



Integrated Solid Waste Management Overview



Prepared for:
County of Maui
**Department of Environmental
Management
Solid Waste Division**



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February 17, 2009



The County of Maui has developed an updated Integrated Solid Waste Management Plan (ISWMP). The updated ISWMP is reflected in the final approved ISWMP dated February 17, 2009. This document provides an overview of the ISWMP and provides a summary of each chapter in the full document. The ISWMP can be viewed on the County's website online at <http://hi-maui-county.civicplus.com/index.aspx?nid=881>.

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OFFICE OF THE MAYOR
County of Maui

February 24, 2009

It is my privilege to present the finalized updates of the Integrated Solid Waste Management Plan for the County of Maui. This plan maps out a course of action to increase our efficiency in handling waste, divert more tonnage of waste from our landfills, and implement innovative options for managing the waste stream.

The formulation, revision and finalization of this plan was made possible only by the hard work and dedication of the sixteen community members I appointed to the Solid Waste Resource Advisory Committee in 2007. Representing a broad cross-section of the community, the committee worked closely with the County's Department of Environmental Management-Solid Waste Division and with consultants Gershman, Brickner & Bratton to assess our needs, facilities, recycling and green waste programs, landfills and waste stream resources, and to consider new policies and options.

On November 5, 2008 the County received comments from the State Department of Health acknowledging the plan's compliance with State legal requirements. Earlier this week, the plan was presented to the County Council's Infrastructure Management Committee.

As we move forward, it will be important to continue to prioritize funding for the ambitious new projects, programs and staff positions outlined in the plan. Future implementation will involve further review by stakeholders in government and the community. Ultimately, this plan will serve our community by guiding our efforts to maintain a healthy environment by caring for our islands' natural resources.

Sincerely,


Charmaine Tavares
Mayor



Acknowledgements

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State of Hawaii Department of Health, Solid and Hazardous Waste Branch, Office of Solid Waste Management staff members attending the SWRAC meetings:

Karl Motoyama, Supervisor

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Agency and business representatives in the States of Oregon and California that provided guided tours to SWRAC and County staff.

The numerous agency and business representatives, and community members who met with the County's consultant's and staff providing background information regarding solid waste related and recycling activities in the County.



Executive Summary

BACKGROUND

The County of Maui has developed an updated Integrated Solid Waste Management Plan (ISWMP) as a blueprint for solid waste management. It sets forth goals of diverting 60 percent of Maui's waste from its landfills, improving infrastructure, and evaluating current technologies to reduce dependence on landfills. The ISWMP was developed pursuant to the Hawaii Integrated Solid Waste Management Act (Act) codified in Hawaii Revised Statutes Chapter 342(G) which requires that counties "shall consider the following solid waste management practices and processing methods in their order of priority:

1. Source reduction;
2. Recycling and bioconversion, including composting; and
3. Landfilling and incineration.

The respective roles of landfilling and incineration shall be left to each county's discretion."

Revisions to the existing ISWMP, dated June 1994, are substantial and, in accordance with the Act, require approval by the County advisory committee whose members are appointed by the Mayor, public hearings, and approval by the State Department of Health.

Mayor Charmaine Tavares appointed sixteen members to the Solid Waste Resource Advisory Committee (SWRAC). Beginning June 21, 2007, there were 12 publicly noticed meetings during which the SWRAC developed goals for solid waste management in the County. Through a consensus driven process, SWRAC discussed and arrived at draft Plan elements for recommendation to the Department of Environmental Management (Department) and Solid Waste Division (Division). To provide the community the opportunity to offer comments on the draft ISWMP, we held four publicly noticed hearings, including a question and answer period prior to the hearing, in July 2008 in Central Maui, West Maui, Hana, Lanai and Molokai.

Four concepts became evident resulting from SWRAC and Division staff investigations and discussions:

1. The County's current landfill capacity is finite. Most waste goes to the Central Maui Landfill which is projected to reach capacity in 2026.
2. The County has diverted approximately 30 percent of its waste to recycling, composting and other beneficial uses, thereby prolonging landfill capacity. The State's goal is 50 percent diversion by 2000.
3. The high cost of electricity in Hawaii will continue to rise as oil prices increase.



4. Waste generation in the County will increase as a result of population growth and increasing tourism. By 2030 waste is projected to grow an added 439 tons per day.

SWRAC RECOMMENDATION

Pursuant to state mandate, the SWRAC reviewed five scenarios using financial models and considered financial implications, diversion and land use needs. SWRAC recommended to the County Scenario III, with the following clarifications: that the primary focus of the ISWMP be the goal of 60% diversion and, secondarily, the use of WasteTEC¹ technology; that the ISWMP not specify a single WasteTEC but, rather, determine what is right for the County based on further evaluation; and lastly, that the WasteTEC selected must be 'proven technology' that, at the planning and design stage, is not limited to mass burn technology.

The principal features of Scenario III, incorporating the clarifications added by SWRAC and the elements added by the Division are:

1. The goal of 60% diversion of solid waste from the landfills, with infrastructure and programs to achieve that goal including:
 - Recyclable Materials Recovery Facility (MRF)
 - Construction & Demolition MRF
 - Universal curbside collection of refuse, yard waste, and recyclables program
 - Expanded composting facilities
 - Improved white goods and bulky item collection programs County-wide
 - Increased recycling programs for Hana, Lanai and Molokai communities
 - Increased support and mandates for food waste collection and recycling
 - Ordinances and mandates to enforce residential and commercial recycling
 - Household hazardous waste collection programs
 - Increased support for re-use programs
2. A WasteTEC facility for handling the remaining solid waste that is not recyclable, thus greatly reducing the final volume of waste to be landfilled while producing useable energy, including:
 - Researching viable technology options, including a review of feasibility studies already completed by other communities
 - Conducting a feasibility study and an implementation plan that is open to various technologies
3. Improved customer service assistance and education including:
 - A customer call center to handle all solid waste programs, with task tracking
 - An expanded education program focusing on reusing, reducing, and recycling that targets businesses, schools, institutions and residents
4. Improved Division facilities that will provide increased efficiency in operations and services, including
 - Centralizing some Division base facilities and offices

¹ The term "WasteTEC" was created by the Division and used in this ISWMP to describe a waste-to-energy facility that is a key element of the plan but one where the specific technology has not been selected nor has preference. Any technology would be required to meet the County's requirements for "proven" results, economy and efficiency.



- Centralizing Division equipment maintenance and repair operations
- Evaluating putting on stand-by the remote landfills (Hana, Lanai and Molokai) and the transfer of refuse and recyclables to appropriate destinations

The Department and Division support the SWRAC recommendations for implementation with the addition of the following elements:

- All Scenario components will be reviewed by stakeholders and will need to take legal, financial and union considerations into account prior to implementation. Evaluations will be conducted on all proposed projects to determine if they are feasible, attainable, and reasonable.
- Evaluate land needed for increased compost operations.
- Evaluate standby options for Lanai and Molokai landfills while maintaining and improving recycling and household hazardous waste (HHW) collection and processing.
- Complete legislation for commercial recycling mandates, including enforcement components.
- Create mandates for the recycling of commercially produced food waste.

On May 8, 2008, the SWRAC approved the draft ISWMP, with the inclusion of the Division's additional considerations to Scenario III. Table ES-1 compares the current waste management system with Scenario III which calls for more diversion, more services to customers, prolonged landfill capacity to 2042, and generation of electricity from trash that would otherwise be landfilled.

Table ES-1 – Current/New System Highlights

Topic	Current	New (Scenario III)
Diversion Rate	30%	60%
Curbside Customers	27,000	44,000
Curbside Recycling	No	Yes
Curbside Bulk Item	No	Yes
Curbside White Good	Partial	All
Household Hazardous Waste Collection	Partial	Yes
Materials Recovery Facility (MRF)	No	Yes
Construction and Demolition MRF	No	Yes
Active Landfills	4	3
Curbside Pilot Yard Waste	No	Yes
Generating Electricity from Garbage	No	Yes
Central Maui Landfill Closes	2026	2042
Average Annual Division Budget 2006 – 2042	\$50 million	\$109 million
Cumulative Capital Needed	\$76 million	\$200 million



CONCLUSION

The ISWMP sets forth timelines for implementation that are intended to be conceptual only and are for the purpose of providing a general sense of the time involved in implementation of the ISWMP recommendations. Such schedules often require involvement between many public and private entities. Prior to implementation of recommendations contained in this ISWMP legal, financial and union considerations will need to be taken into account.

As an important part of maintaining the long-term environmental and public health of the community, the ISWMP is a dynamic document intended as a guide to address the finite capacity of the County's landfills, the growing waste stream, the rising cost of energy, and the desire to provide more and better services to the people in the County in accordance with the State's and County's diversion goals.



Acronyms

Acronym	Full Name
A&E	Architect and Engineering
AD	Anaerobic Digestion
ADC	Alternative Daily Cover
ADT	Average Daily Trips
ASL	Automatic Side-Loader
BLS	Bureau of Labor Statistics
C/PC	Closure and Post-closure
C&D	Construction and Demolition Debris
C&DMRF	Construction and Demolition Materials Recovery Facility
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CESQGs	Conditionally Exempt Small Quantity Generators
CFCs	Chlorofluorocarbons
CFR	Code of Federal Regulations
CML	Central Maui Landfill
County	County of Maui
CRT	Cathode Ray Tube
CY	Cubic Yard
Division	Division of Solid Waste, County of Maui
DOT	Department of Transportation
DPW	Department of Public Works
EDF	Environmental Defense Fund
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FA	Financial Assurance
FCA	Full Cost Accounting
FOG	Fats, Oil, and Grease
FY	Fiscal Year
GIS	Geographic Information System
HazMat	Hazardous Materials
HDPE	High Density Polyethylene
HHW	Household Hazardous Waste
HRS	Hawaii Revised Statutes
ISWMP	Integrated Solid Waste Management Plan
KWh	Kilowatt Hour



LDPE	Low Density Polyethylene
LFG	Landfill Gas
MCL	Maximum Contaminant Level
MECO	Maui Electric Company
MRF	Materials Recovery Facility
MSL	Mean Sea Level
MSW	Municipal Solid Waste
NDA	National Demolition Association
NIMBY	Not In My Backyard
NPDES	National Pollutant Discharge Elimination System
NSWMA	National Solid Waste Management Association
OCC	Old Corrugated Container (Cardboard)
OSHA	Occupation Safety and Health Act
PET	Polyethylene Terephthalate
PM	Preventive Maintenance
PO	Purchase Order
PPB	Parts-Per-Billion
PPM	Parts Per Million
PS	Polystyrene
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
R&D	Research and Development
RDF	Refuse Derived Fuel
RFB	Request for Bids
RFP	Request for Proposals
RFQ	Request for Qualifications
RPPC	Rigid Plastic Package Containers
RPS	Renewable Portfolio Standard
SWANA	Solid Waste Association of North America
SWRAC	Solid Waste Resource Advisory Committee
TEQ	Toxic Equivalents
TPD	Tons Per Day
TPY	Tons Per Year
USEPA	United States Environmental Protection Agency
WasteTEC	Waste-to-Energy Conversion Technologies
WTE	Waste-to-Energy



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Integrated Solid Waste Management Plan *Overview*

The County of Maui (County), Department of Environmental Management (Department), Solid Waste Division (Division) and Solid Waste Resource Advisory Committee (SWRAC) developed this Integrated Solid Waste Management Plan (ISWMP) to update its 1994 ISWMP in compliance with the State of Hawaii's Department of Health requirements. These requirements are set forth in the Hawaii Integrated Solid Waste Management Act, Hawaii Revised Statutes (HRS) Chapter 342(G) which requires each county to review and update their respective ISWMP every five years.

The ISWMP is a plan for use by stakeholders and will need to take legal, financial, and union considerations into account prior to implementation.

Chapter 1 - Introduction

The HRS requires the ISWMP updates to review current operations, research alternative approaches, develop long-term scenarios, and provide capital and operational cost/revenue projections. The resulting revised ISWMP provides policy-makers and Division staff with a guide in managing future solid waste issues.

Solid Waste Hierarchy

The United States Environmental Protection Agency (USEPA) has ranked strategies to manage municipal solid waste (MSW) as follows:

1. *Source Reduction (also called Waste Prevention) and Reuse*: This reduces waste before it is produced. Copying on both sides of the page is an example of source reduction.
2. *Recycling (including Composting)*: In 2006, the United States recycled 82 million tons according to the USEPA. Material is collected and processed into raw materials for the production of new goods.
3. *Combustion with Energy Recovery*: MSW can be processed and combusted to produce energy for beneficial use.
4. *Landfills and Incineration*: The Resource Conservation and Recovery Act (RCRA) established standards for landfills. Landfilling and incineration without energy recovery are the lowest priority.

Solid Waste Resource Advisory Committee

County Mayor Charmaine Tavares appointed sixteen (16) people to the SWRAC as required by Hawaii HRS Chapter 342(G). The SWRAC members represent a broad spectrum of concerned citizens, industry leaders, and members of the County Council.



The Division hired a solid waste management consulting firm, Gershman, Brickner & Bratton, Inc. (GBB), to conduct field research, provide analysis and present its findings to Division staff and the SWRAC. This included a guided tour for SWRAC of solid waste facilities in Oregon and California as part of a research and education process with supplemental presentations by the consultant and staff on industry practices and current County operations.

The presentations included the following topics regarding Maui's current solid waste activities and industry best practices: Orientation, Garbage & Recycling Collection, Review of Tour, Construction & Demolition Debris (C&D), Pay-As-You Throw, Yard Waste, Waste-to-Energy Alternatives, Alternatives to Disposal, Organics to Energy, Zero Waste, Household Hazardous Waste, Education, County Finances, Landfill Capacity, Consensus Point Recommendations, Organization, Draft Scenarios, Draft Final ISWMP.

Professional mediators, Mediation Services of Maui (MSM), were retained to facilitate SWRAC discussions and assist in reaching consensus points in order for SWRAC to make recommendations to the Division.

These recommendations are as follows:²

1. Establish overall objectives for solid waste management.
2. Develop new ordinances and/or statutory authorities for recycling requirements.
3. Plan and implement an ongoing hazardous waste materials collection program and facility in Central Maui, including, at a minimum, annual collections from the Hana region, Molokai and Lanai.
4. Develop systems for intra-county and inter-island transportation of solid waste & recyclable materials.
5. Provide universal curbside collection (refuse, recycling, yard waste, bulky waste and white goods) for all residences served by streets and roads meeting County standards.
6. Construct a new, fully enclosed materials recovery facility (MRF) on the Island of Maui to process the County- and commercially-collected curbside and recycling center materials. Single-stream collection requires a MRF that can process the material and currently there is no such facility in the County. The MRF site should be in a central location, such as the Central Maui Landfill (CML) or Puunene area, and implementation planning for the MRF should start immediately.

The SWRAC recommended a procurement process incorporating a design, build and operate structure resulting in a long-term service agreement.

7. Reduce landfilling at the Hana Landfill to a minimum and maintain the permit by limiting landfilling to mainly inert materials. This would provide the County

² The order of presentation does not imply ranking.



with a facility in East Maui when needed. The waste received each day (approximately four tons) will be transferred back to CML using rear-load trucks.

8. Utilize the Hana Landfill facility as a staging ground for any storm management operations. This may include stockpiling, processing, and loading debris at the site.
9. Pursue landfill gas utilization (energy conversion) at the CML.
10. Evaluate the feasibility of commercial technology alternative resource management.³ This recommendation is specifically for the advancement of a Maui County-specific feasibility study utilizing established data and best practices.
11. Expand Olowalu Convenience Center to include: (1) convenience center for residential refuse and recycling drop-offs as currently operated; (2) base yard for the Division's Refuse Collection Section serving west Maui; and (3) transfer station for MSW, green waste and recyclable materials collected by the County and private collectors.
12. Evaluate the feasibility of extending the life of the existing commercial C&D landfill.
13. Immediately form a C&D Task Force of all interested stakeholders to provide a forum to discuss C&D waste generation, recycling, and disposal issues.
14. Review local ordinance changes associated with C&D waste generation and management options that could increase diversion.
15. Contract with the private sector to receive, store and process abandoned autos and discarded appliances rather than the County initiating its own operations on the Island of Maui.
16. Pursue alternative methods of funding solid waste services, including: (1) system revenue bonding for major capital investments; (2) Solid Waste System Benefit Fee collected via property tax or other bills; and (3) other fees for services, including possible "Pay-As-You-Throw" fees.
17. Utilize full service contracting for major infrastructure improvements requiring sale of products working toward an Enterprise Fund or Solid Waste Authority in the future.
18. Continue SWRAC involvement with annual review and comment on ISWMP implementation.

³ There was a unanimous vote by the SWRAC in favor of the County issuing a request for proposal (RFP) for a study of alternative technologies including reviewing Los Angeles County's research and avoid "reinventing the wheel." The intent is for the County and its consultant to review such research and then do a feasibility study specific to Maui.



Chapter 2 - Existing and Future Conditions

The County's population will continue to increase and tourism is expected to remain strong, therefore the amount of garbage the Division manages will continue to increase. Currently, the County owns and operates four active landfills. One privately owned landfill on the Island of Maui receives C&D debris.

The County is made up of the five islands of Maui, Molokai, Lanai, Kahoolawe, and Molokini. This ISWMP addresses the three inhabited islands of Maui, Molokai and Lanai. The Island of Kahoolawe has a very small population (less than 50) and is not addressed in this ISWMP. Inherent to island environments, water separation causes unique difficulties in transporting equipment and allocating human resources. Additionally, the remote district of Hana on Maui faces similar issues with separation in that the connecting road infrastructure is limited and the distance to the population center is great. In the Hana Region and on Molokai, the collection of trash is performed by the Department of Public Works (DPW) Highways Division.

Population and Waste Generation

Table 1 illustrates the total population, total tons generated, and the average tons per year generated by each person for Fiscal Year (FY) 2006. It uses the County's Planning Department's population projection and waste generation rate of 2006 to project waste generation to 2030. "Tons Generated" includes all recycling. The Division is projected to have to manage an additional 439 tons per day (TPD) of generated waste by 2030.

Table 1 - Population and Waste Generation

Year	Population	Tons Generated	Per Capita Tons Per Year	Tons Per Day Generated
2006	140,050	363,697	2.6	996
2030	199,548	523,938	2.6	1,435

Diversion

The diversion of waste from landfills in the County in 2006 was 30.6 percent. This diversion includes recycling, composting and other beneficial uses of waste materials.

Chapter 3 - Landfill Capacity and Disposal

The County has four active MSW landfills with CML being the largest. Table 2 shows the quantity of waste handled daily and the year each landfill is projected to close, assuming no major changes in current practices.



Table 2 – County-Owned Landfills

Landfill	Owner	Items Taken	Estimated Year Capacity Is Filled	Tons Per Day
Central Maui Landfill	County	MSW/Recycling	2026	550
Hana Landfill	County	MSW	2096	3.8
Molokai Landfill	County	MSW/Recycling	2015	17.6
Lanai Landfill	County	MSW	2020	14 ⁴

The ISWMP provides strategies for diverting MSW away from “low use” facilities to other disposal points in order to save landfill capacity and improve operational efficiency. One strategy considered was to have the County-owned landfills in Hana and on Molokai and Lanai placed on “Standby with Permit.” These landfills’ permits stay active, but the MSW previously going into the facility would be containerized and shipped to another disposal site or recycling facility.

Chapter 4 - Recycling

The State of Hawaii has a goal of each county recycling 50 percent of its waste by the year 2000. The County presently diverts approximately 30 percent of its waste away from landfills. Chapter 4 sets forth the traditional type of recycling programs excluding those organic and scrap metal materials programs.



Collection Strategies

The ISWMP sets forth recycling operational strategies which include drop-off facilities and curbside collections; equipment used to operate these programs; and the kind of commodities (paper, glass, plastic, steel and aluminum cans) normally collected in such programs.

Drop-offs are the most common form of self-haul. At these locations residents and small businesses can drive to and unload their material by category. Once the large container is full, a hauling truck collects the full container and replaces it with an empty one or unloads the container into the truck body.

According to EPA, as of 2006 there were 8,660 *curbside recycling programs* in the United States. While there are various operating methods in these programs, the materials are set out in one of the following ways:

1. Either the resident or the collector source-separates the material at the curb;
2. The resident combines most or all of the recyclables into one (single-stream) or two (dual-stream) containers. Materials are taken to a MRF that separates the different commodities; and

⁴ Lanai Landfill is only open 5 days/week; therefore, actual daily tonnage is 19.7.

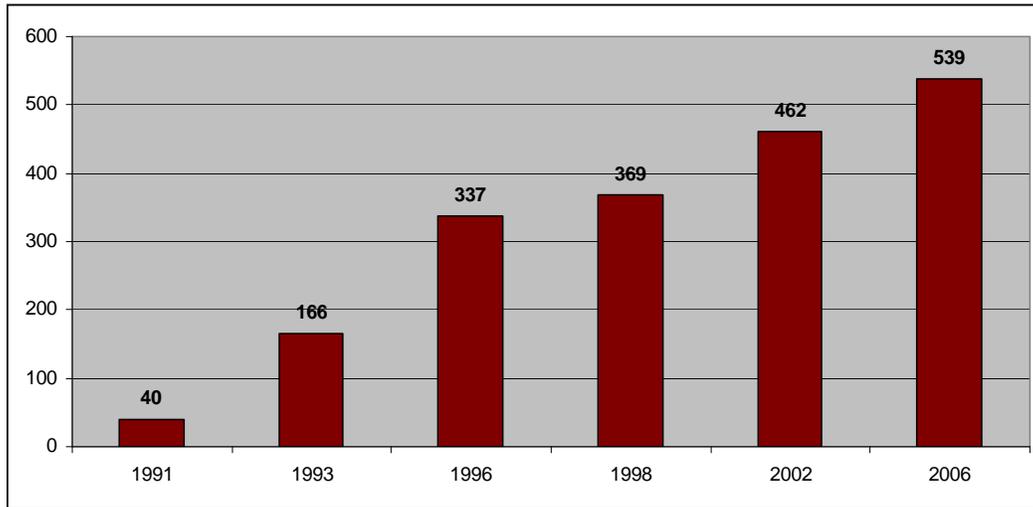


3. MSW and recyclables collected are mixed together in one vehicle and taken to a separation facility.

Materials Recovery Facility

Recyclables collected at the curb in a single-stream manner must be separated at a MRF which is an enclosed facility consisting of areas for receiving, processing, and product storage and loading. Currently, there is no MRF in the County that can efficiently process single-stream material. The SWRAC recommended single-stream collection and that the County construct a MRF through a design, build, and operate contract. Figure 1 shows the growth of MRF capacity in the United States.

Figure 1 - Number of MRF Facilities in Operation in U.S. (in tons and year)



Source: Governmental Advisory Association, Inc.

The ISWMP sets forth current County recycling operations by island. Table 3 summarizes the current and proposed recycling activities for each County island and the Hana Region.



Table 3 - Summary of Recycling Activities and Proposal

Location	Current Recycling Activities	Proposed Recycling Activities
Central Island of Maui	Drop off facilities; redemption centers	Every other week collection of single-stream material; County owned MRF; continue with drop off sites but regularly evaluate for possible growth in types of material taken and/or consolidation of sites.
Hana Region	Redemption Center	Every other week collection of single-stream material; a full service convenience center where residents can drop off recyclable items.
Lanai	Redemption center	Every other week collection of single-stream material; a full service recycling center where residents can drop off recyclable items, location to be determined.
Molokai	A drop of facility; redemption center	Every other week collection of single-stream material; a full service recycling center located at the landfill where residents can drop off recyclable items.

Chapter 5 - MSW, White Goods, and Bulky Waste Collection

Chapter 5 of this ISWMP sets forth the history of MSW, white goods, and bulky waste collection as well as the different collection methods, equipment used, and importance of routing. Information regarding operations in Hawaii and on the mainland and recommendations for the collection of MSW, white goods, and bulky waste are also covered in this chapter.

Collection of MSW

The collection of MSW has progressively moved from a system based exclusively on manual collection with three crew members on a truck to fully automated collection with one crew member on a truck. Carts with wheels to hold waste are used by residents in the automated collection program. The following briefly describes the three types of collection vehicles:

1. *Manual*: a truck loaded from the rear that has no mechanical assistance for employees to lift garbage cans. There are normally three or more employees working this one truck;
2. *Semi-automated*: a truck that is equipped with a hydraulic lifter. An employee rolls the cart to the truck and attaches it to the lifter. The hydraulics of the lifter raises the cart, empties it into the body of the truck, and returns the cart to the ground. There are normally two people working with this type of collection vehicle, although it can be a one-person operation; and



3. *Automated collection*: a truck that is equipped with a metal arm that extends out with a mechanical hand that grasps the cart, raises it up and unloads the contents into the truck packing unit. Only one employee is required on this vehicle. This is less of a labor cost from other vehicles which require at least three employees and has fewer injuries associated with its use.

Table 4 sets forth a comparison of manual collection with semi- and fully-automated collection efficiencies and also includes information regarding ranges of stops collected and the number of crew members on the truck. A fully automated truck with one crew member is more productive than all other categories of trucks and crews.

Table 4 – Service Stops⁵

Design	Manual 2-Person Crew	Manual 3-Person Crew	Semi- Automated 1-Person Crew	Semi- Automated 2-Person Crew	Fully Automated 1-Person Crew
# of Stops per Day	500 – 700	700-900	400-500	600-800	800-1,100

Collection of White Goods/Bulky Waste

The type of equipment used for the collection of white goods and bulky waste varies. For white goods, compaction vehicles are not recommended because compaction can break a line causing Freon or other chlorofluorocarbons (CFCs) to be released into the air causing damage to the ozone layer. The following briefly describes the vehicles covered in the chapter:

1. *Non-Compaction Trucks*: These vehicles cannot compact items that are collected. Currently, the Division collects white goods using a flat bed truck with a liftgate. Workers move the material onto the liftgate, where it is hydraulically lifted and placed onto the bed of the truck. Knuckleboom Trucks are collection vehicles that have a hydraulic arm that telescopes out twelve to twenty-five feet. At the end of this telescopic arm is a clamshell that grabs the material and lifts it into the trailer.
2. *Compaction Trucks*: These vehicles generally compact the material by hydraulic pressure causing a metal blade to crush bulky waste into an enclosed vessel. Compaction trucks generally have higher waste load capability.

The ISWMP sets forth collection alternatives along garbage collection routes for white goods and bulky waste. Some of those alternatives include the following:

1. *Collection Events*: Notices are published indicating locations and times for these events, usually on a weekend, where residents may bring their bulky waste. Such locations are generally at a neighborhood school or community center.

⁵ H. Lanier Hickman, Jr., Solid Waste Collection & Transfer, American Academy of Environmental Engineers Staff, 2000, pg. 91.



2. *Collecting along Trash Routes:* Notification is provided to customers along the routes where bulky waste and white goods from existing trash collection routes are collected on a periodic basis.
3. *Collection by Appointment:* Residents make an appointment by phone or email requesting bulky waste and white goods collection.
4. *Mass Collection:* This is a hybrid of the collection by appointment and collecting along trash route systems. Under this method, jurisdictions are divided into sectors by geographic areas and residents are notified of the days that collection vehicles for bulky waste (placed out by residents) will be collected. Trucks are sent into the area for the stated period of time to collect the material.

Routing

Efficient routing maximizes the time collection vehicles are collecting solid waste/recyclables and minimizes the time that vehicles are involved in non-collection activities. Efficient routing should also balance routes so that each one takes about the same amount of time. Inefficient routing results in unequal routes, with a disproportionate amount of the work and time placed on a few trucks.

Transfer Stations

Transfer stations are waste transportation facilities intended to reduce hauling costs by consolidating waste into larger vehicles such as transfer trailers, railroad cars, or barges. Typically, these vehicles haul waste from a central point(s) within a jurisdiction to one or more distant solid waste management facilities. The transfer includes unloading of collection vehicles at the transfer station, loading solid waste from the transfer station to the transfer vehicles, and hauling it to distant solid waste management facilities.

County of Maui's MSW Collections

In FY 2007, the Division collected MSW from approximately 24,000 of the estimated 51,000 single family households in the County. The Division is also assisted with collections by the DPW Highways Division in some locations. MSW collection on the County's three islands and the Hana Region occurs from six separate locations or base yards that serve the population.

MSW is collected in either fully automated collection vehicles or manual rear-loaders. The Division provides wheeled, covered carts to customers whose refuse is collected twice weekly with a fully automated collection vehicle. Lanai residents' refuse is collected once a week in the automated collection program. Residents whose refuse is picked up by manual collection are serviced once a week and required to provide their own containers.

County refuse drivers work under the "task" system as set forth in the United Public Workers Unit 1 Agreement and Task Work Policies, signed in the 1970s and effective on July 1, 1993 and as subsequently modified.⁶ The task system is common

⁶ Task Work Policies for Refuse Collection Operations.



throughout the U.S. refuse collection industry, both in the public and private sectors. Under the task system, when a worker finishes his/her route and corresponding duties before the end of the shift, he/she can leave work and still be paid for a full day's work. In Maui County, this work practice is referred to as "Uku Pau."

Island of Maui: Collection services begin out of four base yards:

1. Wailuku Base Yard
2. Makawao Base Yard
3. Lahaina Base Yard
4. Hana Base Yard

The Wailuku and Makawao Base Yards have separate equipment and personnel that could create efficiencies if combined and centrally located. The Lahaina Base Yard serves the west side of Maui and is strategically located close to the population center.

The Hana Region solid waste collection service operates out of the DPW Highways Division facility located in Hana at 35 Hana Highway. There is one collection vehicle operated by three DPW Highways Division staff. The Division's Collection Section has no personnel assigned to solid waste collection in Hana.

Island of Lanai: For the approximately 1,300 households in the Lanai Community Plan area, about 640 households receive once-a-week MSW collection service. This service is provided by one automated sideloader (ASL) truck operated by one Landfill Section employee. The Landfills supervisor supervises this employee and the collection operation on Lanai.

Island of Molokai: Solid waste collection for Molokai operates out of the DPW Highways Division's facility located off the Maunaloa Highway in Kaunakakai. Because the Division's Collection Section has no personnel assigned to Molokai, curbside collection is performed by DPW Highways Division personnel who are supervised by the DPW Highways Division supervisor for the island.

County of Maui's Bulky Waste and White Goods Collection

Bulky waste: There is no official program for the collection of bulky waste items in the County by the County crews. However, at some locations such as Hana, the collection crew picks up bulky waste items in a rear-loader as it collects the curbside trash on routes. There is no separate record for this activity in the County.

White goods: The Division's Collection staff collects white goods by appointment on the island of Maui except in the Hana region. Residents can also take white goods to the contracted metals processor for no direct fee as discussed in Chapter 10. The Division does not collect white goods from residents on the islands of Molokai and Lanai. Plans are underway to collect white goods at the Hana and Molokai landfills.

County of Maui's Olowalu Refuse and Recycling Convenience Center

Currently residents bring MSW and recyclables to the recently upgraded refuse and recycling convenience center and deposit them into containers which are hauled to the CML or a recycling facility under contract with the County. The Olowalu Convenience Center has a natural elevation differential that would allow for a relatively low-cost, enclosed transfer facility to be built that could be used to consolidate loads from



residential and commercial haulers as well as the County's own garbage collection trucks. This would result in lower costs and less trash trucks on the highway from Olowalu to the disposal point. Lahaina's collection crews and fleet could also be located at this site.

Table 5 compares the current versus the recommended facility operations at Olowalu.

Table 5 - Comparison of Olowalu's Current and Recommended Operations

	Current	Recommended
Operation	Convenience Center	Transfer Station
Tons to Central Maui Landfill per Load	5 to 9 Tons	20 to 22 tons
Cost per Ton	\$31.00	\$20.00
Revenue Generated	No	Yes
Traffic, Solid Waste Trips	Increases	Decreases
Personnel Facilities	No	Yes

Hana Region

A convenience center with transfer facility could be constructed at the Hana Landfill for customers to place MSW into the back of a roll off truck. Every two days this truck would be taken to the CML and unloaded.

This convenience center and transfer facility could include space for two rear-load trucks, a small office, restroom facilities, and a small meeting area. With such a facility, and the Hana Landfill on "Standby with Permit," rear-load containers could be placed at the facility for resident loading and for use when the rear-loader trucks are on collection routes or are shuttling between the Hana Transfer Facility and the CML.

Customer Service Center

An important part of the collection activities involves customer service with both the frontline interaction of the Division's crews with customers and the handling of customer call requests. The Division currently does not have a customer call center or a single number for people to call for information. Seven phone numbers are listed in the phone book.

With the recommended call center, a trained customer call technician could process calls for all services provided by the Division on all islands served. A single phone number should be utilized.



SWRAC Recommendations

The SWRAC has advised the Division of the following recommendations that pertain to MSW, white goods and bulky waste collection:

1. Develop systems for Intra-County and Inter-Island transportation of solid waste materials;
2. Provide universal curbside collection for all residences served by streets and roads meeting County standards. This would include:
 - Yard and large green waste collected in cans, paper bags, or bundled, within the volume and size restrictions, and collected every other week;
 - Bulky waste collection on an appointment basis within ordinance limits; and
 - White goods collection, expanded to include all metals, on an appointment basis.
3. Locate a base yard, convenience center, and transfer facility at the Hana Landfill site. Landfilling at the Hana Landfill would be minimized and receive mainly inert materials. This would provide the County with a facility in East Maui, when needed. The approximately four tons of waste received each day would be transferred back to the CML using two rear-load trucks.
4. Expand Olowalu Convenience Center. This new center would include:
 - Convenience center for residential refuse and recycling drop-off as currently operated;
 - A new base yard for County Refuse Collection Section operations serving West Maui;
 - Transfer station for MSW, green waste and recyclable materials collected by the County refuse collection and private collectors; and
 - Additional infrastructure for ingress and egress from the facility.

ISWMP Recommendations

1. *MSW*:
 - Manual collection should be discontinued and replaced with automated collection or with semi-automated collection where fully automating is not possible
 - Refuse collected once per week in a cart provided to residents by the County
2. *Bulky Waste and White Goods*:
 - Bulky waste collection by appointment



-
- White goods collection by appointment
3. *Wailuku and Makawao:*
 - Combine these two base yards into one central location where other solid waste activities could be consolidated
 4. *Olowalu Refuse and Recycling Convenience Center:*
 - Convert to a Transfer Station
 5. *Hana Landfill / Transfer Facility:*
 - Keep the landfill's permit active but do not bury MSW
 - Construct Transfer Facility and transport MSW and recyclables to Central Maui
 6. *Customer Call Center:*
 - Implement a central customer call center with one phone number for all the Division's services.

Chapter 6 - Education Strategy

This chapter sets forth key elements used by many communities to implement effective education programs. This chapter includes extensive examples from other communities on ways to implement educational programs. These details are meant to illustrate the steps necessary for the Division to implement a successful campaign.

Social Marketing

Educational programs are increasingly becoming based on the principles of social marketing, where the goal is to influence action. The Social Marketing Institute lists the following central principles of this educational strategy:

1. If audiences believe that the benefits they receive will be greater than the costs they incur, they will take action;
2. Successful programs are those based on the target audience's perceptions of the proposed exchange;
3. One message does not fit all people in the target group;
4. Marketing efforts must incorporate all of the "4 Ps:"
 - "*Product:*" must be enticing (i.e., the package of benefits associated with the desired action);
 - "*Price:*" minimize the cost to the target audience;
 - "*Places:*" make the exchange and its opportunities available in places that reach the audience and fit its lifestyles;



- *"Promote:"* maximize desired responses with creativity;
5. Understand that recommended behaviors always have competition and these should be understood and addressed;
 6. The marketplace is constantly changing so program effects must be regularly monitored and management must be prepared to rapidly alter strategies and tactics.

County of Maui's Educational Program

The Division's Recycling Section staff has developed a network of recycling-oriented citizens, nonprofits and business representatives who assist in education efforts. The Division has an informative website which includes instructional information. The Division also distributes grant monies for recycling activities, and has dedicated personnel towards the effort of advancing diversion.

ISWMP Recommendation

The Division should develop an integrated educational strategy for the purpose of changing habits. This strategy should enhance the County's resources, provide top-quality services to the residents, and promote a green ethic. A coordinated Division-wide education program is important to maximize the learning opportunities in brochures, web site, radio ads and shows, public forums, and speeches by public officials. There should be an intentional effort among managers within the Division to coordinate activities and follow the strategy so that education can support the operations from the implementation stage throughout the activity. Under this strategy education is an evolving partnership with Division staff, the media, and the public and not a "one-shot" deal.

Chapter 7 - Source Reduction and Reuse

Source reduction is waste prevention. It is the practice of designing, manufacturing, purchasing, or using items (such as products and packaging) in ways that reduce the amount or toxicity (chemically and/or biologically produced illness to an exposed organism) of trash created. The USEPA lists source reduction as the first step in managing MSW issues in its waste hierarchy. The National Recycling Coalition (NRC) and the Environmental Defense Fund (EDF) also view source reduction as a viable means to reduce MSW. Recently, the NRC broadened its mission statement to include source reduction. It states that "ton for ton, source reduction is more valuable to society than recycling." The EDF has stated that eliminating excessive layers of packaging is one of the most obvious and important forms of source reduction, and that source reduction has the potential to alleviate natural resource depletion.

The benefits of source reduction and reuse fall into three categories:

1. *Saves natural resources.* Waste is not just created when consumers throw items away. Throughout the life-cycle of a product—from extraction of raw materials to transportation, processing and manufacturing facilities, and end use—waste is generated. Reusing items or making them with less material can



dramatically decrease waste, creating fewer materials to be recycled or sent to landfills or waste combustion facilities.

2. *Reduces toxicity of waste.* Selecting non-hazardous or less hazardous items is another important component of source reduction. Using less hazardous alternatives for certain items (e.g., cleaning products and pesticides), sharing products that contain hazardous chemicals instead of throwing out leftovers, following label directions carefully, and using the smallest amount necessary are ways to reduce waste toxicity.
3. *Reduces costs.* The benefits of preventing waste go beyond reducing reliance on other forms of waste disposal. Preventing waste also can mean economic savings for communities, businesses, schools, and individual consumers. For example, reducing the weight of a product or its packaging will result in lower shipping and transportation costs.

Current Activities of Maui County

The Division currently engages in the following activities to reduce waste and to promote reuse:

1. *Grants:* As shown in Table 6, this money is distributed for use in supporting paint exchange programs, E-Cycling events, as well as other reuse programs;
2. *Education:* Public education program focusing on reuse of materials and preservation of resources;
3. *Copy Paper:* County Departments are encouraged to print and to copy on both sides of paper. If this is not possible, the paper is used again in a printer or copier for draft printing;
4. *Reuse Your Bag:* Approximately 15,000 reusable shopping bags have been purchased in the County in the past two years, with purchases continuing. With input from SWRAC members, each island - Maui, Molokai and Lanai – has its own individual design, based upon the flower for that island. Educational information is printed on one side of the bag. The bags are made available to each person who signs a pledge designed to educate the public about plastic bag reduction, reuse, and proper disposal (i.e., "knot your bag" to prevent the bags from blowing out to sea).

Reuse

The Division assists businesses and non-profit organizations that operate reuse centers and stores with a program of grants. Table 6 highlights select organizations that provide reuse programs and outlets.



Table 6 – Examples of Reuse Options in Maui

Organization	Location	Reuse Services
Aloha Shares Network*	On line and by phone	All items, matches donors with non-profit organizations in need
A-1 Recycled Appliances		Working appliances
Friends of the Library	Puunene	Used book store
Community Work Day*	Puunene	Paint recycling Computer recycling
Habitat For Humanity*	Wailuku	Restore, building materials
Big Brother/Big Sister		Clothing
Kidney Clothes		Clothing
Puaa Food Waste*	Liana and Haiku	Collects food waste to feed pigs
Many Thrift and Consignment Stores	All Islands	Clothing, household goods, toys, books, furniture

*County assisted organizations and businesses operating reuse programs

ISWMP Recommendations

1. The Division continues and expands the government's reduction and reuse of paper in copy and printer machines. The County shall strive to be a paperless office government;
2. The Division provides training for other departments and yearly reminders to use material a second time;
3. The Division continues to promote and support the County's environmental purchasing efforts;
4. The Division continues to assist new and existing Reuse programs operated by non-profit organizations through grant funding;
5. The Division establishes a consumer waste reduction campaign. With the cooperation of area grocery retailers, the Division coordinates with the local grocery stores to distribute informational materials and provide demonstration about bulk purchases, provide incentives for the use of reusable grocery bags, and other waste reduction consumer methods;
6. The Division develops seasonal promotions to support waste-conscious consumer purchases. For example, fall season messages could promote cloth lunch bags instead of disposables and other Back-to-School waste reduction tips;



7. The Division assists in detoxifying the waste stream and reduces the amount of hazardous waste generated in the County through continued promotion of alternatives to toxic products. The Division distributes on the web and through other means a fact sheet describing substitutes for commercial cleaners. In addition, the Division works with the maintenance departments at area institutional settings to promote environmentally friendly cleaning products;
8. The Division provides technical assistance to businesses in evaluating existing waste practices and developing waste reduction strategies. The technical assistance could include:
 - Waste audits for businesses and institutional establishments. These waste stream audits would identify current waste generation rates (as a baseline) and identify waste reduction methods that could be utilized within the basic operation of the firm or organization;
 - Examination of existing procurement practices, including encouraging life-cycle cost strategies when evaluating product purchases that take into account replacement costs and processing and disposal costs; and
 - Suggestions for changes to operational practices to reduce waste and increase recyclability of the waste stream.

Chapter 8 - Construction and Demolition Debris

This chapter sets forth the construction and demolition debris (C&D) situation in the County. A private landfill currently receives C&D and the owner has projected approximately six years of permitted life remaining at the facility.

Private C&D Landfill

The Decoit C&D landfill in the County receives and buries approximately 50,000 tons per year. Table 7 compares material going into the private C&D Landfill with that going into the CML.

Table 7 - Annual Comparison of CML and C&D Landfill Use, FY2006

	CML	C&D Landfill
Population Served	131,640	N/A
Households Served	46,530	N/A
Total Received (tons)	268,246	49,984(1)
Average Total Materials Received in tons per day (TPD)	735 (basis: 365 days/yr.)	165 (basis: 300 days/yr.)
Materials Diverted (tons)	60,362	655
Waste Landfilled (tons)	207,884	49,329

(1) Tonnage includes inerts and recyclables; carpets and tires removed.



Ordinances

Jurisdictions are increasingly making the recycling of C&D waste a part of their permitting process. The chapter sets forth specific examples from ordinances in North Carolina, Illinois, and California. Most of these regulations provide a cost and/or square footage threshold of the construction and/or demolition project at which the ordinance is to be applied. This limits the onerous expense applied to those who undertake small projects. Some ordinances require security bonds/deposits that the contractor and/or owner will not get back until there has been satisfactory completion of the recycling/reuse requirements.

Mandated C&D Recycling

GBB completed a study for the National Demolition Association (NDA) and compiled recycling data from over 100 NDA members nationwide. The data indicated that six states recycle over 70 percent of their demolition waste.

Table 8 – Examples of State Recycling Rates of Demolition Materials

State	Percent Demolition Material Recycled in the State
CA	90%
FL	90%
WA	86%
MN	77%
IL	74%
NJ	72%
TX	49%
Average other 43 States	19%

Processing

A few jurisdictions own and operate their own construction and demolition debris materials recovery facility (C&DMRF) in order to divert and recycle material and take these materials away from their landfill to preserve capacity and extend the time before another landfill has to be constructed. Fauquier County, Virginia, developed such a C&DMRF that has the ability to process up to 130,000 tons per year of C&D.

County of Maui Alternatives

The County is faced with a potential of having the CML capacity used up two years earlier than projected if no alternative to C&D disposal is found. Alternatives for the Division to consider are:

1. Do nothing. This will use up the County's landfill capacity more quickly. But it would be a simple initiative to once again accept C&D at the CML.



2. Integrate C&D processing into the MRF discussed in Chapter 4. By combining the operations into one facility with a reuse and landfill facility on the same solid waste campus, both capital and transportation costs will be reduced. Reusable construction materials that are recovered could be offered for sale at the reuse facility to citizens for home repair and improvement projects.
3. Once a C&DMRF is operational, the County could implement a C&D recycling ordinance similar to the ones reviewed in Subsection 8.2.4 in this chapter.
4. The County could coordinate a meeting of interested private sector parties (e.g., haulers of C&D, developers, contractors, the owner of the existing private landfill) for the purpose of planning for the management of C&D waste by the private sector. This may result in a joint effort to conserve capacity in the privately owned C&D landfill, a private C&D separation facility, and a private reuse facility.

ISWMP Recommendations

The Division should implement operational and legislative actions to minimize C&D material flowing into the landfill for disposal and encourage recycling. This includes:

- A C&DMRF located at a central site;
- Local ordinances mandating C&D recycling; and
- Division provides grants to assist start-up of private operations and support if/when needed.

Chapter 9 - Organic Waste

The Division has had great success in managing its organic material. Maui and EKO Compost entered into a contract in 1995 and this operation is located on land adjacent to the CML. Under this contract, the Division pays EKO on a per ton basis to receive and process the biosolids from the County's waste water treatment facilities and mixes this with green waste to produce compost. This partnership has won the Division national attention.

Pacific Biodiesel builds scalable plants to process fats, oil and grease (FOG) into biofuel. In 1995, the company entered into a contract with EKO and established a plant also adjacent to the CML. It has a facility to convert approximately 5,000 tons of FOG into 200,000 gallons of biodiesel fuel for diesel engines.

Much of the commercial food waste on the Island of Maui has been diverted from the landfill for use as feed on hog farms. With this arrangement, the hog farmer avoids high daily grain costs and the food waste generator avoids paying landfill disposal fees.



ISWMP Recommendations

The Division's goal is to build upon its strategy of handling organic waste in a practical and cost-efficient manner. This composting activity for over sixteen years has been applauded. Specifically, the recommendations are as follows:

1. The Division continues to support a composting activity using biosolids with green waste;
2. Develop and implement pilot programs to collect green waste, both curb-side and regional drop-off sites, and evaluate the viability of making these full scale programs;
3. Enhance backyard composting program with classes by composters including the Division providing backyard composting machines, at cost, to graduates of the class;
4. Continue to support commercial food waste collection by supporting this activity with grants distributed by the Division for the purposes of reusing the material as food for hogs;
5. The Division gauge the demand and need for green waste collection in the Hana Region and develop collection pilot programs to address those needs;
6. The Division continue a green waste program on Molokai with ground mulch being provided back to the public; and
7. Develop and implement pilot programs for green waste collection on Lanai and evaluate the viability of making this a full scale program.

Chapter 10 - Metal Recycling

This chapter sets forth the policies and programs for recycling metal commodities. There are two primary types of metal commodities covered in this chapter: "white goods" which are typical household items such as stoves, washing machines, and hot water heaters; and abandoned vehicles. Also included are smaller and more diverse metal items which need to be collected and processed for recycling, such as lead acid batteries, aluminum siding, scrap copper wire and plumbing materials. The collection of white goods is discussed in Chapter 5. This chapter primarily covers the processing of white goods and abandoned vehicles.

Abandoned vehicle regulations are covered under HRS Chapter 290 and under Maui County Code Title 20, Chapter 20.20. The Division recently acquired the derelict and abandoned vehicle abatement program that was established and formerly administered by the County's Finance Department. The purpose of this program is to proactively reduce the number of abandoned vehicles left on public property throughout the County through education, assistance and enforcement. These vehicles on Maui, as on other islands, become a problem to collect, process and ship.



SWRAC Recommendations

The SWRAC examined how to best process the metals, in particular the derelict and abandoned vehicles. As stated in Section 1.3.2.5 of the ISWMP, SWRAC arrived at a consensus on a recommendation that the County contract with the private sector to receive, store and process abandoned autos and discarded appliances instead of the Division initiating its own operations on the Island of Maui.

There was a sense among the SWRAC that if the private sector is now doing the work adequately, then it should continue to do it without competition from the County. However, the SWRAC fully recognized that a problem currently exists away from the more densely populated areas on the Island of Maui, and that a regular and routine process needs to be developed to process the metal items on the Islands of Lanai and Molokai and in the Hana Region.

ISWMP Recommendations

1. *Island of Maui:* The County has contracts with private service providers to collect, store, process, and market scrap autos, white goods, and other metals. This system is currently working well. The continuation of this public/private partnership is recommended.
2. *Hana Region:* The Division provides regular removal of ferrous and non-ferrous metals from the Hana Region by providing a roll-off at its new convenience center for scrap metal and making arrangements for the curbside collection of white goods by appointment.
3. *Island of Molokai:* The Division provides regular removal of metals from the Island of Molokai by: receiving appliances at its facility and preparing them for shipment to a processor off island; making arrangements for the curbside collection of white goods by appointment; and implementing a plan, in conjunction with its processor, to remove automobile scrap from the area at least once per year.
4. *Island of Lanai:* The Division provides regular removal of ferrous and non-ferrous metals from the Island of Lanai by: receiving appliances at its facility and preparing them for shipment to a processor off island; making arrangements to collect white goods at the curb by appointment; and implementing a plan, in conjunction with its processor, to remove automobile scrap from the area at least once per year. The Division may partner with local private businesses to provide these services.

Chapter 11 - Household Hazardous, Specialty, and Electronic Waste

This chapter sets forth programs related to household hazardous waste (HHW), electronic waste, and sharps collection. Starting in 1988, the State has held HHW collection events through its contractor EnviroServices. Contrary to the direction of the 1994 ISWMP, the State stopped holding HHW collection events as of 2000.



Federal Description

- HHW is exempt from regulations as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) rules of the Code of Federal Regulations (40 CFR Part 261.4).
- Conditionally Exempt Small Quantity Generators (CESQGs). The federal government exempts CESQG generators of 220 pounds or less in a calendar month from obtaining an EPA identification numbers. This exempts those generators from much more stringent and costly guidelines (40 CFR 261.5).

Collection Methods

1. *Single Day Events:* Single day events are the norm among the counties in the State of Hawaii. Single day events used to be the norm on the mainland but are increasingly being phased out for more service-oriented collection methods discussed below.
2. *Permanent HHW Facilities:* Permanent facilities allow the jurisdictions to accumulate enough material to decrease the per unit management cost. A permanent facility also provides a consistent service to the public by providing more dependable and convenient times to drop off material.
3. *Mobile Collection:* A mobile HHW collection program is designed for collection within a prescribed geographic area. This program usually consists of a crew of trained workers in a single box truck or a truck and trailer, who travel to certain locations at publicized times and dates to receive material from citizens who otherwise would not drive into a fixed facility.

Trends in Hawaii

Table 9 sets forth the current and future plans of the four counties. Only Maui County does not provide a broad, multi-material HHW collection program. Kauai appears to be considering a permanent facility that will also service small quantity generators.

Table 9 – Comparison of HHW Program in Hawaii (FY 2006)

Program Elements	Hawaii County	Kauai	Honolulu	Maui
HHW Collection	Yes	Yes	Yes	No
Type	Event	Event	Event/Fixed	None
Number of collections	5	4	6	0
In-house/Contractor	Contractor	Contractor	Contractor	Neither
Contractor's Name	EnviroServices	EnviroServices	EnviroServices	None
Amount Spent	\$186,760	\$75,000	Unknown	None
Fixed Facility	No	Developing	Yes	No
Small Quantity Generator Program	No	Developing	No	No



Metro Portland conducted a study⁷ of 25 communities across the country regarding their respective HHW operations. Some general observations can be made from the results:

1. The ten most cost-efficient programs were operated in-house with public, as opposed to contracted, labor.
2. Median costs were \$55 per participant and \$0.67 per pound.
3. More than two-thirds of HHW programs offer mobile collection events with a median of 17 operation days per year and 161 participants per day.

Electronics

Used electronic products are the most rapidly growing waste problem in the world due to their quantity, rapid obsolescence, and toxicity. The National Safety Council estimated that more than 300 million computers became obsolete in the United States in 2004. The International Association of Electronics Recyclers projects that 1 billion computers will be scrapped worldwide by 2010, at a rate of 100 million units per year. Further, federal legislation overseen by the FCC requires conversion of all television broadcasting to high definition by February 2009. This will make obsolete most analog television sets if they are not connected to a cable system with a converter.

Electronic wastes contain toxic substances, including lead, mercury, cadmium, lithium, brominated flame retardants, and phosphorous coatings. These toxic materials may be released upon disposal, posing a threat to human health and the environment.

To deal with the electronic waste issue, a number of states have banned electronic waste from landfill disposal, including: Arkansas, California, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, and Rhode Island. In Hawaii's 2008 legislative session, the House and Senate passed a bill banning certain electronic waste from landfill disposal.

Some jurisdictions chose to implement a policy of product stewardship that has helped manufacturers assume responsibility for the impacts of a product and its packaging, the energy and materials consumed, air and water emitted, the amount of toxics in a product, worker safety, and waste disposal in product design and end-of-life management.

As of October 2007, nine states have implemented various forms of product stewardship. Eight of the nine states emphasize producer responsibility, whereby the producers provide for the means to fund a portion of or all the cost associated with collection, transportation, and disposal. California, however, has chosen to implement an advanced recycling fee directly to consumers on products such as televisions and monitors.

⁷ "Comparison of HHW Programs" by Metro Solid Waste and Recycling Department, Fall 2005; also reviewed was "Sonoma County HHW Programs Benchmarking and Program Evaluation" by Sonoma County Waste Management Agency, January 2007. The latter examines targeted facilities within California and the former examines targeted facilities across the country.



Sharps

Sharps refer to needles, syringes, and lancets. Three billion needles are placed in the trash each year by nine million consumers of these products in the U.S. As the country's population continues to age, these numbers are expected to increase.

The State of Hawaii recommends that all sharps from households be placed in rigid, strong plastic or metal containers with a screw-on or tightly secured cap, such as a laundry detergent bottle, and disposed of with regular household trash.

ISWMP Recommendations

1. The Division implements a strategy to hire a HHW Manager, build a permanent HHW facility in Central Maui, contract with a HHW disposal company, and hold event collections in the Hana Region and on the Islands of Lanai and Molokai.
2. The Division works with non-profits, other counties, the State, and the producers of electronic material to develop cost-efficient methods to handling and processing electronic waste.
3. The Division educates the public on proper disposal for sharps to minimize the risk of people getting stuck by them.

Chapter 12 - Alternative Resource Conversion

This chapter contains information for solid waste professionals, decision-makers and citizens on the state-of-the-art waste processing technologies, potential emerging technologies and their applicability to the local needs, and the potential of these technologies to contribute to the County's overall solid waste management system. There has been a re-emergence of alternative resources conversion technologies over the last few years. The consultants canvassed traditional and emerging companies to understand the viability of these technologies, their costs, and where they are being considered.

On June 2, 2004, with the signing of SB2474 SD3 HD2 (Act 95, Session Laws of Hawaii 2004), Hawaii's existing renewable portfolio standard (RPS) goal was replaced with an enforceable standard.

Under Hawaii's original RPS goal, which was established by Act 272, SLH 2001, electricity generated from renewable resources is supposed to be 8% of net electricity sales and increased to 10% of net electricity sales by December 31, 2010. The requirement increases to 15% by December 31, 2015; and 20% by December 31, 2020.

"Renewable energy" means electrical energy produced by wind; solar energy; hydropower; landfill gas; waste-to-energy; geothermal resources; ocean thermal energy conversion; wave energy; biomass, including municipal solid waste; and biofuels, or fuels derived from organic sources, hydrogen fuels derived from renewable energy, or fuel cells where the fuel is derived from renewable sources.



WasteTEC

As a key element in the ISWMP, the terminology “WasteTEC” was created by the Department and Division staff to reflect the SWRAC discussion regarding the waste-to-energy conversion technology concept recognizing that specific technology has not been selected. Processing the solid waste remaining after diversion in a WasteTEC facility would further reduce the amount to be landfilled by 60 to 80%. Depending on the specific WasteTEC used, the landfill capacity could be significantly extended. The consideration and determination of a specific technology will be made as the County proceeds with its feasibility studies and preliminary planning efforts through its procurement process prior to implementation. The use of the term “waste-to-energy” has deliberately not been used to avoid any impression that a particular technology has been selected or has preference. Any technology selected would be required to meet the County’s technical, legal and financial requirements.

As a background, the waste-to-energy industry in the United States represents \$14 billion of productive assets from a total of eighty-nine (89) WTE facilities. These U.S. facilities handle up to 15 percent of the country’s MSW. Both the geographically large continent of Europe and the relatively small country of Japan exceed these numbers as Table 10 below illustrates.

Table 10 – WTE Facilities by Location

Location	Number of Facilities	Amount of MSW Managed by WTE as a Percent of Total MSW Generated
USA	89	8-15% based on EPA & <i>BioCycle</i> data
Europe	400	Varies from country to country
Japan	100	70 to 80%
Other Nations (Taiwan, Singapore, China, etc.)	70	Varies from country to country

WTE facilities grew in numbers in the United States until 1994. Growth slowed and then stopped because federal tax incentives halted after 1986; landfill costs were low; and the 1994 U.S. Supreme Court decision *Carbone v. Clarkstown* apparently eliminated a jurisdictions’ ability to direct waste flow.

There has been a resurgence of interest in WTE recently because landfill costs are rising, oil and electricity costs are high, and the Supreme Court’s 2007 decision in the *Oneida-Herkimer* case that counties’ flow control ordinances do not discriminate against interstate commerce.

Commercial Processes

This section provides information regarding current mechanical processes that jurisdictions and private companies can implement to transform waste into a productive product:



1. *Mass-Burn/Waterwall Combustion:* MSW is placed directly into the system for incineration with no pre-processing, except for removal of large identifiable non-burnable items (refrigerators, washing machines, microwave ovens, etc.). Table 11 shows a recent breakdown of the ownership and operation of these facilities.

Table 11 – Ownership of U.S. Mass-Burn/Waterwall Facilities⁸

Entity	Owned	Operated
Public	39	12
Covanta	11	27
Montenay/Veolia	2	9
Wheelabrator	10	16
Other	3	1
Total	65	65

2. *Mass-Burn/Modular Combustion:* Unprocessed MSW is placed directly into a refractory lined chamber. The primary chamber of the incinerator includes a series of charging rams which push the burning waste from one level to another until it burns out to an ash and is discharged to a wet ash pit.
3. *Refuse-Derived Fuel/Dedicated Boiler:* Refuse-derived Fuel (RDF), in its simplest form, is shredded MSW with ferrous metals removed. Additional processing can be applied to the incoming waste stream, such as removal of glass and aluminum, or additional shredding stages can be placed in the processing line to match RDF particle size to firebox residence time.
4. *Refuse-Derived Fuel/Fluidized Bed:* MSW is shredded to less than four inches mean particle size (the same as with the RDF process described above) but is blown into a bed of sand in a vertical cylindrical furnace. Hot air is also injected into the bed from below, and the sand has the appearance of a bubbling fluid as the hot air agitates the sand particles. Moisture in the RDF is evaporated almost instantaneously upon entering the bed, and organics burn out both within the bed and in the freeboard, the volume above the bed. Steam tubes are embedded within the bed and a transverse section of boiler tubes captures heat from the flue gas exiting the furnace.

Emerging Waste Technologies

1. *Pyrolysis:* Organic waste (MSW) is heated without oxygen (or air), similar to the generation of coke from coal or charcoal from wood. Both a char and a gas are generated. The gas is burned out in a gaseous phase, requiring much less oxygen than incineration, and the char will usually melt at the temperatures within the pyrolysis chamber and will be discharged as a black gravel-like substance, termed frit. Advantages of this process are in the lack of air entering the chamber and the resulting smaller size of system components.

⁸ Integrated Waste Management Services Association, 2004 Directory of WTE Plants.



Without air, there is little nitrogen oxides generation and low particulate (soot) formation. There have been many attempts to develop this technology outside a laboratory or a pilot plant. In past demonstrations in the 1970s, it was difficult to maintain a sealed chamber to keep air out, and waste variability creates problems in maintaining consistent operation. When the pyrolysis gas is fired in a combustion chamber that is part of the system, the system is classified as an incinerator. Currently, there are no full-scale pyrolysis systems in commercial operation on MSW in the United States.

2. *Gasification*: Gasification is the heating of an organic waste (MSW) to produce a burnable gas (approximately 85% hydrogen and carbon monoxide mix) for use off-site. While pyrolysis systems are primarily focused on waste destruction, a gasifier is designed primarily to produce a usable gas. Thermoselect, a European firm represented in the U.S. by Interstate Waste Technologies of Malvern, Pennsylvania, has developed a system composed of 400 TPD modules processing MSW.
3. *Anaerobic Digestion*: Anaerobic Digestion (AD) has been used for a century to reduce and stabilize biosolids and produce combustible gas in wastewater treatment plants. The process uses waves of microorganisms to do the work. The first wave of microorganisms breaks down the materials in an acidic environment. This process is called hydrolysis. The second wave breaks down the output of the first wave by transforming the fatty acids, acetate, hydrogen, and CO₂. This second wave produces the methane biogas.

The use of MSW in AD systems has been slow in coming because the processes are more costly than landfilling. But over the past fifteen years, as the cost of landfilling MSW has increased in Europe, AD systems have increasingly become operational. For instance, when the European Union Landfill Directive demanded the stabilization of organic material, it added to the cost incentive and created a legislative fulcrum to advance AD MSW processing. In 1999, 53 AD plants processed about 1 million tons a year of mixed MSW or source separated organics. In 2006, the number of AD facilities increased to 124 and processed 4 million tons of mixed MSW.⁹

4. *Mixed Waste Composting*: Large scale mixed waste composting facilities are industrial plants which receive waste and grind the material in large shredders, removing inert materials by screening and other processes. The feed material is then moved to the composting vessel where the organic materials are digested by the micro-organisms. This process is controlled by computer. After initial processing the resulting compost product is stored to "cure" and is then ready to be sold. Using California post-recycling waste composition data¹⁰, it is estimated that aerobic composting would reduce the waste landfilled to 25 percent of the initial feed. There would be 43 percent recovered as compost and material products and 32 percent released to the atmosphere as gases (mainly CO₂ and water vapor).

There are several hundred mixed waste composting plants in Europe, both aerobic and anaerobic. The trend seems to be toward segregating bio-wastes

⁹ "Anaerobic Digestion Outlook for MSW Streams," BioCycle, August 2007, Vol. 48, No. 8, p. 51.

¹⁰ Statewide Waste Characterization Study, California Integrated Waste Management Board, December 1999.



and then composting to produce biogas. In the United States, composting is used primarily to process yard waste and sewage sludge, and there are thousands of successful projects. BioCycle reports¹¹ that there are 14 mixed solid waste composting facilities operating in the United States in 2006. These are generally small units processing less than 120 TPD, with two facilities processing 200 to 250 TPD. Large-scale plants have been built in Portland, OR; Baltimore, MD; Miami, FL; Atlanta, GA; and Pembroke Pines, FL, all of which failed for technical reasons, generally odor control or financial difficulties. A key problem has been that the quality of the product produced was lower than expected, which reduced the revenues and made the projects too costly and/or non-competitive with other available alternatives.

5. *Plasma Arc*: Plasma arc technology is the destruction of MSW using the intense heat generated by a plasma torch. It is a pyrolysis-related process where little or no oxygen is injected into a reactor. Electric current is passed through a series of torches at the bottom of a reactor, which heat a process gas to a temperature in excess of 5,000°F. This hot gas stream heats waste within the reactor to over 3,500°F and, as air is provided to the system at a low controlled rate, some of the waste will burn to help maintain reactor temperature. At this high temperature, organics within the waste will form elemental compounds such as hydrogen, oxygen and carbon and some of this carbon will convert to carbon monoxide or methane. The gas flow will have a high enough heat content to be able to sustain its own combustion and be used as a fuel gas external to the system.

Few, if any of the plasma arc pilot facilities have been able to generate a fuel gas (synthetic natural gas, or syngas), and air emissions have been found to be no better than conventional incineration systems.

6. *Chemical Decomposition*: Chemical decomposition, also referred to as depolymerization, is a process whereby waste is directly liquefied into useful chemical feedstocks, oils and/or gases. The oils are a replacement for fuel oil and the gases consist of carbon monoxide, hydrogen and methane. The process generally utilizes medium temperature and pressure to break large complex molecules into smaller ones. If higher temperatures are employed, chemical decomposition becomes indistinguishable from gasification.

Environmental Ramifications

Solid waste incinerators, which EPA refers to as Municipal Waste Combustors, are regulated under the federal Clean Air Act (CAA), originally passed by Congress in 1963 and updated in 1967, 1970, 1977, and 1990. EPA has promulgated a number of regulations under the CAA since 1990.

In 1995, amendments to the CAA were enacted to control the emissions of dioxins, as well as other toxins, such as mercury, hydrogen chloride, and particulate matter. This was done because in the early 1980s, dioxins were discovered in the exhaust of a WTE facility on Long Island, NY. This chemical, toxic to animals in even very small quantities, was a major concern. Other WTE plants were tested, as well as other types of facilities, and were found to be a major dioxin source.

¹¹ BioCycle Magazine, JG Press, Inc., November 2006.



With the implementation of the CAA requirements, dioxin emissions from WTE decreased significantly¹².

Mercury is another toxin that was found in WTE exhaust and was addressed in the CAA amendments. By modifications in the burning process and the use of activated carbon injection in the air pollution control system, dioxins and mercury, as well as hydrocarbons and other constituents, have effectively been removed from the gas stream.

Mercury emissions from WTE in 2005 have been reduced from 1990 levels by 91.2 percent.

Residue Disposal

Ash from WTE facilities contains some heavy metals but is regularly tested and passes the USEPA standards.

Recycling and WTE

In 2002, a survey of U.S. WTE facilities by the Integrated Waste Services Association took a look at the effect WTE facilities have had on local recycling efforts. "According to the U.S. Environmental Protection Agency," write the authors of this study, "the current municipal recycling rate in the U.S. is 28%. By comparison, 57% of the 98 WTE communities contacted for this investigation have a higher recycling rate.

SWRAC Recommendation

The SWRAC voted unanimously for the County to pursue the feasibility of commercial technology alternative resource management. This recommendation is specifically for the advancement of a Maui County feasibility study utilizing established data and best practices.

The intent of this recommendation is that the County reviews the alternative technologies by using the research that others, including Los Angeles County and City of Los Angeles, have recently amassed. By reviewing existing research the County would save time and money. The County and its contractor should review this new research and then undertake a feasibility study including projections for County costs and revenue.

Chapter 13 - Funding, Organization, and Alternative Scenarios

This chapter provides an overview of alternative methods available to fund the County's solid waste services including guidance on organizing the Division and options to consider for implementation in the future. Also, this chapter provides an overview of funding options for the County to choose from when implementing its ISWMP. It also provides an explanation of the concepts of Full Cost Accounting (FCA) used both in the analysis of the financial data and as a management tool. The types of financial material reviewed for the FCA evaluation of the Division are described.

¹² "Dioxins from WTE in the USA: 4,260 grams in 1990 to 12 in 2000," J. O'Brien, Comparison of Air Emissions from Waste-to-Energy Facilities to Fossil Fuel Power Plants, SWANA, 2005.



Several topics bear on the County's ISWMP as a whole and on its implementation:

1. *ISWMP Funding Options Overview* – different methods of paying for solid waste services are as follows:
 - Tipping Fees: charging for the disposal and processing of waste material;
 - Utility or Service Fee: Utility fees can be charged to all users of the solid waste system. They can be a simple division of the full cost of the system divided by the number of users and billed monthly, quarterly, semiannually or annually. The utility fee can be billed on a separate bill just for solid waste service, or it can be added to an existing bill for taxes, water, sewage or other utility;
 - Generator Assessments: Generation rates are determined for each class of generator based on local surveys or from an analysis of relevant studies;
 - Sticker Fees: Generators are required to purchase decals to dispose of waste. There are two types of sticker systems: (1) per bag or container, and (2) for a vehicle;
 - Improved Lot Assessments: Improved lot assessments are typically charged to the owner of an improved residential or commercial lot. They are usually applied as a flat fee in a special assessment on the annual property tax bill or as a special charge on a municipal utility bill, such as for water or sewer service. These assessments provide a predictable source of revenue and can be applied in addition to or in lieu of a tipping fee;
 - Impact Fees: scheduled charges applied to new residential and commercial development to finance infrastructure in high-growth areas. These fees provide revenue for the construction or expansion of facilities;
 - Franchise or Licensing Fees: In some jurisdictions, private haulers are granted exclusive or non-exclusive franchises to collect waste/recyclables in the community or unincorporated area of a county. The rate the hauler charges the customers can include a pre-set franchise fee determined as a percentage of service fees charged to its customers;
 - General Funds and Taxes: Traditionally, general funds and taxes, usually property taxes, are used to pay for services provided by local governments;
 - Bonding: General Obligation Bonds and Revenue Bonds are the most prevalent type of bonds utilized by jurisdictions. The bonds from a jurisdiction are rated and the rating impacts interest rates. Jurisdictions with a history of financial problems will have a lower rating for their bonds and, hence, a higher interest rate; and
 - Jurisdictions can also issue bonds to finance specific revenue-producing projects, and the repayment of such bonds is financed by the revenue generated by the project and not by the taxing power of the jurisdiction. These are known as revenue bonds.



2. *Facility Procurement*: The ISWMP includes a recommendation for the construction of facilities. There are several strategies for the County to consider in proceeding with construction:
 - Architect and Engineering (A&E) consultant is hired by the County for all planned facilities to streamline construction activities;
 - Turnkey: procure for design and construction so that the facility is ready for an operator to enter and begin working; and
 - Full Service: a design, build, and operate contract whereby the vendor is responsible for all aspects of the development and operation of the facility.
3. *Public-Private Partnerships* – method of contracting and operating facilities and services, and distributing associated risks. In the solid waste industry, as in other industries, individuals and companies accept risk when they feel that there is an adequate reward. When the reward is too low, the individual or company will go out of business. In other words, the jurisdiction would have to pay its private partner to take any risk involved in a service or facility. Therefore, the jurisdiction will need to evaluate each potential public-private partnership to determine which risks and rewards it wants to accept and which it believes are best assigned to the private partner.

Analysis of Current Costs

The USEPA recommends FCA for solid waste management as a best practice. The goal of FCA is to capture all costs and revenues associated with providing solid waste services.

The consultants reviewed revenues and expenditures for the Division for FY 2006. An expense/revenue model was created where each is allocated to the selected activities that generated them. This high-level view does not include revenue to the Division from the County's General Fund. The result is a \$5.8-million-dollar shortfall in revenue in FY2006 as shown in Table 12. In the scenarios evaluating the County's alternatives, this format without the General Fund contribution will be used. It identifies the Division shortfall and makes no assumptions about which funding approach, discussed in Chapter 13, Section 1, will be used.



Table 12 - Full Cost for FY 2006 without General Fund Revenue

FCA FY 2005-06 Without General Fund Revenue	Collection	Diversion	Disposal	Total
Expense	\$4,962,290	\$5,454,904	\$8,407,707	\$18,824,901
Revenue	\$3,354,457	\$2,858,279	\$6,766,345	\$12,979,081
General Fund Contribution	\$0	\$0	\$0	\$0
Excess/ (Shortage)	(\$1,607,832)	(\$2,596,625)	(\$1,641,363)	(\$5,845,820)
Number of Employees	49.2	4.4	31.4	85
Number of Accounts	24,106	NA	NA	24,106
Number of Tons	\$47,685	101,342	201,889	303,231
Expense per Ton	\$104	\$54	\$42	\$62
Excess/(Shortage) per Ton	(\$34)	(\$26)	(\$8)	(\$19)

Alternative Solid Waste Management Scenarios

Alternative solid waste management scenarios for the County are examined for their cost and revenue impact over a 20-year-plus planning period. The SWRAC advised the Division staff on these scenarios at its October 18, 2007 meeting. The five scenarios discussed in this chapter are:

Scenario I - Maintains the existing solid waste operation and infrastructure and extends it out to 2042

Scenario II - Increase Recycling to 60 Percent

Scenario III - Increase Recycling to 60 Percent plus WasteTEC

Scenario IV - Increase Recycling Diversion to 60 Percent with Alternative Conversion Technology and place Lanai and Molokai Landfills on "Standby with Permit"

Scenario V – Increase Recycling Diversion to 75 Percent without WasteTEC and place Hana, Lanai, and Molokai Landfills on "Standby with Permit"

Table 13 provides a comparison matrix of these five scenarios.



Table 13 – Scenario Comparison Matrix

Note: All scenarios components are based on the assumption that it will be reviewed by stakeholders and will need to take legal, financial and union considerations into account prior implementation.

Activity	Scenario I Status Quo	Scenario II Improved Recycling at 60%	Scenario III Improved Recycling at 60%With WasteTEC*	Scenario IV Improved Recycling at 60% With Gasification	Scenario V Most Recycling at 75%
Diversion Rate In 2042	28%	60%	83%	73%	75%
Residential Collection	Voluntary, some automated, some manual, no recycling collection	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation	Universal, all residences on County standard streets: Refuse, Recycling, Green Waste and Bulk Max Automation
Trash Collection	Continue providing a mixture of once a week and twice a week collection using a combination of automated and manual trucks	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands & Hana	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands and Hana	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands and Hana	Eliminate twice a week collection of residential trash; eliminate manual collection; collect with automated or semi automated on all islands and Hana
White Good Collection: Operational 2009	Yes, only on Island of Maui excluding Hana; by appointment but work is not tracked	Yes, on all islands and Hana; work goes through call center and is tracked	Yes, on all islands and Hana; work goes through call center and is tracked	Yes, on all islands and Hana; work goes through call center and is tracked	Yes, on all islands and Hana; work goes through call center and is tracked
Estimated Collection Accounts in 2015	27,000	44,000	44,000	44,000	44,000
Land Disposal	4 active landfills: <ul style="list-style-type: none"> • CML • Hana • Lanai • Molokai 	3 active landfills: <ul style="list-style-type: none"> • CML • Lanai • Molokai Hana on standby	3 active landfills: <ul style="list-style-type: none"> • CML • Lanai • Molokai Evaluate Lanai & Molokai for standby status Hana on standby Residue from WasteTEC land filled at CML	Landfill: Only CML active (Hana, Molokai, and Lanai landfills on standby with permit) Residue from gasification landfilled at CML	Landfill: Only CML active (Hana, Molokai, and Lanai landfills on standby with permit)
Year CML Closes	2024	2031	2042	2035	2035



Activity	Scenario I Status Quo	Scenario II Improved Recycling at 60%	Scenario III Improved Recycling at 60% With WasteTEC*	Scenario IV Improved Recycling at 60% With Gasification	Scenario V Most Recycling at 75%
Alternative Disposal	None	None	Waste to Energy County sponsored 360 tons per day; Operational in 2014 Capital Cost - \$86M Operations - \$133 per ton; net revenue \$54 per ton Design, build, operate	Alternative Tech. 200 tons per day; Operational in 2014 Capital Cost - \$53M Operations - \$167 per ton; net revenue \$72 per ton Design, build, operate	None
Other Waste Management Facilities	Olowalu Convenience Center	Olowalu converted to transfer station Hana convenience center	Olowalu converted to transfer station Hana convenience center	Olowalu converted to transfer station Hana, Lanai and Molokai convenience centers	Olowalu converted to transfer station Hana, Lanai and Molokai convenience centers
Recyclable Materials Processing	Reliance on private sector facilities	County sponsored MRF; 205 tons per day; Operational in 2012 Capital Cost - \$18M Operations - \$75 per ton; net revenue \$50 per ton Design, build, operate contract assumed	County sponsored MRF; 205 tons per day; Operational in 2012 Capital Cost - \$18M Operations - \$75 per ton; net revenue \$50 per ton Design, build, operate contract assumed Evaluate need for more land to process increased green waste collection Lanai & Molokai: Expand collection & processing	County sponsored MRF; 205 tons per day; Operational in 2012 Capital Cost - \$18M Operations - \$75 per ton; net revenue \$50 per ton Design, build, operate contract assumed	County sponsored MRF; 309 tons per day; Operational in 2012 Capital Cost - \$24M Operations - \$70 per ton; net revenue \$45 per ton Design, build, operate contract assumed
C&D Processing and Disposal	C&D disposed in private landfill until filled in 2012 After 2012 C&D goes to CML Some private recycling	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - \$8.7M Operations - \$66 per ton; net revenue \$24 per ton; Design, build, operate	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - \$8.7M Operations - \$66 per ton; net revenue \$24 per ton Design, build, operate	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - \$8.7M Operations - \$66 per ton; net revenue \$24 per ton Design, build, operate	County sponsored MRF; 170 tons per day; Operational in 2012 Capital Cost - \$9.8M Operations - \$69 per ton; net revenue \$24 per ton Design, build, operate



Activity	Scenario I Status Quo	Scenario II Improved Recycling at 60%	Scenario III Improved Recycling at 60% With WasteTEC*	Scenario IV Improved Recycling at 60% With Gasification	Scenario V Most Recycling at 75%
Dedicated Ash Cell at the CML	No	No	Yes	Yes	No
Hana Landfill On Standby: permit active but no active MSW burial	No: Hana Landfill continues operating with a finite source of dirt cover and only 4 TPD coming through its gates	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW are transported to CML for disposal	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW are transported to CML for disposal	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW are transported to CML for disposal	Yes: A convenience center is built at Hana Landfill and the 4 tons of MSW are transported to CML for disposal
Molokai & Lanai Landfills On Standby: permit active but no active MSW burial	No: both landfills remain open and active	No: both landfills remain open and active	Evaluate each landfill remaining open and active OR putting on standby, therefore processing MSW for shipment to markets or disposal points	Yes: material is processed/separated to a greater degree than is currently; material is compacted into overseas containers and shipped to disposal points	Yes: material is processed/separated to a greater degree than is currently; material is compacted into overseas containers and shipped to disposal points
Solid Waste Division Base Facilities	Scattered and some hosted by DPW Highways Division	Centrally Located Division Campus Maintenance Shop, Base Yard, MRF, C&D, HHW facility, and Adm. 15 Acres, 7,600 sq. ft of office space	Centrally Located Division Campus Maintenance Shop, Base Yard, MRF, C&D, HHW facility, Composting and Admin. 15 Acres, 7,600 sq. ft of office space	Centrally Located Division Campus Maintenance Shop, Base Yard, MRF, C&D, HHW facility, and Adm. 15 Acres, 7,600 sq. ft of office space	Centrally Located Division Campus Facilities at Convenience Centers Lanai & Molokai 15 Acres, 7,600 sq. ft of office space
Household Hazardous Waste	County collects used oil & batteries	Staffed HHW facility at Division Campus	Staffed HHW facility at Division Campus Lanai & Molokai: HHW event-based	Staffed HHW facility at Division Campus	Staffed HHW facility at Division Campus and Lanai and Molokai Convenience Centers
Customer Call Center: operational 2009	No: Division continues to have 7 numbers for services, no tracking of work, and no reporting capabilities	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.	Yes: call center with one number to handle all request for services and information; work orders are opened and closed with activities being tracked.
Generates Electricity: sell to MECO	No	No	Yes	Yes	No



Activity	Scenario I Status Quo	Scenario II Improved Recycling at 60%	Scenario III Improved Recycling at 60%With WasteTEC*	Scenario IV Improved Recycling at 60% With Gasification	Scenario V Most Recycling at 75%
Policy Level	No new ordinances	New Ordinances Universal recycling: 2012; C&D 50% requirement: 2013; Commercial recycling mandate: 2013	New Ordinances Universal recycling: 2012; C&D 50% requirement completed by: 2013; Commercial recycling mandate with enforcement, completed by: 2013	New Ordinances Universal recycling: 2012; C&D 50% requirement: 2013; Commercial recycling mandate: 2013	New Ordinances Universal recycling: 2012; More enforcement C&D 70% requirement: 2013; Commercial recycling mandate with bans and enforcement
Materials Reuse	Private and non-profit facilities, some County grants	Private and non-profit facilities, some County grants, increased support	Private and non-profit facilities, some County grants, increased support	Private and non-profit facilities, some County grants, increased support	Private and non-profit facilities, some County grants, Add County facility
Commercial Food Waste	Privately done but use of grant monies and ordinances to assist	County Assistance, privately done but use of grant monies and ordinances to assist	County Mandated w/enforcement Privately done but use of grant monies and ordinances or mandates to assist	County Assistance Privately done but use of grant monies and ordinances to assist	County Mandated Privately done but use of grant monies and ordinances for enforcement
Average Annual Division Budget 2006-2042	\$50 million	\$80 million	\$109 million	\$103 million	\$91 million
Cumulative Capital Needed	\$76 Million	\$104 Million	\$200 Million	\$162 Million	\$123 Million

*Because the acronym "WTE" is frequently assumed to mean specifically or only mass burn WTE technology, the DEM coined the term "WasteTEC" to be broadly interpreted as various waste-to-energy conversion technologies that might be considered appropriate for the County of Maui.



Chapter 14 – Implementation/ Recommendation

During the investigations and corresponding discussions between SWRAC and Division staff, four concepts became evident:

1. Current landfill capacity is finite. Table 14 below lists each landfill and the projected year capacity will be reached. The large majority of municipal solid waste goes to the CML. In less than two decades, capacity at CML will be depleted.

Table 14 – MSW Landfills Owned by County

Location	Projected Year Capacity is Reached
Central Maui Landfill	2026
Hana Landfill	2096
Molokai Landfill	2015
Lanai Landfill	2020

2. As shown in Table 15, the County's diversion rate has remained steady in the 30 percent range for the past few years and is non-compliant with the State's goal of 50 percent diversion by 2000. If the County wishes to prolong the life of its existing landfill, it will have to implement programs that divert more materials.

Table 15 - Diversion Rate

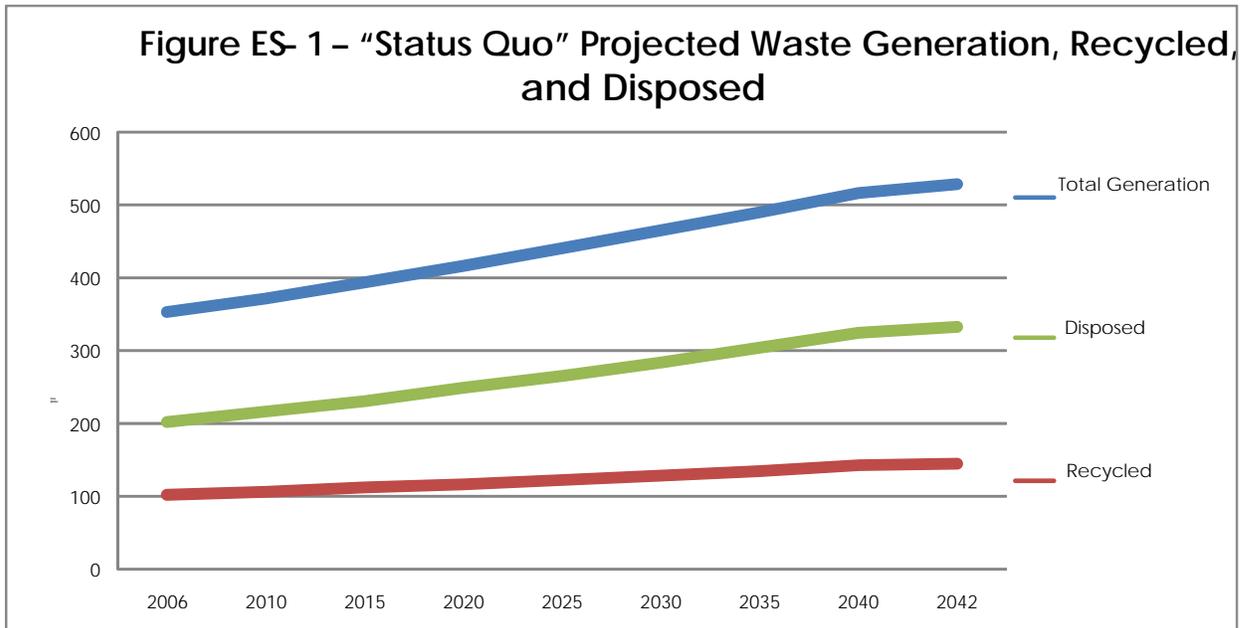
2001	2002	2003	2004	2005	2006 (Base Year)
33.2%	26.9%	34.3%	31.8%	30.8%	30.6%

3. Energy is expensive. Fuel costs for electricity in Hawaii and on Maui are the highest in the United States. These costs will continue to rise as the world price of oil increases. The cost of energy in Hawaii and on Maui is generally related to Number 2 fuel oil costs. Maui Electric (MECO) uses this fuel in its two diesel engine generation facilities on the Island of Maui. In 2007, MECO paid about \$2.85 per gallon of Number 2 fuel without road use taxes. The average retail cost of electricity in Hawaii in 2006 was \$0.2072 per KWh.
4. Waste generation will continue to increase with the growth in population and businesses in the County. Maui is one of the most popular vacation destinations in the world. It is a constant challenge to educate visitors to



reduce, reuse, and recycle when visiting Maui. The influx of tourists means more tons generated than would normally be expected with a population the size of the County's. Figure 2 shows the projected increase in the amount of waste generated, recycled, and disposed under Scenario I, which maintains the current level or "status quo". As shown, the quantity disposed is projected to increase from 303,231 tons in 2006 to 527,564 tons in 2042. Recycling tonnage is also projected to increase.

**Figure 2 – Status Quo Projected Waste
Generated, Recycled, and Disposed**



Taking into account these four issues, the SWRAC and Division staff developed five alternative scenarios to manage the County's municipal solid waste as presented in Chapter 13. Scenario I maintains the status quo. Scenarios II through V all include the following elements:

- Increase the diversion rate;
- Provide for single-stream curbside recycling;
- Develop a MRF to process the recyclable items collected by the County and the commercial haulers from residential customers;
- Develop a MRF to process the C&D waste since the private C&D landfill is expected to reach capacity by the year 2013;
- Implement, where appropriate, a landfill gas collection system and generate electricity from it;
- Provide consistent residential curbside collection of white goods and bulky waste;



-
- Collect HHW on a consistent basis;
 - Continue to support diversion grants;
 - Increase environmental education;
 - Develop the Olowalu convenience center into a transfer facility;
 - Develop a convenience/recycling center in the Hana Region;
 - Create efficiencies within the Division by consolidating certain base yards and developing a centrally located solid waste campus;
 - Address changes in ordinances for MSW and recyclable curbside collection and C&D recycling;
 - Initiate C&D debris recycling programs; and
 - Implement a customer call center with one number for all of the Division's services.

The alternative scenarios differed in ways that eventually lead the SWRAC and Division staff to recommend Scenario III. In Scenario V, for instance, the County would implement mandates for recycling 75 percent and limits on what the commercial sector could place into the waste stream. Although SWRAC and Division staff believed this measure to be a feasible goal, it was recognized that an initial goal of 60% would be more attainable.

Scenario IV sets forth the alternative process gasification which converts MSW to electricity and could be a revenue producer. Although the technology of gasification has been known for decades, its commercial (large scale) application to the processing of MSW is neither well proven nor offered commercially by established contractors. Because of the unknown ramifications of implementing an experimental process, this scenario was not selected by SWRAC and Division staff.

Scenario II and III were developed to reach a 60 percent diversion rate. The scenarios differ in the disposal method of the tonnage not diverted to reuse or recycling. In Scenario II the remaining 40 percent not recyclable is disposed of by landfilling. In Scenario III, this 40 percent generates electricity. The finite life of the County's landfills and the rising energy costs that Maui is currently experiencing led SWRAC and the Division's staff to eliminate Scenario II from consideration.

To better understand the financial impacts of each alternative, the consultants prepared a full cost review of the Division's fiscal year 2006 expenses and revenues as the basis for projecting the expenses and revenues of each alternative. The details were presented to SWRAC and Division staff. SWRAC deliberated on these alternatives and recommended to staff that Scenario III be pursued. Additionally, SWRAC added the following clarifications to its recommendation of Scenario III: the primary focus of the ISWMP is the goal of 60% diversion and, secondarily, WasteTEC. The ISWMP should not specify a single WasteTEC because the SWRAC recognized that further evaluation was needed to determine the right technology for the County.



The Department and the Division support the SWRAC recommendations for implementation with the addition of the following elements:

- Evaluate land needed for increased compost operations resulting from improved diversion programs;
- Evaluate standby options for Lanai and Molokai landfills while maintaining and improving recycling collection and processing, including HHW collection;
- Specify the year 2013 to complete legislation for commercial recycling mandates;
- Add from Scenario V the creation of mandates for the recycling of commercially produced food waste;
- Add from Scenario V the enforcement component for commercial recycling mandates

Table 16 highlights the current waste management system with the proposed scenario for implementation. The new system diverts more, provides more services to customers, prolongs landfill capacity, and generates electricity from trash that would otherwise be landfilled.

Table 16 – Current/New System Highlights

Topic	Current	Scenario III
Diversion Rate	30%	60%
Curbside Customers	27,000	44,000
Curbside Recycling	No	Yes
Curbside Bulk Item	No	Yes
Curbside White Good	Partial	All
Household Hazardous Waste Collection	Partial	Yes
Materials Recovery Facility (MRF)	No	Yes
Construction and Demolition MRF	No	Yes
Active Landfills	4	3
Curbside Pilot Yard Waste	No	Yes
Generating Electricity from Garbage	No	Yes
Central Maui Landfill Closes	2026	2042
Average Annual Division Budget 2006 – 2042	\$50 million	\$109 million
Cumulative Capital Needed	\$76 million	\$200 million



Scenario III was recommended by the SWRAC from among five Scenarios created during the course of SWRAC meetings. This ISWMP sets forth the recommendation to increase the County's diversion rate from its current 30 percent to 60 percent by constructing: MRFs for recycling and C&D materials, a fleet maintenance facility, a HHW facility, and transfer stations in Hana and Olowalu. In this ISWMP, the Division is to implement programs for universal collection of single-stream recyclables, bulky waste, white goods, and yard waste; a HHW program; and education to support each program. In addition, in the ISWMP is a recommendation for the County to undertake a feasibility study to consider a WasteTEC facility which would convert the non-recyclable materials and the residue from recycling into energy. The County will proceed with preliminary feasibility and planning evaluations for a WasteTEC facility through its procurement process whereby the County considers various technologies.

In Scenario III, facilities needed to support the Division's activities to reach its diversion goal are identified. In Chapter 13, it is suggested that, for efficient use of land and reduction of transportation and communication links, grouping the facilities should be part of the ISWMP. A solid waste campus, which would be centrally located, was recommended. Because implementation of Scenario III includes site studies and land purchase, no specific site was recommended.

CONCLUSION

The ISWMP sets forth timelines for implementation, the content of which is to provide a general sense of the time involved in the implementation of recommendations. Prior to implementation of recommendations contained in this ISWMP legal, financial and union considerations will need to be taken into account.

As an important part of maintaining the long-term environmental and public health of the community, the ISWMP is a dynamic document intended as a guide to provide better services to the people in the County in accordance with the State's and County's diversion goals.