wendy Sommer, Alameda County Waste Management Authority & Recycling Board, San Leandro, Calif. (510) 614-1699, wsommer@stopwaste.org.

Credits and Disclaimer

Gary Liss & Associates prepared this study pursuant to contract IWM-C8028 (\$198,633, included other services) with the University of California at Santa Cruz for a series of 24 studies and summaries.

The Board would like to acknowledge the following individuals who helped prepare this document:

Stephen Bantillo, City of San Jose

Joan Edwards, J. Edwards & Associates
Kelly Ingalls, KMI Associates
Stephen MacIntosh, County of Santa Barbara
Karin Swarbrick, Community Environmental
Council
Wendy Sommer, Alameda County Waste
Management Authority & Recycling Board
Relly Briones and Steve Austrheim-Smith,
CIWMB

The statements and conclusions in this summary are those of the contractor and not necessarily those of the California Integrated Waste Management Board, its employees, or the State of California. In addition, the data in this report was provided by local sources but not independently verified. The State and its contractors make no warranty, express or implied, and assume no liability for the information contained in this text. Any mention of commercial products, companies, or processes shall not be construed as an endorsement of such products or processes.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Web site at www.ciwmb.ca.gov.