4. Recycling

4.1 Purpose

This chapter includes a short history about the recycling industry's background and growth in Section 4.2. For those readers who have a firm background on recycling, it is suggested that they skip to Section 4.3 where the recommendations of the 1994 ISWMP are listed. Section 4.4 reviews what the County has done toward implementing that plan. Section 4.5 examines pertinent legislation regarding recycling, and Section 4.6 examines recycling alternatives for the County to implement.

The SWRAC advised the Division to provide universal curbside collection which means providing collection services to all residences served by streets and roads meeting County standards. The services would include single-stream marketable recyclables collected once every other week from a cart placed at the curb. The SWRAC also recommended constructing a new, fully enclosed MRF to process the County-collected materials and recycling drop-off materials on the Island of Maui. These recommendations are discussed in Sections 4.6 through 4.8 and make up the bulk of this chapter.

4.2 Background on Recycling

Recycling is the act of taking a discarded product and reprocessing it into a new product. It differs from reuse because the actual product is physically transformed into a different state before becoming a new or renewed item. This process reduces the consumption of raw materials that go into making a product as well as potentially reducing the energy involved in developing that new product. For example, it takes 60 percent less energy to make paper from recycled material than from virgin feedstocks.

The recycling industry denotes two forms of recyclables: (1) pre-consumer recyclables and (2) post-consumer recyclables. Pre-consumer recyclables are materials that are discards in the process of producing an item. These materials never are placed in the hands of the consumer of the product but are used and discarded within the production phase of that commodity. Industries traditionally recycle this type (pre-consumer) of recyclables to lower disposal cost and save on raw material costs.

Post-consumer recycling, the use of a commodity after it has been purchased and used by the consumer, has captured the attention of the U.S. public over the past 30 years. Common post-consumer recyclables include newspapers after they have been read, soda cans after their contents have been consumed, and old corrugated containers (OCC) (also commonly referred to as cardboard) after the container has been emptied and not in use any more.

Recycling is not a new concept. Many people remember times when a shortage of raw resources occurred. During World War II, for instance, communities across the country promoted the recycling of post-consumer paper and metal because the access

to raw resources was limited because of the priority for war goods. After the war, when shortages of raw materials abated, neither the government nor consumers placed much importance on post-consumer recycling.

In the 1970s, however, two variables came together to help jumpstart a post-consumer recycling campaign. The first was the rise in the cost of oil due to an embargo initiated on October 17, 1973 by the Organization of Arab Petroleum Exporting Countries (OAPEC). The jump in price and fall in available supply caused U.S. businesses to look for less energy-intensive means to manufacture a product.

The second call to recycle was more cultural than economic. In the 1970s, a growing faction of citizens became concerned about actions that affect the Earth and its raw resources. In 1970, the federal government created the United States Environmental Protection Agency (USEPA), which, in turn, promoted Earth Day One in the same year that brought the issues of air and water quality, as well as recycling, into the country's classrooms. EPA began to close the open dumps and to implement safer and more stringent landfill regulations known as Subtitle D.[1]

The second stage of this cultural pressure to recycle got started when Lowell Harrelson loaded 3,100 tons of industrial waste onto a barge, and a tugboat named the "Break of Day" left Islip Harbor of Long Island, New York, to find a cheap disposal opportunity. Six months later, the barge returned to New York, and its cargo was incinerated in Brooklyn. During that time, editorials were written, speeches were given, and late night TV hosts joked about the garbage barge no jurisdiction wanted.

The six-month journey of the garbage barge, *Mobro*, and the USEPA's implementation of Subtitle D regulations began to underscore, for people, a need to recycle because of a false sense that U.S. landfill capacity was running out. Recycling took on a new importance after *Mobro*'s well documented journey. When the barge left New York on March 22, 1987, only 600 cities had curbside recycling. In 2007, the number had increased to nearly 10,000 cities.

These two primary forces to recycle, economic and cultural, have never fully collaborated in a seamless manner. As the recycling movement progressed into the 1990s and beyond, articles were written assailing the proposition that recycling without having a basis in market realities was unrealistic. Yet, when the interest of each is complemented, the representatives of these two forces come together to implement programs that have wide support and success.

Some of these widely supported programs are discussed in this chapter. These municipal recycling collection programs fall into two types: self-haul (the household or business brings the material to a central point) and door-to-door collection systems.

4.2.1 Drop-off Collection

Drop-offs are the most common form of self-haul. Drop-off facilities are locations where citizens and small businesses can drive to, unload their material by category, usually, or commingled into a large container, and leave. Once the large container is

[1] Subtitle D of the Federal Resource Conservation and Recovery Act (RCRA) was enacted in 1976 and addresses the management of municipal solid waste.

full, a hauling truck comes to the facility and collects the full container and replaces it with an empty one or unloads the container into the truck body.

Some drop-off centers have dumpsters, usually eight cubic yards, where citizens can unload their material, and a front-loading collection vehicle loads the container's contents into the compactor body of the truck. After the contents are emptied, the empty dumpster is set back down to be loaded with recyclables again. Locations that utilize these types of containers need less site development work than other container collection methods.

Other containers used at drop-off facilities are roll-off containers. These are either enclosed or open-top containers that are approximately 20 feet long and range in capacity from 20 to 40 cubic yards. If enclosed containers are used, they normally are between 27 and 35 cubic yards with multiple portals on the sides for customers to dump their material through. When open-top containers are used, site locations generally are built to facilitate the citizen unloading the material from above the container. This is done by developing a site where there are two levels, with the containers on the lower portion and the citizens on the higher level. If the site is configured where the cost of developing a split level is prohibitive, then some communities build ramps where a citizen can either drive or walk above the container and dump material directly into the open-top roll-off. If no site elevation is created, the roll-off container will generally be smaller in size so that citizens can easily reach the portal to place the material into the container.

Compactors can also be used in drop-off facilities, particularly for cardboard. These can either be stationary with a dedicated power source to operate a metal blade or ram to compress the material, or a mobile compactor such as a rear-loader trash truck that once full transports its contents to a distant location.

Compacting material is an efficient method of transferring material that has much volume but not much weight. Items, such as OCC, for instance, when placed in an open-top container that is 40 cubic yards may weigh two tons but, when compacted into a 40-cubic-yard container, may weigh between five and seven tons. This means that a compacted OCC container will be hauled away one time for every two to three times a loosely loaded OCC container is hauled.

Drop-off sites can be managed and staffed with municipal employees, contractors, or non-profit groups. Schools, for instance, may host a recycling drop-off facility and have its science club, for instance, oversee the site by cleaning it up, helping customers, and distributing education material in exchange for a percentage of the proceeds gained from the sale of the material. Some jurisdictions do not staff drop-off sites but send crews periodically to clean debris on- and around the site.

4.2.2 Curbside Collection

Instead of citizens taking their materials to drop-off facilities, a collection vehicle can go to the resident and collect the material. The resident simply places the recyclable materials at the curb. There are different approaches to prepare the materials for curbside collection: (1) either the resident or the collector source-separates the material at the curb; (2) the resident combines most, if not all, of the recyclables into one container, and it is taken to a separation facility (MRF); and (3) MSW and

recyclables are combined into one facility where it is then taken to a separation facility.

Collecting source-separated material at the curb requires a collection vehicle with multiple compartments for different commodities. Either the resident sets the material out on the curb and has segregated the material into categories, or the collector sorts the combined material at the curb and places each commodity in its compartment on the truck. When the truck is full, or when any one commodity is too full to take more material, the collection vehicle goes and unloads. The benefit of this system is that it eliminates the cost of separating the material at a facility, but the collection is slow which means more trucks have to be in service thereby driving up the costs.

The second manner of collection is when commingled materials are placed at the curb. The resident places the material together into one or two containers. Single-stream collection is the term used when all the recyclables are placed in one container. Dual-stream collection is the term used when paper is placed in one container and commingled materials (metal, plastic and sometimes glass) are placed in a second container. The collection crew unloads the container(s) into the body of the truck and all sorting of the material is done at a MRF. The commingled collection has variations on the same theme. Some locations find their paper more marketable if kept separate from other material, especially glass bottles and jars. A collection vehicle may have the capacity of collecting paper and the other material separately, either by having two compactors or compartments on the truck.

The third collection is when trash and recyclables are placed together, collected, and transported to a materials recovery facility that can handle the weight and grime of municipal solid waste. The recyclables are picked out of the waste stream while the non-recyclables are loaded into a container to be landfilled or incinerated. This method cuts the cost of collection drastically, but the cost of separation is higher and contamination is a problem.

4.2.3 Commodities Collected

Paper: In 2005, 51.5 percent of the paper consumed was recovered for recycling. Paper recovery now averages 346 pounds for each person in the U.S. Every ton of paper that is recovered saves approximately 3.3 cubic yards of landfill space.

Paper is not just a single commodity but a plethora of commodities grouped under a heading called “paper.” Old newsprint (ONP) is recycled into new newsprint, egg cartons, and paperboard (material that is used for cereal boxes). High-grade, white office paper is recycled into almost any paper product including tissue paper. Old corrugated containers are made into new corrugated containers.

When the post-consumer paper is recovered, it is baled and shipped to a paper processing mill. At the mill, the paper is shredded and mixed with water to make a pulp. The pulp is washed, refined, and cleaned, then turned to slush in a beater. Color dyes, coatings, and other additives are mixed in, and the pulp slush is pumped onto a large moving screen. As the pulp travels down the screen, water drains away. The resulting paper sheet, known as a web, is pressed between massive rollers to extract most of the remaining water and to ensure smoothness and uniform thickness.

This semi-dry web is then run through heated dryer rollers to remove any remaining water.

Chemicals and contaminants are filtered out and often burned in an on-site industrial power plant that helps to meet the energy needs of the facility, and, in some cases, of the local community. The finished paper is then wound into large rolls of up to 30 feet wide and a weight of 25 tons. A slitter cuts the paper into smaller, more manageable rolls, and the paper is ready for use in its new recycled form.

In the 1980s, very few paper mills in the U.S. used post-consumer paper to make new paper. By 2005, 78 percent of paper and paperboard mills in the U.S. used some percentage of recovered paper, and 149 mills used only post-consumer paper.

Glass bottles and jars: Glass jars and bottles are heavy and therefore add to the recycling weight collected. Municipalities and post-consumer collectors were enticed by the post-consumer glass industry to collect this material back in the 1980s because of the weight diverted from the landfill and the potential of receiving $0.02 per pound for glass. In 1991, the price per pound dropped to $0.01 and then went negative for green glass as glass container manufacturing plants across the U.S. closed operations because of less demand for glass containers. The packaging market share for glass has consistently gone down over the past 20 years while plastic containers have increasingly become the substitute container.

Many municipalities had already begun their programs before the price dropped. These localities decided to continue with the collection of glass because both the customer had come to expect the service, and the weight was valuable to the municipality because it added to its diversion rate.

After it is collected, the post-consumer glass is segregated into colors and freed of heat-resistant glass such as cookware, ceramics, window glass, drinking glasses and light bulbs. These heat-resistant items are made of ingredients different from container glass and will cause problems in the glass-container-making process.

The glass is loaded and shipped to a processor that further cleans the glass of all debris, such as metal caps and labels, and then crushes the glass into “cullet.” This cullet is screened to a predetermined size set by the manufacturer. The cullet is mixed with virgin material and heated to 1,500 degrees Celsius. Molten glass is fed as ‘gobs’ to an automatic bottle- or jar-making machine which first makes a blank shape and then blows the final bottle or jar. Bottles and jars pass into an oven where they are reheated to remove stresses, cooled and inspected.

Because glass as a commodity provides little to no revenue, glass collection is an issue for competing post-consumer commodities that do provide revenue. As municipalities increasingly move toward single-stream collection of recyclables, the paper industry discourages the co-collection of glass with paper. Broken glass mixed with the paper creates a problem for paper mills, making paper co-collected with glass less valuable in the post-consumer market.

The use of post-consumer glass lowers the energy required to make new glass with every 10 percent of recycled glass in the manufacturing of new glass. However, instability in the manufacturing process increases if post-consumer glass rises above 32 percent. In other words, the glass production system has a higher percentage of

breakage when the percentage of post-consumer glass content rises above 32 percent.

Plastic bottles and jugs: Unlike post-consumer glass, post-consumer bottles and jugs are a potential revenue stream. And, unlike glass, plastic containers weigh very little. If collectors were to place one plastic jug after another into a baler, 7,200 soda bottles are needed to produce a 1,200-pound bale. It takes a lot of plastic to compensate for the expense of transporting this light-weight material to a processing facility. Plastic collected is generally separated by resin and color and then baled.

Bales of plastic are sold to reclaimers who tear the bale apart and place the contents onto a conveyor belt. The conveyer takes the plastic through a shredder producing tiny flakes of plastic. These flakes are washed, rinsed, and dried after which they are melted and put into an extruder that reforms the plastic into tubular strands. These strands are chopped into pellets and used to make items such as soda jugs, plastic lumber, decking furniture, and thread for clothing.

The economics of plastics is problematic, however. As oil prices continue to climb, one would suspect that post-consumer plastic recycling would become relatively cost efficient. Yet, those same oil prices increase the cost of collection, transportation, and processing. And, as discussed above, accumulating the quantity of plastic needed to make cost efficient entry into the post-consumer market is difficult.

Steel Cans: In 1809, the French began preserving food in cans, and in 1812, tinplated cans were produced in Britain. In 1938, the first steel beer can was produced. These steel cans have a thin layer of tin on the can's inner and outer surfaces to prevent rust and to protect food and beverage flavors. This is the derivation of the term "tin can."

In the U.S., there were 2.6 million tons of steel cans produced in 2005. Approximately 1.56 million tons of these were recycled. Each person, on average, consumed the contents of 1,000 cans with an average weight of 2.3 ounces.

After the can is collected, it is segregated from other kinds of metal and densified into small bundles and shipped to a processor that removes the layer of tin from the old steel cans. Then, the material is melted in a furnace with other scrap and poured into casters that continuously roll and flatten the steel into sheets.

Using post-consumer steel cans takes 60 percent less energy than using virgin iron ore. Recycled steel cans may be mixed with other sources of recycled steel, vehicles, appliances, etc., and made into new cars, girders for buildings, or new food cans. Steel is a widely and easily recyclable material.

Aluminum: Aluminum cans were introduced in the U.S. in 1965 and are used primarily for beverages, beer and soda. Post-consumer aluminum also uses 95 percent less energy to manufacture new aluminum than from virgin material. With the rising cost of energy, the manufacturers of aluminum cans actively encouraged localities to develop collection program. In 1972, 15 percent of the 7.5 billion cans shipped were retrieved in collection programs. In 1982, the percent captured had risen to 56 percent, and in 2000, it had reached 68 percent. The aluminum cans are separated from other material in a MRF (usually by an eddy current separator and compacted into bales that range from 30 to 1,200 pounds, depending on the size of the baler. The bales are shipped to aluminum smelters which break the bales, strip the labels and melt the aluminum along with virgin material. Other aluminum items, including

foil, roasting pans and other packaging, are also recycled in these programs. These other aluminum items have lower value than aluminum cans.

4.3 Review of 1994 ISWMP

The following are recycling recommendations from the 1994 ISWMP. Although they are listed in numerical order, those recommendations that better apply to other chapters are omitted in this chapter.

- Recommendation 4-3: Promote community drop-box program and expand where needed.
- Recommendation 4-4: Ensure capacity for processing an increased amount of recyclables. This is both to encourage private-sector development and contracting out for processing.
- Recommendation 4-7: Continue and expand in-house recycling program.
- Recommendation 4-8: Develop a monitoring/reporting system for recycling /composting where retailers must report recycled quantities to the County.
- Recommendation 4-9: Continually investigate local markets for glass, newspaper, plastic, cardboard, white office paper, aluminum cans, and green waste.
- Recommendation 4-10: Continue recycling grant program.
- Recommendation 4-11: Provide technical assistance to private recycling service operators for more efficient/effective programs. This recommendation is to move local post-consumer industry to the highest market value possible.
- Recommendation 4-12: Develop procurement policies that favor recycled products.
- Recommendation 4-13: Support a state resolution to develop reduced costs for shipping recyclables.
- Recommendation 4-14: Establish advanced disposal fees (county or state legislation) with suggested fees of:
    - $0.015 per glass bottle
    - $2 per automobile tire
    - $500 per automobile (collected with initial registration fee)
    - $0.025 per quart of oil
    - Encourage the state to consider ADF on white goods
- Recommendation 4-15: Request that the state hold semi-annual meetings of all County recycling coordinators and designated task force members.
- Recommendation 4-16: Establish a Recycling Roundtable for private/public recycling managers.

- Recommendation 4-17: Attract businesses involved in diversion work in Maui County.

- Recommendation 4-18: Designate one census tract as an enterprise zone suitable for recycling related businesses.

4.4 Activities Done Since 1994 ISWMP

Since the adoption of the 1994 ISWMP, the County has implemented a number of the recommendations in this ISWMP with regard to recycling. In 1994, the County's diversion rate was 4 percent, and in 2006, it was at 30.6 percent, a significant increase due to the programs listed below. These activities are summarized as follows:

1. The community drop-box program has been expanded and a network of nine drop-off recycling centers now serves the residents and businesses in the County. These facilities are discussed in Chapter 2, Section 4.3.

2. Composting of green waste has been expanded and includes biosolids. This is discussed in Chapter 9, Section 9.8.

3. Capacity for processing the recyclable materials collected by the County drop-off recycling centers has been secured through a contract with Maui Disposal.

4. The in-house recycling program has been continued in County facilities.

5. Local markets continue to be investigated. Since the 1994 ISWMP, pulverized glass aggregate (PGA) has been used in asphalt base course, glassphalt demonstration projects, as sandblasting grit, in water filtration systems, as pipe cushioning, in landscape projects and other on-island end uses.

6. The recycling grant program has continued since the 1994 ISWMP, and grants have been issued by the County to a variety of businesses and non-profit organizations totaling $1.4 million over the last ten years. In addition, $5.2 million of State grant funds have been dispersed for glass, used oil and bottle bill programs.

7. A glass collection and recycling regulation has been established for restaurants and bars, and private haulers provide the hauling and recycling to end markets.

8. The County has executed contracts with private firms to collect, store, process and market white goods, scrap cars and other metals.

The County collects other recyclables at its landfills and has contracts for their processing and marketing.

4.5 Legislation

4.5.1 County of Maui

Glass Recycling for Licensed Liquor Establishments: Chapter 20.22 stipulates that all such establishments shall separate their glass containers from refuse for the purposes of recycling. These establishments shall keep records reflecting such recycling of glass. A penalty of not more than $1,000 shall be levied against a violating entity.

4.5.2 State of Hawaii

Recycling and Materials Recovery Facilities: Chapter 11-58.1-32 states that a permit application shall contain a site analysis, description of equipment list and description, drainage plan, plan to mitigate nuisance, health and safety risks. An operational plan shall also be made part of the application describing materials processed, how material will be measured, and what happens to the residue. A MRF operator is also required to submit annual reports to the State of Hawaii detailing the volume in tons of each recoverable material processed.

HRS Chapter 342G-2 requires the Department and the counties to follow solid waste management practices and methods in the following order of priority:

1. Source Reduction
2. Recycling (to include composting)
3. Landfilling and incineration

Advance Disposal Fee: Distributors of glass containers of non-deposit beverage containers pay an advance disposal fee to the State. The State distributes funds to counties based on de facto population so that it can establish glass buy-back programs that divert glass away from disposal to recycling.

Beverage Container Deposit Program: the statewide program known as HI-5 began on October 1, 2004, with redemption of deposit beverage containers starting January 1, 2005. As of June 30, 2006, DOH had certified 84 redemption centers and reduced the number of containers in the Advance Disposal Fee program by 55 percent. The program places a five-cent deposit on each container which is redeemable when the containers are returned to a redemption center. The deposit applies to glass, plastic, aluminum and bi-metal beverage containers. The redemption rate in FY2006 was 68 percent, and DOH has a goal of 80 percent for the program.

Landfill Bans: The State of Hawaii has passed legislation that prohibits the landfilling of a number of potentially hazardous or recyclable materials. These prohibitions are referred to as “Bans.” Materials listed in the landfill bans in Hawaii include: lead acid batteries, whole vehicle tires, white goods, vehicles and green waste.

4.6 Recycling on the Island of Maui

4.6.1 Current Curbside Collection Operations

The Division does not operate or fund curbside recycling collection programs on the Island of Maui. A private company, Maui Recycling Services, has for several years provided curbside collection on a subscription basis for central Maui. Also, private haulers have piloted curbside recycling in selected communities.

4.6.2 Proposed Curbside Collection Options

4.6.2.1 Universal Curbside Collection

The SWRAC recommended that the County implement a universal curbside collection. "Universal" collection specifically means for all residences served by streets and roads meeting County standards and that this collection specifically includes single-stream marketable recyclables collected once every other week. Implementing such a plan would involve several steps.

If single-stream collection were to be implemented and if its items were to be marketable, then the material would have to be processed and prepared for markets in a MRF. Currently, there is no single-stream MRF on the Island of Maui.

Carts are used for collection of single-stream materials. If the County were to provide carts to the residents for recycling as it has for trash, it would be prudent to provide them with carts that are of a different color so as to easily distinguish them both for the resident and for the collection driver.

Single-stream collection entails using semi-automated trucks (trucks configured with hydraulic tippers) or automated vehicles (trucks that have an automated arm that reaches out and clasps the cart, lifts it and empties its contents into the vehicle's packer). The use of mechanical lifters lower injury rates for workers. Also, the automated vehicles can service more residences in a day.

The materials collected in the program would have to be marketable and maintain the marketability of the other items in the collection program. For this reason, glass bottles and jars may be excluded from the curbside collection program but be collected at the drop-off and redemption centers.[2] Alternatively, a separate container for glass could be utilized. Because of its low value and its contamination potential, both of these approaches are in practice in other jurisdictions. Cardboard, paper, and aluminum and steel cans would be included, as would #1 and #2 plastics. Because of the low value of recovered glass, local markets need to be developed, for example, use as alternative daily cover for landfills.

A new collection program needs a strong and ongoing education component to it. This means that the education element must be on the front-end of the program to instill the purpose of the program. Education also needs to work closely with the collectors

[2] The County has a separate glass collection program for restaurants and collects glass in its drop-off centers.

to prevent problems from occurring. (Chapter 6 provides details on educational support for new programs.)

New collection programs along with new routes need support staff during the first two months after the initiation of the program. The County needs to prepare a bank of customer service representatives to handle inquiries from customers who have become confused on the days of collection or did not get some needed piece of information. To prepare for a surge of calls, communities sometimes hire temporary employees, train them in advance, and utilize them during the implementation of a new collection system.

With any collection of recyclables, the County will have to decide whether it is better to collect the material with County trucks and employees, contract the function out, or develop a partnership with the private sector whereby the County purchases and owns the vehicles for collection but the winning contractor is in charge of the operations, maintenance, and personnel. This merges the best assets of each partner: the County has access to lower cost capital for capital procurement, while the private sector may be more efficient with human resources. These are policy decisions for the County to make going forward with a new collection operation that especially must take into account the County's contractual obligation to the Union.

4.6.2.2 Other Options for Curbside Collection

4.6.2.2.1 Collection Intervals

Alternatives to the every-other-week collection stated in Subsection 4.6.2.1 fall into two categories: intervals of collection and strategy for collection. The timing of the collection of recyclables can be as often as once a week, such as in San Francisco and San Jose, to as less frequently as once a month. Once-a-week collection is more costly than every-other-week collection, currently performed in Seattle, Washington, and Marion County, Oregon, because collection vehicles run twice as much, but it does provide a high level of service. Advocates of recycling may argue that weekly collection generates more pounds a month than every-other-week collection. Anecdotal evidence on both sides of this argument can be found, however.

Once-a-month single stream recycling collection currently is used in Milwaukee, Wisconsin, and Nashville, Tennessee, utilizing 96-gallon containers. Seattle, Washington, also had once-per-month collection for half the City until 2004. Milwaukee's collection has been operating for nearly 16 years while Nashville's has been operating for the past five years. Milwaukee's collection occurs every fourth stated day of the collection. This means it may occur in the last week of the month and the third week another month, and so on. The jurisdiction hands out color-coded calendars to its customers to remind them on which week the collection is each month.

Nashville implemented a collection strategy of one through four weeks with collection occurring in one of those weeks on a certain day. This allowed residents to remember, for instance, that the second week of the month on Tuesday is the collection. This collection also had the added benefit of utilizing the collection crews for other work on those months with a fifth week.

Once-per-month collection lowers costs. To help residents remember their collection day, an automated email reminder and/or an automated phone call reminder can be sent the day before their collection at a minimal cost.

4.6.2.2.2 Garbage and Recycling Co-Collection

Combining trash and recycling into one truck can be done in two ways. The truck can be fitted with two compactor units, one for trash and one for recyclables. The SWRAC research tour made a site visit to San Francisco which operates a co-collection fleet. Most of the collection vehicles have a packer split whereby 60 percent of the volume is allocated for trash and 40 percent for recyclables. This ratio appears to work well for San Francisco and helps to eliminate two collection trucks going down the street.

Yet, not having the right split for the community served can cause problems. Just south of San Francisco in San Jose, the same company that services San Francisco received the contract to collect trash and recyclables for the City of San Jose. This company initiated an even split of 50 percent for recyclables and 50 percent for trash. The result was that the dedicated compactor for trash filled up faster than the compactor for recyclables. One of three things happened at that point. The driver would either decide to go to the landfill and unload the trash and go back to the route to collect until the recyclables were full and then drive to the MRF and unload. The second option to the driver was to unload both packers at that time. The third option was to start loading trash into the recyclable packer until both were full and taken to their respective deposit areas and unloaded. As a result, San Jose's recyclables had a high percentage of contamination.

The other option of co-collecting trash and recyclables is to not separate them at the source but to take it to a MRF sized for the separation of recyclables, organics, and material to be landfilled. These facilities are known as "dirty MRFs." Although collection costs go down significantly, processing costs are significantly higher.

4.6.3 Drop-off Programs

The centers the County currently operates are described in Subsection 2.4.3. The SWRAC did not recommend any changes to the existing drop-offs on Maui Island excluding the Hana region. Items that are collected at the curb will be diverted from the drop-off sites located in the areas that this curbside collection occurs. However, these same materials will be coming into the center from homes not collected by the County and from small businesses wishing to recycle. If the County implements an education program to raise the awareness of recycling, this may increase the desire to recycle in those homes and businesses where the County will not provide curbside recycling service.

If the volume of materials collected at the drop-off sites were to diminish, the County should consider either increasing the types of materials taken at these sites or consolidating them. Some communities, such as Montgomery County, Maryland, provide a full service convenience center where all types of material can be taken to this single site, such as traditional recyclable items, as well as household hazardous waste, electronics, batteries, reusable construction materials, white goods, waste oil, and textiles. Any new material the County may collect would have to be carefully researched to assure that the County can recycle such material in a cost-effective manner.

4.6.3.1 Central Maui Region

The Division plans to implement the SWRAC's recommendation of universal collection including recyclables for all residences served by streets and roads meeting County standards and that this collection specifically include single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2. As markets are developed for post-consumer material, the Division will review the ability to collect additional material. Glass jars and bottles will continue to be received at the recycling drop-offs and, at least bottles, may be redeemed at the Redemption Centers. The Division believes that plastic bags are the responsibility of the generators who should receive these items back from the public for the purpose of recycling.

To implement this collection service, several things will have to be done:

- A MRF will have to be available to process the commingled material into separate categories of products. The collection program will need to be implemented in conjunction with the implementation of a MRF;
- Carts for recyclables will have to be purchased and delivered to the customers by the Division;
- Drivers will have to be trained on the automatic collection fleet;
- Routes will need to be developed for the collection of the material; and
- An education strategy will need to be devised and implemented to educate citizens on the collection services.

The drop-off programs will remain the same with the Division continuing to look at the feasibility of augmenting the number of categories of items that can be taken and recycled/diverted in an economical fashion The Division will continue to track the tonnage of material going to the individual drop-off depots, and if there is a significant drop in tonnage due to the curbside collection service, then the Division should review the option of consolidating the number of drop-off depots.

4.6.4 Hana Region

4.6.4.1 Curbside Collection Operations

The Hana region has no current collection of recyclables. The collection of residential trash currently occurs once a week with a rear-loader. The SWRAC has recommended that this region be provided universal collection service which would include every-other-week recycling collection to residences served by streets and roads meeting County standards. Approximately 600 homes would be collected.

At a projected 24 pounds per set-out of recyclables, a rear-load semi-automated truck would collect approximately 3.6 tons per day. The truck would be taken back to the MRF either on the same or a different day where the material would be processed. Having the material placed in carts also allows the Division to send an automated side-loader to collect the material in the event a mechanical problem prohibits its semi-automated rear-loader from performing the work.

4.6.4.2 Drop-off Program

The SWRAC unanimously recommended placing a full-service and staffed convenience center (a recycling drop-off facility that also receives MSW) in the Hana Region. The facility would accept all the materials that the curbside program collects as well as other items that the County finds reasonable to take. This may include green waste and household hazardous waste (HHW).

It is important to provide a full-service center if the County decides not to bury garbage in the Hana Landfill. Citizens who are accustomed to self-hauling will need a place to take their material so that it does not end up on the side of the road. Since the material will be coming into the facility, Division employees should maximize the material recycled as well as reused. Spotters in this facility would educate people on separating metals from garbage, HHW from garbage, and recyclables. These employees are the front-line education people for the Division. These functions would be performed by the Division employees currently operating the landfill.

The recyclables would be placed into roll-off containers and transferred back to the MRF to be processed. At the MRF, the containers will be weighed, providing the County with accurate data on the weight of the material collected in Hana.

4.6.4.3 Plan for New Operations

The Division plans to implement the SWRAC's recommendation of universal collection of recyclables for all residences served by streets and roads meeting County standards and that this collection specifically includes single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2.

To implement this collection service, several things are required:

- A MRF will have to be available to process the commingled material into separate categories of products. The collection program will need to be implemented in conjunction with the implementation of a MRF;
- Carts for recyclables will be purchased and delivered to the customers by the Division;
- Drivers will collect the material using rear-load collection vehicles with cart lifters;
- Routes will need to be developed for the collection of the material; and
- An education strategy will need to be devised and implemented to educate citizens on the collection services.

A full-service convenience center will be placed on the Hana Landfill where citizens can place metal appliances to be recycled, limited types of household hazardous waste to be transported to the HHW facility, and household garbage to be transported to the Central Maui Landfill. The Convenience Center will be implemented before the curbside recycling service because of the latter's dependence upon the construction of a MRF.

4.7 Recycling on the Island of Lanai

4.7.1 Curbside Operations

Lanai currently has no curbside recycling program but, as with Hana, this change is recommended. Currently, a County landfill employee collects refuse in an automated collection truck from approximately 600 homes. Universal collection would expand this to 1,300 homes. Carts for recycling could be provided to these customers, and collection would then occur every other week.

The projected 16 tons of material collected would be taken back to the Lanai landfill where it could be stored commingled with or without compacting. Once a few containers have been filled and readied for shipment, the containers would be shipped to an, as yet, undetermined processor on Oahu or Maui. The materials collected would include fiber (all paper), metal drink containers, and plastic drink containers.

4.7.2 Drop-off Programs

The Lanai Landfill currently has carts, as seen in Photo 4-1, placed outside the office with handwritten signs on each designating them as the facility's recycling center for citizens to use. There is no promotional literature on recycling and apparently no encouragement on the part of the staff. Although the site is small, there is room to place a proper drop-off facility with recycling literature for people to take with them on how they can reduce, reuse, and recycle more items.

Photo 4-1. Public Recycling Drop-Off at the Lanai Landfill

The facility would accept all the materials that the curbside program collects as well as other items that the County finds reasonable to take. This may include green waste and household hazardous waste. A site other than the landfill may be more efficient, such as a location adjacent to the HI-5 redemption center.

4.7.3 Plan for New Operations

The Division plans to implement the SWRAC's recommendation of universal collection of recyclables for all residences served by streets and roads meeting County standards and that this collection specifically include single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2.

To implement this collection service, several things will have to be done:

- Lanai is not tethered to the construction of a MRF. The Division can make an arrangement with a MRF on Oahu to process the commingled collection materials on Lanai and ship them to the facility from Lanai;

- Carts for recyclables will have to be purchased and delivered to the customers by the Division;
- The Division currently collects garbage using an automated side loader and can use the same vehicle to collect recyclables every other week on Lanai;
- The Division would use the routes already developed for garbage collection; and
- An education strategy will need to be devised and implemented to educate citizens on the collection services.

The Division also plans to develop a more customer friendly drop-off facility at the Lanai landfill. This will involve roll-off containers that can be moved on the landfill site.

4.8 Recycling on the Island of Molokai

4.8.1 Curbside Operations

There is no collection of curbside recycling currently performed by the County on the Island of Molokai. However, the County does have a mobile recycling drop-off unit for HI-5 deposit containers only. Recovered materials are shipped to Oahu for processing. The current refuse curbside collection of approximately 600 units is performed by the County's Highway Division using the Solid Waste Division's rear-loader vehicles. SWRAC has recommended universal collection with every-other-week recycling collection to these homes plus an estimated 600 additional homes. Carts would be provided to these homes and collected with semi-automated collection vehicles (rear-loaders with hydraulic lifters on the back).

Once the material is collected, it would be deposited at the Molokai Landfill where it would be containerized commingled for shipping. If this were to occur, adequate loading and unloading of shipping containers would need to be put in place. The material would most likely be shipped directly to Oahu to a processor which is where recycled paper and other materials are currently shipped. Future approaches would be determined through a procurement process.

4.8.2 Drop-off Programs

The existing drop-off programs operated by the County would continue at the landfill, and the mobile unit would be phased out.

4.8.3 Plan for New Operations

The Division plans to implement the SWRAC's recommendation of universal collection of recyclables for all residences served by streets and roads meeting County standards and that this collection specifically include single-stream marketable recyclables collected once every other week. The material collected will be all fiber products, aluminum and tin cans, and plastics #1 and #2.

To implement this collection service, several things will have to be done:

- Molokai is not tethered to the construction of a MRF. The Division can make an arrangement with a MRF depending upon best price and lowest cost to process the commingled collection materials on Molokai and ship them to the facility direct (This is done currently by the County's recycling contractor for the materials recovered on Molokai);

- Carts for recyclables will have to be purchased and delivered to the customers by the Division;

- Drivers will collect the material using rear-load collection vehicles with cart lifters;

- Routes will need to be developed for the collection of the material; and

- An education strategy will need to be devised and implemented to educate citizens on the collection services.

4.9 Materials Recovery Facility

Recyclable materials collected at the curb or in drop-off centers require processing to meet the specifications of industrial markets, and storage to collect sufficient quantity to ensure economical shipping. Materials recovery facility, or MRF, refers to an enclosed facility consisting of areas for receiving, processing, and product storage and loading. The design of a MRF is geared to the type(s) of materials collection used. For example, if dual-stream collection is used, the receiving area will have two conveyors that feed the two processing areas: one for mixed paper (newspaper, cardboard, junk mail, magazines, etc.) and one for commingled containers (aluminum, steel cans, plastic and glass). If the collection is single-stream, there is a single conveyor in the receiving area which feeds a set of screens and other equipment that produce the dual streams for further processing. The processing of commingled containers uses magnets, eddy current separators, pneumatics, and screens to separate steel, aluminum and glass, respectively. Plastics can be sorted manually or by using an optical or other electro-magnetic spectrum scanning and air blast separator. The mixed paper fraction is separated using screens and manual sorters. These are processes using sensors that determine the type of resin in plastic and the color of material thereby triggering separation of predetermined material with a high percentage of reliability.[3] All the products except glass are baled to increase the density for economical shipping. Bales are stored until one or more trucks or containers constitute a shipment. MRFs also are testing material identification and sorting methods.

4.9.1 History of an Idea: County MRF

The County has been grappling with the idea of having a MRF since the 1994 ISWMP was passed. Recommendation 4-4 of that ISWMP called for the County to ensure capacity for processing an increased amount of recycling, and projected that $2 million would be spent by the County on the construction of such a facility.

[3] For further information on optical sorting, see: "Low Cost Optical Sorter for Recyclable Materials: Final Report" Sonora Environmental Research Institute, Inc. by Monika L. Crank, Jamie M. Kern, Jennifer L. Lindquist, Anna H. Spitz, Ann Marie A. Wolf, and Anita Zavodska.

In October 2002, a County-sponsored Recycling Task Force released its recommendations for achieving the state goal of 50 percent recycling. The committee's first recommendation was, in part, for the County to develop "a permanent material recovery facility" on the Island of Maui.

In 2003, the previous permanent Solid Waste Chief for the County produced a memorandum entitled "Solid Waste Programs & Issues." In this document, the Chief wrote:

> "Currently, the primary barrier to increasing County diversion rates and improving the economic viability of recycling on Maui is the lack of adequate processing capacity. While there are two commercial facilities on Maui who receive, process, and ship out the majority of the island's recyclables, both are operating beyond reasonable capacity…."

The Chief went on to estimate that the facility would need five acres of land, the facility itself should be under roof, and should be placed adjacent to the Central Maui Landfill. For several years, the County allocated monies in the Division's budget to pursue the concept of a MRF. For the past few years, the County has kept an inventory of acceptable vendors to assist the County in the design and procurement of such a facility.

The concept of a MRF developed by the County seems to have won support in the first ISWMP, in the 2002 Solid Waste Task Force, within the Division, and in the budget process. On October 4, 2007, SWRAC recommended that the County develop a MRF that is fully enclosed, centrally located, built to handle single-stream material, and that its operational functions should be contracted out.

4.9.2 Private Processing Facilities in Maui County

Maui County has two recyclable materials processing facilities, located in or near Wailuku and Kahului, as shown in Table 4-1. Both of these facilities are owned and operated by private companies. In addition, the County has some processing capability at Molokai for recyclable materials, including a baler and a glass crusher. None of the current facilities has full MRF capability. The recyclable materials processing facilities are small and have limited capability. These facilities, their locations and quantity of materials processed are shown in Table 4-1.

Table 4-1 - Maui County Recyclable Materials Processing Facilities

Name	Location and Description	Status
Aloha Recycling, Inc.	Located at 75 Amala Place off Hobron in Kahului. This site is approximately 1.0 acre.	Processes glass into processed glass aggregate (PGA) road base and backfill for the landfill and other road construction. In FY2006, processed approx. 5,400 tons. Also, permitted for OCC, plastic and aluminum.
Maui Disposal Co. Inc.	Located in the Central Maui Base Yard off Mokulele Hwy, just south of Puunene. The site is approximately 1.2 acres.	Recycling processing facility, just installed new Marathon Badger baler (bales OCC, plastic & metals) with a building over it. Baled materials stored outside. In FY2006, processed approximately 9,500 tons of materials.

4.9.3 Marketing of Existing Recycled Materials

At the present time, the County maintains contracts with the private sector for processing recyclable materials. These contracts also include provisions for marketing the materials processed. This applies to the drop-off center materials, scrap autos and white goods, fats and greases, used motor oil and green waste compost.

4.9.4 Proposed Plan for County Single-stream MRF

The Division plans to procure a single-stream recyclables materials processing facility to process the material its curbside collection of service collects. SWRAC advised the Division to develop a public-private partnership using a design, build, and operate procurement. In that way, the Division would interface with one entity that is responsible for the overall development and operations of the facility. The Division would provide the land for the facility and have ownership of the buildings and the equipment, which could be transferred right after the acceptance test or turned over to the County at the end of the contract term. The Contractor will process all of the County's curbside and drop-off recyclable material as well as material brought to it by private vendors.

The Division and the contractor partner to assure completion of tasks. The Division will need to develop performance specifications for the facility that identify parameters, including daily capacity, residue rate, products recovered and marketing requirements. Engineering studies needed for the approval and building of the facility may be shared by both the Division and the contractor. Construction of the building and the procurement of equipment would be the responsibility of the contractor but must be equal to or above the standard of quality set by the County.

4.9.5 Summary

The Division has reviewed the various options to enhance recycling and has decided to do the following:

- Implement curbside recycling on all three inhabited islands and the Hana Region within the County;

- Develop a new convenience center in Hana with recycling operations;
- Upgrade the recycling drop off at the Lanai Landfill; and
- Procure for the design, build, and operate of a MRF in Central Maui.

4.10 Private Recycling

4.10.1 Active Haulers

There are three private service providers on the Island of Maui that provide collection services for refuse and recyclable materials for a fee. In addition, the Islands of Lanai and Molokai each have a private service provider for businesses. However, in many instances, both residents and businesses prefer self-hauling and have no service, either County or private.

4.10.1.1 Service Provided

The private collection service providers operating in the County of Maui are listed in Table 4-2, along with their service areas and services.

Table 4-2 - Maui County Private Service Providers

Name	Service Area	Services
Aloha Waste Systems, Inc.	Island of Maui	Provides collection of recyclable materials and refuse from residents and businesses, including office paper. Collects glass and yard waste separately.
Maui Disposal Co. Inc.	Island of Maui	Provides collection of recyclable materials, including office paper and refuse from residents and businesses. Collects glass and yard waste separately.
Maui Recycling Service, Inc.	Island of Maui	Provides collection of recyclable materials only.
Lanai Trucking	Island of Lanai	Provides collection of refuse from residents and businesses. Offered recycling services previously but found it unprofitable.
Island Disposal	Island of Molokai	Provides collection of recyclable materials and refuse from residents and businesses.
Puaa Food Waste Services	Island of Maui	Provides collection of food waste from commercial generators. Food waste is taken and used by pig farmers.
Empire Disposal, Inc.,	Island of Maui	Provides collection of refuse from businesses.

4.10.1.2 Tons Reported to County

The County weighs all private trucks of the service providers at the Central Maui Landfill. At the Hana and Lanai Landfills, there are no scales and the waste quantities are estimated. At the Molokai Landfill, there are scales, and most private service provider trucks are weighed and the rest estimated.

The County of Maui has a number of other private service providers that offer various recycling and disposal services to residents and businesses in addition to those discussed above.

Table 4-3 - Maui County Private Refuse and Recycling Service Provider FY2006 Quantities

Name	Quantity of Refuse (tons)	Quantity of Recyclables (tons)
Aloha Recycling, Inc.	NA	5,400
Aloha Waste Systems, Inc.	48,400[1]	NA
EKO Compost, Inc.	NA	54,253
Island Disposal	3,972	0
Kitagawa Towing	NA	5,300
Lanai Trucking	3,265	0
Maui Earth Compost, Inc.	NA	4,000
Maui Disposal Company, Inc.	82,400[1]	9,500
Maui Recycling Service, Inc.	NA	NA[2]
Pacific BioDiesel	NA	6,200
SOS Metals	NA	0

[1] Estimated by GBB. NA = not applicable.

[2] Materials collected by Maui Recycling Service is processed by Maui Disposal and included in that quantity.

Table 4-3 shows the private service providers and the quantity of recyclable materials and refuse collected.