

MAUI RECYCLING GROUP

CONSTRUCTION SITE RECYCLING PROJECT

FINAL REPORT & HANDBOOK

Published by the Maui Recycling Group
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PART 1 – THE PROJECT

EXECUTIVE SUMMARY

The Maui Recycling Group (MRG) Construction Site Recycling Project was initiated in early 1998. The primary impetus for development of this project was a series of workshops on Construction and Demolition Waste Management sponsored by the State of Hawaii, Department of Health, Office of Solid Waste Management, and by the County of Maui, Department of Public Works, Recycling Section.

One of the most meaningful findings of these workshops was the fact that Hawaii's developers, contractors, and others in the building trades believed that on-site recycling programs would be costly and difficult to implement. Time and time again this belief would be expressed and, once expressed, would stifle further investigation of the issue. All this despite the fact that there were ample data from other areas in the US that construction site recycling was workable, cost-effective, and an important element in any community's landfill diversion program.

With this in mind MRG determined that a demonstration project should be undertaken. After consultations with personnel from the County of Maui Department of Public Works and Smith Development, a Maui housing developer, a County grant application was filed. The resulting contract included funds to reimburse the developer and contractor for out-of-pocket expenses incurred as a result of implementing on-site source separation programs.

With funding for the project established Smith Development agreed to host the development at its Liholani Golf Village development. Located adjacent to the Pukalani Golf Course, this project was to consist of 26 housing units on a site of 3.4 acres. The contractor on the project was Dilloway Construction Company of Wailuku.

At this point a series of meetings between MRG, Smith and Dilloway focused on waste stream analysis; selecting the materials that would be appropriate for diversion; initiating contacts with Maui's commercial haulers; and, preparation of a Request for Bids, submitted to all haulers, for refuse and recyclables hauling services.

The next task was to design the on-site source separation systems. The result of this effort was a decision to utilize 6 yard receptacles for deposit of the three commodities which were to be recycled -- drywall, cardboard and plastic. These receptacles were to be hauled, on demand, to the recycling facilities on the Island which were able to accept the materials.

When construction of the housing units began in September 1998 all elements were in place. Initial meetings with sub-contractors and trades introduced the program and communicated the necessary steps and changes in normal practices to implement the recycling program. The program was enthusiastically accepted and endorsed. As construction progressed very few problems were reported and it soon became clear that there were virtually no negative effects on production and performance as a result of integrating the on-site source separation programs.

The construction phase continued until April 1999. Thanks to careful record-keeping and follow-up by all the partners involved in the project one of the primary goals – development of reliable data on the financial and operational impacts of the program – was accomplished.

The total amount of drywall diverted was 18 tons. This material was utilized by one of Maui's commercial compost companies as a valuable addition to their feed stock. The total amount of plastic diverted was 1,000 pounds. This material was delivered directly to Aloha Plastic Recycling in Kahului to be used in manufacturing new value added products. The total amount of cardboard diverted was approximately 2 tons. This material was stockpiled, along with cardboard collected from other sources, and will be marketed on the commodity market. The total amount of treated lumber diverted was 5 tons. This material was made available to the public on a "Giveaway" day. Over 150 individuals attended this event.

As a result of this program the amount of material disposed of in Maui County landfills from this project was reduced by 35% vs. the original estimate. The total cost of trash/recycling hauling services was 20% less than the original bid. Thus the project not only diverted significant amounts of material from landfill disposal, but also demonstrated that on-site source separation on a construction site actually reduced costs.

ACKNOWLEDGEMENTS

As the initiator of this project Maui Recycling Group wishes to acknowledge the participation of all the individuals and organizations involved.

The enthusiastic participation and support of the management and staff of Smith Development Company was instrumental in moving the project forward from the beginning. Without their initial work, prior to any assurance that funding would be forthcoming, the project could not have progressed. In addition their “real-world” input, focusing on the economic barriers and operational considerations, was invaluable. It allowed the MRG project manager to design the project in a way that assured that others in the development and construction industries could see its value and utility. As the project progressed several members of the Smith Development staff, in particular Jennifer Spector, Ian Smith and Randy Hall, were also helpful and supportive.

The personnel of Maui Disposal Company (which became a unit of BFI after the project began) were also helpful and supportive. Their willingness to work with the unique requirements of the project helped ensure its success.

The primary impact of the project fell on the management and staff of the Dilloway Construction Company. Although their major concern was completing their commitments regarding timely and quality construction of the 26 housing units, they were more than willing to set aside time to develop and review the on-site source separation programs. Special thanks go to Jon Dilloway, Kyle Smith, Sye Smith, Morrow Smith and many of the tradespersons involved in the construction.

David Goode, Deputy Director of Public Works for the County of Maui, and Dr. Hana Steel, Recycling Coordinator, were enthusiastic and supportive throughout the course of the project. Both supported the MRG grant request and were always available to provide information and ideas on making the project as successful and meaningful as possible.

Tim Gunter of Maui Earth Compost also performed a vital task willingly and professionally. He and his staff modified their processes to accept the drywall and integrated it into their composting process quickly and efficiently. In addition they allowed their baseyard to serve as a temporary repository for treated lumber recovered from the project site.

Thanks also go to Rick Woodford, President, and Joy Webster, Executive Director, of the Maui Recycling Group. They, along with the MRG Board of Directors, provided the organizational and administrative support necessary for any project of this nature to succeed.



PART 2 --THE PROCESS

NOTES

PLANNING & ANALYSIS

1 – WASTE STREAM ANALYSIS

This process begins by identifying what materials will go into your project “waste stream” -- the different types of material which you would ordinarily haul to the landfill from your project site. In most cases your waste stream will be quite similar to your materials list because it is extremely rare for all of a particular material to be totally consumed by the building process. The major difference will be some packaging, for example paint cans, which will not be specifically identified in your materials list.

ACTION – Copy your materials list; eliminate any materials which will be totally consumed; add any materials not specifically identified on your materials list.

2 – DETERMINE AMOUNTS OF “WASTE” MATERIALS

In most cases the work you have done in assembling your materials list, and your experience in previous projects, will enable you to forecast the amount of any specific material which will be left after that material is used in your project. Identifying that amount will enable you to provide specific information necessary for your trash hauler to service your project.

ACTION – Copy your materials list and annotate with the projected amounts of materials to be generated.

3 DETERMINE WHERE “WASTE” MATERIALS WILL BE GENERATED

In some projects a specific area of the job site or baseyard may be designated for specific activities. You may have a milling operation, or a paint shed which services the entire project. Or you may conduct similar operations at several sites. Identifying the physical locations which will produce certain materials will enable you to plan your recyclable materials recovery operations for optimum efficiency.

ACTION – Copy or create a site plan and annotate with areas where materials will be generated.

4 – DETERMINE WHEN “WASTE” MATERIALS WILL BE GENERATED

As your project progresses the focus of your activities

will change. Each separate step will involve different types and quantities of materials. Some phases will produce more “waste”, some less. Most projects will have a timeline or schedule. Examination of this planning aid will enable you to accurately predict what materials will be generated when. Knowing your schedule will help you and your haulers plan for efficient hauling of both recyclable and non-recyclable materials.

ACTION – Copy or create a project timeline and annotate with dates when materials will be generated.

STEP 2 – DETERMINE REUSE AND RECYCLING OPTIONS

The primary goal of any recycling program is to reduce the amount of materials you send to Maui’s landfills. However, recycling is only one of the options available. Source reduction is the technique of planning and purchasing so as to reduce “waste” before it even reaches your project site. Reuse involves utilizing a material in a secondary fashion not originally intended by the manufacturer or user. These are the other two elements of landfill diversion programs. They can often be even more effective than recycling in reducing waste and costs.

1 – IDENTIFY SOURCE REDUCTION OPTIONS

Specifying pre-cut structural components – trusses, walls, etc. can dramatically reduce the amounts of materials generated at your project site. Modern techniques, including computer designed and controlled milling, make sense both economically and environmentally. Utilizing drywall scraps by filling between wall studs will reduce “waste” and enhance the sound absorption qualities of your buildings. Buying consumables such as fasteners, interior finish items and others, in bulk, can reduce packaging “wastes.” Focusing first on reducing the types and amounts of materials can have a significant impact on both materials handling and hauling costs.

ACTION – Contact suppliers, contractors associations, sub-contractors, colleagues, the Maui County Department of Public Works Recycling Section and the Maui Recycling Group for suggestions and ideas. Make your materials list and project timeline available for analysis. Over time the types and quantities of materials which can be utilized for recycling and/or manufacturing new products on Maui can change dramatically. Be sure to get up-to-date information. Refer to the “Resources” section of this publication for contacts.

2. – IDENTIFY RECYCLABLE/RECOVERABLE MATERIALS

NOTES

Recycling programs in Maui County are dynamic and change frequently. Some materials that will be generated from the job site may be easily recyclable, others must go to the landfill. As of this writing the following materials can be diverted from landfill disposal and delivered to an organization manufacturing value added products. All materials handled in this fashion are exempt from the County of Maui “tipping fee” – currently \$43 per ton.

Green Waste – Grubbing, grading and clearing operations can produce quantities of green waste. All of this material is currently utilized in composting operations.

Drywall – Excess drywall is also utilized for compost.

Cardboard – Cardboard is marketed as a commodity.

Plastic Sheeting and Packaging – This material is utilized by Aloha Plastic Recycling Inc.

Untreated Lumber – Untreated lumber can be utilized for compost.

Metals – All metals can be recovered.

Paint: Not currently recyclable on Maui. However, can be donated to community groups and others. See “Resources” section of this publication for details.

ACTION -- It is important to remember that different materials are recyclable at different times. For up-to-date information on all construction site recycling options call the County of Maui Recycling Section at 270-7874.

3 – CONTACT COMMERCIAL HAULERS

In order for an on-site recycling program to be effective the project’s hauler should be involved from the beginning. Working with the hauler(s) to determine types and numbers of containers, pickup frequency, and materials to be collected is vital.

The most effective way to facilitate this process is to prepare a “Request for Bids” and distribute copies to all commercial haulers, including recycling only haulers. This will alert the haulers to the fact that you plan to implement an on-site recycling program. Be sure to cross-check with your materials list and timeline to determine amounts of materials and timing for different materials.

ACTION – Prepare and mail a “Request For Bids” to all prospective haulers. Please see the “Resources” section for a sample letter format.

4 CONTACT TRADES AND SUBCONTRACTORS

Effective recycling programs require widespread if not universal participation. In order for a construction site program to work all trades and subcontractor personnel must be informed, trained and motivated. Knowing how, and why, to avoid contamination, to recognize and utilize single material containers, to plan for and manage changes in standard operations must penetrate throughout the project personnel.

Contamination is one of the major destroyers of recycling programs. Contamination occurs when any other material is introduced into a single material collection site. For example, if paint is deposited in a drywall container the load is contaminated and must be taken to the landfill. Something as simple as tossing lunch containers and bottles into the wrong bin can instantly turn valuable recyclable materials into costly trash.

ACTION – Provide all trades and subcontractors with written information on the scope and operations involved in your onsite program. Include site plans with receptacle locations; instructions on which materials go in special bins and which go in the trash bins; information on how to facilitate timely pickups. Present the program and materials at all project meetings. Please see the “Resources” section for samples of typical documents.

5 – PREPARE THE SITE

Using your materials list and timeline you should be able to identify when your project will begin to generate recyclable materials. This will allow you to work with your hauler(s), trades and subcontractors in implementing and tracking your program.

Proper and prominent signage on recyclable and trash bins is a vital component in any onsite program. Onsite small bins should be labeled by spray painting, posting self-stick signage, or by color coding. Larger rolloffs should also be properly identified.

ACTION -- Coordinate with your hauler(s) to develop a single signage plan and determine how and where bins and rolloffs are to be labeled. Coordinate trades and subcontractors to assure that all personnel are aware how, when and where to separate their “wastes” into appropriate categories.

6 – SUPPORT, REPORT, AND MODIFY

Once your project is underway it will still require some degree of “promotion” and support. The onsite recycling program will, of necessity, involve many different individuals and organizations. Active and continuing support by management will be among the most important elements determining the project’s success. Memos, signs and “re-visiting” the scope and operation of the project at any and all meetings should be helpful. It is also important to solicit comments from the trades and subcontractor personnel involved. Often these individuals will have insights gained through actual experience that will enhance the operation of your program.

Reporting on the performance of the project, particularly as that performance relates to the project goals and projections, can help keep all involved up-to-date and motivated.

ACTION: Prepare and distribute regular reports; solicit verbal and written comments from all involved individuals and organizations; modify procedures and policies as feedback and data suggest.



RESOURCES

This section of our handbook contains a variety of resources garnered from the actual experience gained during our demonstration project as well as from other sources. Included are sample forms, letters, reports and analyses. In addition you will also find here information on how to obtain data, help and technical assistance from government agencies and non-profit agencies involved in all phases of construction site recycling and environmentally appropriate building practices.

Contact names, phone numbers, email addresses and website addresses for organizations offering technical assistance.

Maui Recycling Group, P.O. Box 121, Wailuku, HI 96793, (808) 667-7744
For comprehensive information on Maui Recycling Programs: Website: <http://www.himex.org>
Email: info@himex.org. For specific construction information – Jeff Stark, Project Manager – (808) 573-6262,
Email: jstark@maui.net

County of Maui Department of Public Works, Recycling Section, 200 S. High Street, Wailuku, HI 96793
For Information on currently recyclable materials call Recycling Specialist Susanna Bubar – (808) 270-7874
County of Maui Recycling Hotline – (808) 270-7880, from Lanai and Molokai 1-888-991-4000
Website: <http://www.maui.net/~recyclemaui> Email: recyclemaui@maui.net

State of Hawaii, Department of Business, Economic Development and Tourism, Energy Division,
Clean Hawaii Center, P. O. Box 2359, Honolulu, HI 96804
The Clean Hawaii Center has a variety of resources available regarding construction site recycling. This organization also sponsors a variety of workshops and supports Hawaii's "HABIT" program which investigates all facets of "green" building programs and initiatives. For more information on Clean Hawaii Center and its programs, contact: Gail Suzuki-Jones at (808) 587-3802, gsuzuki@dbedt.hawaii.gov or Michael C. Owens at (808) 587-2778, mowens@dbedt.hawaii.gov
Website: <http://www.state.hi.us/dbedt/ert/chc/chc.html>

THE FOLLOWING DOCUMENTS CAN SERVE AS TEMPLATES TO ASSIST YOU IN THE PRELIMINARY PHASES OF YOUR CONSTRUCTION SITE RECYCLING PROGRAM DEVELOPMENT

Sample "Request For Proposals" for construction site recycling services from commercial trash and recycling haulers.

Sample "Monthly Report" on construction site recycling program progress.

Sample "Final Report, Conclusions, and Recommendations" on construction site recycling program.



About the Maui Recycling Group
The Maui Recycling Group (MRG) is a not-for-profit Hawaii corporation, tax-exempt under IRS (501 [c] [3]). Established in 1989, the mission of MRG is to work toward economically and environmentally sound solid waste programs for Maui and the State of Hawaii. Over the years MRG has, with funding from the US Environmental Protection Agency, the State of Hawaii and the County of Maui, developed and managed a variety of public education and research programs which have been instrumental in the development and success of a variety of County and State solid waste resource management programs.

DILLOWAY CONSTRUCTION INC.

REQUEST FOR PROPOSALS

CONSTRUCTION MATERIAL RECYCLING AND WASTE DISPOSAL FOR LIHOLANI GOLF VILLAS

OVERVIEW

Dilloway Construction Inc. has been chosen as the General Contractor to build 26 new residential homes in Pukalani. Site construction is already in progress and home construction is now scheduled to begin in late September.

We have been asked by the Developer and the Maui Recycling Group to participate in a pilot program to determine whether the normal practice of hauling all construction waste to a landfill can be modified to recycle any or all waste products to another destination. To date no one on Maui is engaged in this kind of program so both County officials and members of the construction industry are interested in seeing whether this type of recycling is practical both in the actual separation methods, costs associated with it and a realistic end use for the recycled items.

Initial studies have determined that the potential is there to recycle the following items from a construction site environment:

- I. Drywall scraps- Hauled off to be used as a soil treatment
- II. Cardboard from packing boxes- banded and shipped to recycler.
- III. Lumber scraps- usable pieces picked up for use by others in small projects
- IV. Plywood scraps- usable pieces picked up for use by others in small projects
- V. Plastic drywall and paint pails- recycled to landscapers or other end users
- VI. Plastic sheathing - reclaimable by plastic recycler.

IMPLEMENTATION

In order to make this program feasible any and all waste material handling must be kept to a minimum. Separation of materials must be done at the source. In the case of a construction site the creator of the waste, carpenter, plumber etc. must assist in recycling as he cleans up his trade area. Sufficient containers or disposal bins must be provided close enough to the work areas to encourage this separation. Education of the on site workman will be an ongoing task until the workman gets used to placing the recycled items into their respective containers.

The location of this site is very compact and will preclude the use of multiple large recycle containers. Find outlined below the perceived disposal parameters necessary for this jobsite.

TRASH (non recyclable materials such as wood scraps, waste paper, pipe, wire cutoffs etc.)

Scheme #1 Provide tipster dumpsters to be moved around site by OC and loaded into rolloff container for disposal at Construction Materials Landfill.

Project requirements: 4 tipster dumpsters for 5 months 1 rolloff dumpster on site to be emptied at a rate of once every 2 weeks total of 10 rolloff loads 40 tons total

Scheme #2 Provide a minimum of 8-3 yard rollable containers to be emptied into standard trash trucks on a 3 times weekly schedule Total of 40 tons of waste to be removed in this manner over a 4-5 month period.

RECYCLABLE PRODUCTS (to be handled by disposal company)

Drywall Provide 2 tipster type dumpsters and 1 rolloff container. Tipster dumpsters to be filled with drywall board scraps only and emptied into large rolloff. Rolloff to be filled and emptied 5 times during course of construction.

Cardboard Provide 1 rolloff container at site or 4 smaller roll around type containers to be filled with cardboard and emptied as needed. Total of 45-50 yards for project or about 3 rolloffs or 20 small roll around loads.

Plastic Provide 1 roll around container and empty as needed. total of 20 yards for project or 8 small roll around loads.

LUMBER AND PLYWOOD SCRAPS

Any scraps of usable size to be stacked up and stored for later salvage by recycle company or volunteer group. Anticipate cleanout of this pile 3 times during course of construction.

GENERAL BIDDING REQUIREMENTS

Interested companies are to provide unit pricing for the above outlined criteria. Prices to include charges for dumpsters, pickup fees, tonnage or disposal costs, delivery fees or hauling fees of rolloffs.

Interested parties will have to provide adequate marking on all recycle product containers as to which product they are for. Disposal company must provide pickup service as per the outlined frequency for small container loads and provide rolloff pickup within 24 hours of being notified that it is full. Single product rolloffs must be emptied and returned or a replacement provided on the same day of pickup.

Billings to be submitted at the end of each month with 30 day terms.

Please provide a proposal of the scope of this project that you would be willing to participate in and the associated charges. Proposals to be submitted no later than 8/14 to be considered. Please fax or mail same to our office. You may contact me at any time at 244-7900 or by cell at 283-1156 with questions.

Jon S. Dilloway President & RME

DILLOWAY CONSTRUCTION INC.

Subj: Recycle Program for Liholani Golf Villas Monthly report dated 10/26/98

We have completed our first month of the recycling program for the Liholani Golf Villas and feel that it is proceeding better than we had expected and with very few glitches.

To date we have sent to the county landfill less than 1 ton of non recyclable waste via our weekly pickup service from Maui Disposal. We have sent two full rollofs of wood waste to Maui Composting for stockpiling for future use as a wood additive to their proposed plastic/wood decking similar to the "Trex" material we are now using for our exterior decks. We have also identified to the recycling coordinator other on island sources of clean wood waste that will provide the necessary annual tonnage required to start up processing of this wood/plastic decking here on Maui. We have also recycled one container of cardboard waste.

Our program with Truss Systems to precut all of our wall and header packages has also eliminated a tremendous amount of on site generated lumber waste. Their computer program calculates the entire cut list required for each house and then optimizes the use of the lumber stock provided to them. Less than half a trash can of waste is generated for each house.

We have also completed the drywall on the first two houses and by loading the walls and ceiling spaces with the drywall cutoffs we appear to generate less than 800 lbs of gypsum board waste per house. We will be able to get a better figure of actual tonnage once we dump the first rolloff in several more weeks.

Cooperation by all subs has been excellent and all recycled material is being delivered to the recyclers uncontaminated and 100% usable in their recycling process.

We will update you next month by which time we will have totally completed several houses and will have experienced all phases of the project's recycling program

Jon Dilloway

DILLOWAY CONSTRUCTION INC.

Subject: Recycle Program for Liholani Golf Villas Final report

1. The following raw data is forwarded for your use in preparing a final report to all concerned parties. Following this presentation of data I will draw my own conclusions based upon the analysis of this data and a comparison to data generated by our second project at Kauhale Mahinahina in which we did not conduct a full recycling program.

TONNAGE REPORT

Material removed direct from jobsite to dump.

16 Rolloffs 94 tons

Material removed to Greenwaste (drywall)

2 Rolloffs estimated at 18 tons

Material removed to Greenwaste and later transferred to dump (lumber)

2 Rolloffs 14.75 tons

Cardboard removed to recycle depot

6 6yd bins total 36 yards compacted

Plastic removed to recycle depot

2 3yd bins total 6 yds

SUBTRACT 10 TON FOR CONCRETE AND ROCK RUBBLE

These figures have been generated from BFI, billing statements from per load disposal charges divided by \$37/ton

DATA ANALYSIS

I believe that the Recycle Program conducted at Liholani Golf Villas generated some significant data that can now be used to help shape effective standards for recycling construction waste on Maui in the years to come. In addition to the data generated from this project we also gleaned some additional information from our informal recycling program we conducted during the construction of 19 identical homes in Lahaina at Kauhale Mahinahina.

LIHOLANI , Lumber recycling:

Lumber waste in a residential project is one of the larger components of the disposable waste. We generated 15 tons of pure lumber waste during the first month of framing alone. At least 50% of the total waste tonnage was lumber only. Based upon 26 houses this would work out to be about 1.5 tons per house. This is further supported by our data from the Kauhale Mahinahina project where we separated out most of the lumber waste and stored it for later recycling by other end users. Comparing the project tonnage totals on a per house basis we support the above conclusion with a 4 ton/house at LUV versus a 2.5 ton/house at KM.

Factors to consider in the above conclusion when comparing these figures to other construction projects on Maui are:

a) These houses utilized an OSB shear wall exterior which generated a tremendous amount of OSB waste. This product is heavier than plywood which is typically used for this application on Maui. A plywood sided house using T-1-1 I would generate similar quantities of waste as ours. Houses like those being constructed by the lower priced builders such as Spencer and Betsill use almost no OSB or plywood for shear so on some large scale projects the amount of lumber waste generated could be about half of ours.

b) Our approach to precut the 2 x 4 plate/stud and header packages eliminated a considerable amount of waste at the jobsite. The amount of waste generated at the precut facility was kept to less than 1 garbage can per house.

LIHOLANI, Drywall Recycling

We were not as successful with our drywall recycling as I think we could have been. A large part of this was due to the inability to keep the drywall rolloff free of other waste. Liholani was a very constricted jobsite and rolloffs were spotted along Liholani Street for lack of any other available location. Nearby residents found our drywall bins to be a great place to throw their oversized trash. Because the jobsite is so intense the tipsters used to collect the drywall waste were constantly being contaminated with other trash. We also were able to recycle a lot of the drywall scraps into the house walls.

LIHOLANI, Cardboard

Cardboard is one of the easier items to recycle. Once again our constricted jobsite made it more of a challenge than it has to be at a normal sized jobsite. I recommend the use of a full size rolloff with a cover on it instead of the smaller 6 yard bins which don't allow you to compact the cardboard as much as you can in a larger rolloff

LIHOLANI, Plastic

PVC large

We quickly realized that the amount of recyclable plastic was minimal on this project. Pipe cutoffs made up the bulk of the first 3 yard bin. Drywall was delivered without the plastic sheet covers so by mid project we abandoned efforts to recycle any plastic.

LIHOLANI Finding New Endusers

It is a shame that no enduser exists on a large scale to absorb the lumber scraps that are easily separated from other site waste. Most of the lumber scraps are generated during the framing portion of each house and scraps can be left in a pile until a final post framing cleanup is conducted. Most of the scrap is free of nails and is easily handled into designated containers.

In addition to our onsite lumber waste, significant amounts of clean scrap dimensional lumber are generated at the truss assemble plant as well. Our use of the recycled "TREX" decking shows that products have been developed to make use of this type of scrap lumber.

At both jobsites it became apparent that a consumer market exists for most of the larger pieces of lumber we couldn't reuse. Our first public giveaway in December at Liholani was a success in that everything we wanted to give away was gobbled up. The problem was we didn't have as much to giveaway as the public demanded. At Kauhale Mahinahina we tried a more subtle approach by advising only non profit agencies by fax. This was a much more orderly approach which resulted in more satisfied end users and a much smaller management task for us.

CONCLUSIONS AND RECOMMENDATIONS

Construction site recycling has a future on Maui but in order to do so in a way that benefits all parties the following guidelines need to be considered.

a) The project site needs to be of sufficient size to accommodate large collection bins for the recycled materials away from general public access.

b) The project needs to be of a minimum size (probably 5 or more houses) being built simultaneously to justify the larger size collection bins and labor costs associated with separating materials.

c) Recycled materials will most likely be limited to lumber, drywall and cardboard on residential projects.

d) Commercial projects could be required to recycle if they are going to be producing large amounts of any single item listed above.

e) The program must be managed on a daily basis at the jobsite to ensure containers remain accessible and free of contaminants. You must appreciate that the average tradesman has little interest in implementing such a program so it is essential that management be very proactive on the site.

f) A large scale enduser needs to be developed for the large quantities of scrap lumber and plywood generated. The general public and other endusers would quickly be saturated with materials if a mandatory program was implemented island wide.

g) The labor costs associated with managing the program can be kept to a minimum if the above handling guidelines are adhered to. Large scale handling equipment is a must in order to effectively separate and load recycled materials into the large size collection bins.

h) Separation and sorting on site is the only practical way to implement recycling of construction materials.

In conclusion, development of the large scale end user for lumber waste is essential to implementing a mandatory recycling program. Once this outlet is available and the associated cost savings can be seen by the average general contractor, recycling will work for the builder and the County.