required that immediate action be taken in order to meet the stated target and Consent Decree mandated dates. Since some of these dates have been exceeded, new later dates have been requested for US EPA approval in 2006.

2.4.2 Implement an Ongoing, Comprehensive SWM Data Collection, Analysis and Planning Process As Soon As Possible (Short-Range)

The planning process for solid waste management is dependent on the collection and analysis of data. Facilities and systems that handle solid waste can vary greatly in capacity and effectiveness. The use of improperly sized equipment or systems or poorly planned facilities will only serve to greatly magnify problems associated with the handling and disposal of solid waste. Guam is in critical need of actual data on solid waste generation, collection, storage, diversion, and disposal in order to practice active solid waste management. For these reasons, the implementation of this objective requires short-range execution through the effective and full compliance with permits and operational plans and procedures for all critical facilities, especially those operated by DPW pending privatization. The Consent Decree requires interim or continuing operational permits for this very reason, reinforcing the objectives contained in the 2000 ISWMP.

2.4.3 Establish Guam-wide Solid Waste Management Operations, inclusive of the Military's Collection, Storage, Processing and Disposal Operations by October 1, 2008 (Short-Range)

In order for the solid waste management system to be truly integrated, it should include the consolidation of all solid waste operations on Guam, both civilian and military. The locations of military facilities on Guam with respect to existing Government of Guam solid waste facilities lend themselves to assimilation into an integrated system, providing convenient service points in the northern and southern areas. The 2006-2008 time frame is ideal for consolidation because of the anticipated growth in recycling, the requirement that the permit for Andersen Landfill end in 2008 and the pending commitments for military expansion planning in partnership with Government of Guam. Subsequent sections will detail the plan of implementation for this element of the 2006 ISWMP.

CHAPTER 3: MANAGEMENT OF SOLID WASTE OPERATIONS AND THE FORMATION OF A PUBLIC UTILITY: THE GUAM SOLID WASTE AUTHORITY

This Plan update calls for the transfer of DPW's solid waste duties to a newly formed public utility, the Guam Solid Waste Authority (GSWA or Authority). It reviews the history of Guam EPA's 1999 adoption of a public utility, the 2006 recommendation for the Authority in the Public Utilities Commission's (PUC) Focused Audit Report and Recommendations ("PUC Audit Report" and Appendix B), and DPW's financial and program management. It concludes that the GSWA, with a general manager and a chief financial officer, is the only viable management entity by which Guam can achieve effective solid waste operations.

3.1 Background: 1998-2000

In 1999, after several public meetings, the Guam EPA Board of Directors adopted an Integrated Solid Waste Management Plan (1999 Plan). The 1999 Plan included as Chapter Five "Management Options Analysis," which began with this statement:

> The deteriorating effectiveness of the DPW-operated public solid waste collection and disposal systems, coupled with the [outsourcing and tipping fee] mandates of PL 24-272 demand ... a radical change ... to the existing organizational and functional structure [of DPW's solid waste responsibilities]. This [radical change] must be the first step in assuring the efficient and effective implementation of the solid waste management strategy adopted in this plan.

It identified five organizational responsibilities for successful implementation of Guam laws and the ISWMP:

1. **Tipping Fee Management**: Implement and manage the collection, accounting, budgeting and expenditures of the solid waste tipping fees;
1. **Debt Management**: Pursue the financing for capital improvements, operation and maintenance of solid waste facilities;
2. **Outsource Operations**: Contract all solid waste operations as mandated by PL 24-272 (and privatize the new landfill through a finance/design/build/lease agreement as mandated by PL 24-06);
3. **Contract Administration**: Effectively manage contracts with private companies for collection, transfer stations and disposal; and

4. **Environmental Compliance**: Ensure that operations during transition to outsourcing and contractors meet environmental and health laws.

The 1999 Plan reviewed environmental, economic, political and social challenges to implementing the laws and the ISWMP, and compared advantages and disadvantages of: (1) a public utility, the "Solid Waste Management Authority," (2) a "Solid Waste Agency," similar in organization to the former Public Utility Agency of Guam; or (3) DPW management. The 1999 Plan adopted the public utility as the organizational option, and listed the advantages of it to include:

1. **Long-Term Debt**: An autonomous public utility would have greater success in borrowing money because the tipping fee revenues would not be subject to transfer by elected or appointed officials;
2. **Regulation by the Public Utilities Commission**: PUC would regulate both the cost of service and standard of service;
3. **Focused Mission**: The public utility would be focused on service to rate payers and not be distracted by other DPW responsibilities;
4. **Privatization**: The utility would not be limited to service contracts, but could enter into agreements for franchises, concessions, joint ventures, etc.; and
5. **Stability**: Policy and operational decisions would be de-politicized.

It also included draft legislation. On December 12, 2000, the Legislature disapproved of the public utility, and removed the Chapter from the final 2000 ISWMP. Public Law 25-275 adopting the 2000 ISWMP stated:

> The Plan calls for the creation of a separate government agency to deal with waste management, a function which is adequately performed by the Department of Public Works and *I Liheslaturan Guahan* believes the creation of such an agency would result in unnecessary expense and duplication of effort within the Executive Branch of government.

Consequently, implementation of the ISWMP has been through continued management by DPW. DPW management has been without the benefits of an experienced general manager and chief financial officer, and without autonomous control of revenues, expenses, and financing.

3.2 DPW Fiscal Management of Solid Waste Operations

Between 1999 and late 2005, Guam achieved only a few small steps towards effective fiscal management to support solid waste capital improvements, operations, and environmental compliance. These small steps were driven by (1) U.S. EPA, through the Ordot Consent Decree, and (2) the PUC. The Ordot

Consent Decree mandated DPW to prepare and implement a financial plan. The Consent Decree Financial Plan was required to include funding sources and a schedule to secure funds for the design, construction, and operating costs for Ordot Dump closure and landfill development. It also set a schedule that propelled DPW into the PUC rulemaking process. That process resulted in a cost of service analysis (PUC Rate Report), which the PUC's consultant completed in September 2005. The findings and recommendations of these two reports are incorporated into the following review of DPW's management of the tipping fee system, financing and debt, contract administration, rate making, and environmental compliance.

3.2.1 Tipping and User Fee Management

a. Fee Management 1999 -2005

Although DPW had authority to assess commercial tipping fees starting in 1994 with PL 22-115, it never did so. The first tipping fees were initial commercial and residential rates established in 1998 by PL 24-139. They went into effect on January 1, 1999, the month after the Guam Legislature approved the tipping fee regulations. The regulations require monthly billing and payment within 60 days.

In 1999 irregularities in the law emerged. The commercial haulers complained that their costs of complying were excessive, as they believed that the law required them to convert their billing systems from being based on volume to being based on weight. The village Mayors claimed lack of funds to pay the commercial tipping fees. Also, there was no charge for residential customers who did self-drops at the transfer stations and the Ordot Dump. By the end of 1999, the Guam Legislature had passed two more laws. In PL 25-70, it changed the commercial tipping fee to be volume-based. In PL 25-93, it created: (1) a self-drop fee, (2) a one-year fee exemption for mayors when performing official duties, (3) a "good citizen" exemption for volunteer litter collection events, and (4) authority for the Governor to suspend fees for up to 60 days following a *force majeure.*

In 2000, DPW fell significantly behind in billing customers. In 2001, it met with public resistance when it billed customers for up to fourteen months of prior service. Customers claimed a credit for payments made but not billed, and for DPW's lack of consistent residential pick-up services. Consequently, the Guam Legislature passed PL 26-17 in May 2001. This law (1) limited collection of arrearages between February 2000 and March 2001 to seven months, (2) required DPW to prorate the arrearages into 12 equal payments, and (3) suspended future after-the-fact billing, or "backbilling," for residential service until the reconciliation and prorating had been completed. Further, for residential services after June 2001, the law limited DPW's ability to backbill to no more than four months. Also in 2001, the fiscal year 2002 budget law, PL 26-35, made permanent the Mayors' tipping fee exemption when performing official duties.

DPW's collection of fees continued to be inconsistent. At some point, the Department of Administration (DOA) began administering the billing and collection of the residential fees in addition to the commercial fees. In 2004, the Consent Decree Financial Plan found an anticipated shortfall of $ 2.2 million in uncollected fees. This finding prompted DPW and DOA to take corrective action. Also by 2004, the billing system needed an overhaul because it had not been purged of inactive accounts.

In September 2005, the PUC Rate Report found that having both DPW and DOA involved in billing and collection was inefficient and would not give much comfort to investors in the bond offering for capital improvements. It also found that DPW had not fully reviewed and purged the customer database of inactive accounts. It recommended that the 2006 management audit evaluate outsourcing billing and fee collection activities.

b. Fee Management 2006.

In August of 2006, the Audit Report found that billing and collection system needed significant improvements to operate fully and fairly. For example, it found that DPW's customer list was incomplete and outdated, that DPW was serving a number of residences that had not paid or were using the mayors for free solid waste collection and free disposal, and that the commercial haulers often did not pay the tipping fees for more than 300 days after disposal. It found that the 2006 practice of revenue collection being dividing between DOA, the Treasure of Guam and DPW was awkward and ineffective. It also found that DPW's poor rate collecting residential fees was impacted by poor solid waste collection services.

The Audit Report recommended the immediate transfer of DPW solid waste operations to a public corporation, the GSWA, under the Combined Commission on Utilities ("CCU"). It also recommended that DPW implement a pre-paid solid waste user and tipping fee system by the end of 2006. The prepaid system would use a combination of prepaid stickers for residential containers and bags for self hauls and extra (*e.g.*, holiday, moving) garbage. The prepaid system would eliminate the back billing problems and increase the cash flow needed for servicing the long-term debt.

The Audit Report contains 24 recommendations, and divides them into legislative, regulatory, and operational actions. DPW has made some progress in implementing the operational changes. By September 10, 2006, it had added staff with financial experience, and had advertised for a contracted Chief Financial Officer. The PUC will conduct a workshop with DPW on September 18, 2006, and the outcome of it appears to schedule for implementing the Audit Report recommendations. The Guam EPA agrees with the PUC's recommendations and adopts them as part of this Plan.

Recommendation: Solid waste operations and the GSWA should retain a general manager and a chief financial officer as soon as possible and expeditiously implement the Audit Report recommendations.

3.2.2 Debt Management

The tipping fees were to provide an income source to help pay for the capital improvements needed to close the Ordot Dump and open the landfill. However, it was clear that significant financing would be needed for these and other facilities in composting, recycling, household hazardous wastes, and for transfer stations.

Between December 2000 and 2005, DPW made little progress on financing any facilities. The PUC Rate Report found no reserve account within the Solid Waste Operations Fund. Between 1999 and 2005, when tipping fees had exceeded expenses, the funds were used for other purposes without long-range financial guidelines. It found that significant increases in the tipping fees would be needed to cover the debt service of the bonds or other loans needed to close Ordot and build the landfill. It recommended phasing in tipping fee increases over time. Further, DPW agreed to a PUC requirement that revenues from the rate increase would be held in reserve for Consent Decree tasks.

The Consent Decree Financial Plan provided the first small steps of financial management needed just to support the financing of closure of the Ordot Dump and the construction of the Layon Landfill. It found, however, that tipping fee revenues barely covered operating expenses (truck and equipment purchase, rental and maintenance, salaries and benefits for DPW employees who collected garbage, operated the transfer stations and dump, did billing, etc.). It established a strategy and a schedule for financing Ordot closure and landfill construction. The financing strategy for construction of Ordot closure was revenue-based, private activity bonds, including using any available federal grants and loans to reduce the amount of the bond financing. For the landfill, the strategy was private financing through a design/build/operate/transfer agreement.

The Consent Decree Financial Plan included an implementation schedule. The U.S. EPA's oversight of the Consent Decree prompted DPW into implementing the Consent Decree Financial Plan, and DPW's implementation has been partially successful. However, in February 2005, with a new politically appointed Director, DPW changed course. It abandoned the Financial Plan's schedule for landfill financing to pursue either revenue-based bonds or an asset sale. This change increased the amount of bond debt and the schedule for the Ordot construction bonds. Hence, the bond issuance was not completed before the April 21, 2006 Consent Decree deadline to award the closure construction contract. The government of Guam has been out of compliance since then.

The 2006 Audit Report concluded that the current billing and collection practices and the inefficient accounting procedures jeopardize the ability of the Solid Waste Division to obtain a favorable bond rating. It recommend (1) the formation of the GSWA,(2) for PUC establish by order appropriate collection standards, and (3) the prepaid solid waste fee, which would eliminate the back billing problems and increase the cash flow needed for servicing the long term debt.

Recommendation: Solid waste operations and the GSWA should retain a general manager and a chief financial officer as soon as possible and expeditiously implement the Audit Report recommendations.

3.2.3 Contract Administration

Public Law 17-87 (1985) had authorized DPW to contract out solid waste collection and disposal. By 2002, DPW had not contracted out any solid waste collection services. In June 2002, the Guam Legislature passed PL 26-99, which directed DPW to divide the residential collection system into three geographical districts and then to contract out the collection of two of the three districts within 4 months, by October 2002. It did not.

Customer complaints of inconsistent waste collection services continue to present billing disputes. Hence, the PUC Rate Report recommended that the focused management audit evaluate whether to outsource all of the collection services. The Audit Report found that DPW's poor rate collecting residential fees was impacted by poor solid waste collection services, which result from poor maintenance of 14 potentially operational trucks, and that on average only 5 to 7 of the trucks were in operation at any given time. It recommended that DPW contract out all solid waste collection services by January 2007 in compliance with Public Law 26-99 and through new legislation.

Administration of contracts for design, construction, and operations of solid waste facilities requires qualified staff with solid waste contracting experience. In May 2004, Governor Camacho received $309,000 from the U.S. Department of Interior to fund and train three engineers through September 2007 so that DPW would have qualified staff to administer the contracts and oversee the design and construction.

The Consent Decree Financial Plan included staffing with an Engineer Supervisor, an Engineer III, and an Engineer II. However, DPW has never hired the engineering supervisor. It hired two engineers on limited-term appointments, but not in the Solid Waste Management Division. One of the engineers left in August 2005 and has not been replaced; the other has limited work experience.

Instead, DPW has assigned other engineers and non-engineers to work part-time on the Consent Decree tasks. The result has been less than ideal for the island's solid waste management, for other DPW projects, and for Guam EPA. DPW has not provided the staff with professional landfill training. Staff participation has been fragmented between the solid waste tasks and other DPW duties, resulting in tasks being delayed and issues taking longer to resolve. To help make up for the shortfall, Guam EPA has invested an inordinate amount of staff effort addressing issues relating to engineering design, contractor performance, the operations plan in the permit application, public information, proposed legislation, and a lawsuit.

In 2004, Guam EPA and U.S. EPA recommended that DPW retain a solid waste expert to assist it in implementing the Consent Decree tasks, including contract management. After a few inquiries, DPW declined because the costs would exceed $200,000. In May 2005, during discussions of selling solid waste operations to a private entity(ies), U.S. EPA renewed its recommendation that DPW hire a solid waste expert.

Instead, DPW proceeded to contract out for a procurement advisor in early 2006. In June of 2006, USEPA informed the government that hiring of the technical advisor is essential to any resolution of the government's lack of Consent Decree compliance, which as of July 25, 2006 had exposed the government to $219,600 in stipulated penalties that are accruing at $5,000 per day. The GSA advertised for the advisor in July, but then withdrew the advertisement. DPW advertised for one in August 2006.

Because Guam EPA has experience in contracting household hazardous waste collection, Guam EPA will continue contract administration of this solid waste component until DPW staff is trained, with there being training of DPW staff in 2006 and 2007.

DPW is also responsible for contract administration of abandoned vehicle removal under Article III of the Solid Waste Management and Litter Control Act and recycling under Public Law 27-37 and Public Law 27-148. In 2005, DPW Division of Highways contracted for abandoned vehicle removal through a bid process. However, due to DPW's inexperience in solid waste contracting, DPW awarded a bid to a contractor who did not have a solid waste facility permit, and the 2006 contractor has experienced numerous environmental compliance problems.

In addition, in 1998, Public Law 24-246 required DPW to contract out to the highest bidder for a company to purchase recyclable paper from the public. DPW was also to subsidize the company $150,000 each year under two-year contracts with funds from the Solid Waste Operations Fund. DPW has never taken action on this requirement. Also, Public Law 24-272 created an Office of Recycling within the Solid Waste Management Division of DPW, with duties to establish recycling demonstration projects, and develop technical expertise in recycling operations. However, DPW has not created the office, in part because of lack of funds to carry out these duties. The Solid Waste Management Division needs permanent full-time employees that are trained in administration of solid waste contracts.

Recommendation: All of DPW's solid waste responsibilities, including the abandoned vehicle program, should be transferred to the GSWA as soon as possible and the GSWA should be required to have permanent full-time employees that are trained in administration of solid waste contracts.

3.2.4 PUC Rate Making

The initial tipping fee rates were to last until January 2001, after which the PUC would set rates based on a cost of service analysis and a focused management audit of existing operations. However, PL 25-70 extended the time frame for the initial rates to July 2002, but the PUC did not act to change the rates until October 2005.

The PUC did not set rates until 2005 in part because DPW did not change its organizational structure. DPW lacked experience in rate making before the PUC, and did not plan or implement the actions needed for rate making. It did not budget the funds for the cost of service analysis, and without it, DPW and the PUC had no revenue and expense data upon which to base the rates. In 2003, because DPW had no funds for the analysis, the PUC sent proposed legislation to the Guam Legislature that would ensure the studies would be funded by the tipping fees.

U.S. EPA's oversight of the Consent Decree Financial Plan prompted DPW to contact the PUC in January 2005 regarding rulemaking. As a result, in February 2005 the PUC sent the Guam Legislature its 2003 proposed legislation to fund the cost of service analysis and focused management audit from the tipping fees. The Guam Legislature adopted the changes in PL 28-56. A cost of service analysis was completed in September 2005 (PUC Rate Report) by the PUC's experts.

The PUC set an interim 25% rate increase in October 2005, effective November 1, 2005. The PUC required that the amounts collected for the increase be held in a reserve account to help pay for Consent Decree tasks.

The PUC's expert noted that even with the 2005 rate increase, the rates for all customers are "lifeline" rates. Such rate should apply only to very low-income residential customers. In order to pay for landfill construction and operations and for Ordot Dump closure and post closure care, improve collection services, etc., the expert predicted that the rates for residential customers rates would likely rise to $27 to $34 per month by 2007. Some people have claimed that the public will not tolerate such high solid waste fees. They have suggested a new tax, such as a beautification tax similar to the one instituted on Saipan, would be a better method. However, $27 to $34 per month residential rates are not uncommon for communities that have to borrow money to build new landfills and close dumps in the past few years, where there were little or no funds that had been held in a reserve account over time to pay for the capital investments.

The PUC ratemaking process forced DPW to take another small, but important financial management step. The PUC Rate Report recommended that the PUC require routine financial and operational reports from DOA and DPW staff to DPW management. Consequently, DPW agreed to provide the PUC with quarterly revenue and expense reports beginning October 1, 2005. The Audit Report and the workshop will prepare the solid waste program for the needed rate increases in 2007.

Recommendation: Solid waste operations and the GSWA should retain a general manager and a chief financial officer in 2006.

3.2.5 Environmental Compliance

Between December 2000 and September 2006, DPW did not outsource solid waste operations, as mandated by laws, to firms with expertise and experience with environmental compliance of solid waste operations. At the same time, it did not hire a solid waste expert or train employees in modern landfill operating procedures and solid waste collection/transport to ensure compliance with environmental and health laws. For example, it did not supply the dump with the requirement of daily cover material. As a result, the dump experienced frequent fires. To pay for the response to the fires, the Guam Legislature appropriated to the Office of Civil Defense over $200,000 for the May 14, 2001, fire (PL 26-35), and $250,000 for the October 25, 2002, fire (PL 26-153). The Governor has also issued executive orders declaring an emergency to respond to Ordot fires so that emergency funds could be used to pay the costs to control the fires [e.g., EO 98-07 (May 1998) and EO 98-34 (December 1998)].

As part of the Consent Decree settlement of unlawful leachate discharges to the Lonfit River, DPW paid $200,000 in civil penalties to the U.S. Treasury in 2004-2005, and by 2008 Guam must expend $1 million in local funds to conduct regular interim household hazardous waste collection events and to construct and operate a household hazardous waste collection facility. It is likely that Guam will have to pay additional civil penalties for the leachate discharges between the date of the Consent Decree, February 11, 2004, and the date the leachate control and treatment system eliminates the discharges to the Lonfit River.

In November 2005, DPW relocated equipment from the dump to the Dededo quarry. At the same time DPW did not supply the dump with adequate cover material for over two weeks. Consequently, the uncovered waste caused odor and leachate problems and increased the risks of fire. Further, Guam EPA fined DPW $11,050 for failure to maintain adequate cover material and adequate safety equipment for dump employees.

In December 2005, Guam EPA issued a solid waste permit to DPW for continued operations to closure and for the closure design, with required revisions. The permit contained numerous conditions regarding training of staff, out sourcing for a trained manager, and purchasing a scale. DPW has not complied with most of the provisions of its permits. In August of 2006, it advertised for a contract of a certified and experienced manager of landfill operations

DPW claimed lack of funds to pay for (1) additional solid waste collections after government holidays, (2) equipment repairs, (3) safety equipment and supplies, and (4) the environmental permit application fee. That is, DPW has not budgeted for the costs of environmental compliance. However, the noncompliance with environmental laws has lead to environmental hazards and ultimately to

additional costs upon the Government. These monetary penalties and hazard response costs are not budgeted or supported by the tipping fee revenues.

Recommendation: Solid waste operations should be outsourced in 2006 as required by the Solid Waste Operations Permit. The contractors should be required to have trained management in environmental compliance, including related costs. The contractors should be required to have policies and procedure that include the maintenance of equipment, proper operations and site maintenance and adequate cover material, and trained employees.

3.3 The CCU, Solid Waste Operations and the Guam Solid Waste Authority

By April 2006, the government was to have raised and/or borrowed over $10 million for Ordot Closure construction, and by November 2006, another $30 million or more for the landfill cell and buildings construction. The primary recommendation of the PUC's Audit Report is that the Solid Waste Division and activities be transferred to a public corporation under the oversight of the CCU. It stated:

> Time is of the essence and the solutions must be put in place immediately. Failure to do so could threaten the proposed bond financing that is required to fund critical compliance projects.

DPW faces similar financial management challenges that GWA and GPA faced in 2002. The result was the formation of the Combined Commission on Utilities (CCU) to oversee management of these agencies. The CCU did not exist in 2000 when the Guam Legislature found that creating a Board of Directors to oversee the Solid Waste Management Authority would be duplicative. The CCU has demonstrated success in overseeing contracting and financial management of the Guam Power Authority and Guam Waterworks Authority. Therefore, extending the CCU's powers to the solid waste operations can be achieved without unnecessary expense and without expanding government.

In addition, experience has shown that demands placed upon DPW management regarding roads, buildings, school buses, and assisting Mayors have impeded adequate implementation of its solid waste duties under the Solid Waste and Litter Control Act and recycling laws. The Government has fallen significantly behind in implementing the Consent Decree mandates, prompting E.O. 2006-12, forming an Ordot Consent Decree Compliance Committee, and E.O. 2006-13, to allow for emergency procurements to implement the Consent Decree projects and the Guam EPA permit conditions. The Committee's progress has been impeded by the demands of other government priorities and crises.

The necessary comprehensive and radical management changes have also been impeded by the frequent changes in the politically appointed Director, and the Government's resources dedicated to litigating with the United States about Ordot's pollution, to siting a landfill at Layon, and to the design of both the landfill and Ordot Closure. Consequently, Guam has fallen significantly behind the standards of solid waste management for developed communities that are

comparable to Guam in terms of population, solid waste composition, and solid waste volume. Therefore, extraordinary changes are needed to Guam's solid waste operations in 2006 and continuing into 2007.

The extraordinary changes extend well beyond tipping fee billing and collection. In order to obtain favorable bond rating or other financing, the revenue stream needs to be independent and not subject to reallocation. That can only be accomplished through an autonomous agency and its revenue. Significant management changes are needed for contract administration, not just for landfill operations and closure, but also for solid waste collection, solid waste separation, recycling, household hazardous waste operations, and transfer stations. Therefore, the GSWA should have a general manager who can effectively transition solid waste operations into an integrated and well-managed system of contract administration, billing and fee collection, and recycling activities.

Finally, experience has shown that GPA and GWA have benefited from the expertise of a chief financial officer. Therefore, because of the significant funds needed for capital improvements, and the complexity of financial management, the GSWA should have an experienced chief financial officer.

Recommendation: In 2006, the Guam Legislature should pass legislation creating the Guam Solid Waste Authority, a public utility overseen by the CCU. The legislation should: (1) transfer all DPW solid waste responsibilities and duties to the GSWA, (2) require the CCU to hire a general manager and a financial manager for the GSWA as soon as possible, (3) require the GSWA to have full-time staff trained in managing solid waste contracts, (4) require that all solid waste contractors have trained management in environmental compliance, including related costs, (5) require all solid waste contractors to have policies and procedures that include the maintenance of equipment, proper operations and site maintenance and adequate cover material, and trained technical employees, and (6) require data collection, analysis, and synthesis by the GSWA and all solid waste contractors.

3.4 Data Collection Needs

Management of the solid waste operations will depend heavily upon the data produced for collection, transport, disposal, recycling, special waste, and public education. Thus, the need in this category is not so much data collection as it is data analysis and synthesis. For example, waste composition data not only would help set recycling priorities, it also helps define the scope and magnitude of the recycling that is achievable. This information will be helpful in contract negotiations and contract administration.

3.5 Performance Standards

3.5.1 Billing and Fee Collection

A. The residential services should be a prepaid system.
Basis: Public Law 28-56, PUC Audit Report, and this ISWMP.

B. The billing and fee collection system shall be designed and operated to accommodate the efficient coordination of various private contracted operators.

Basis: PL 24-06, PL 26-99 and 2006 ISWMP.

C. The billing and fee collection system shall be designed and operated to work in conjunction with a data collection system to optimize coordination and efficiency.

Basis: Billing and collection operations will involve activities similar to those conducted as part of the data collection operations.

D. The billing and fee collection system shall be expandable to include rate increases, any processing fees or payouts, or any subsidies associated with other components of this 2006 ISWMP.

Basis: A flexible system can incorporate subsidies such as grants or beautification tax, and other new revenue sources, as well as payouts for cancelled service or recycling refunds.

E. The billing and fee collection system shall be maintained by Government employees or through a contract separate from the contracts for solid waste collection and disposal.

Basis Collection, disposal, and other contractors should focus on performance, not fee billing and collection. Accountability for collection and for performance is easier with separate contracts.

F. Funds generated through the collection of tipping fees and user charges must be used for the closure of Ordot, opening of the new landfill and for other solid waste management practices (operations), the PUC's regulatory costs and expenses, and the recyclable paper contract.

Basis: Public Laws 24-246 and 28-56.

3.5.2 Debt Management

A. GSWA's general manager and chief financial officer provide accountability through monthly reporting to CCU on debt management.

Basis: New legislation amending 12 GCA Chapter 79, CCU order or resolution.

B. GSWA's general manager and chief financial officer provide proof of timely payments of interest on bonds, loans, etc., through monthly financial reports to the CCU and quarterly financial reports to the PUC.

Basis: New legislation amending 12 GCA Chapter 79, and PUC orders.

3.5.3 Contract Administration

A. CCU review and approval of all contracts.

Basis: New legislation amending 12 GCA Chapter 79.

B. GSWA obtains general manager with solid waste contracting experience.

Basis: New legislation amending 12 GCA Chapter 79.

C. Training plans for the GSWA staff shall be developed and budgeted by GSWA general manager and approved by CCU.

Basis: New legislation amending 12 GCA Chapter 79.

3.5.4 PUC Rate Making

A. GSWA's general manager and financial officer shall provide timely reports and information on costs of service, debt service needs, and other information to the PUC.

Basis: PUC orders.

3.5.5 Environmental Compliance

A. Employee and contractors working and managing the Ordot Dump facility, including closure construction, shall be trained in environmental compliance.

Basis: Ordot Dump solid waste disposal permit for continued operations to closure, closure design and construction, and post-closure operations and maintenance, Guam solid waste regulations, and government contracts.

B. Contractors of landfill design, construction, and operations shall be trained in environmental compliance.

Basis: 10 GCA Section 51104; PL 24-06; solid waste facility permit for Layon design, construction, and operations; Guam solid waste regulations; and government contracts.

C. Employees and contractors for solid waste transfer stations shall be trained in environmental compliance.

Basis: 10 GCA Section 51104; solid waste facility permits for transfer stations; Layon design, construction, and operations; Guam solid waste regulations; and government contracts.

D. Contractors for abandoned vehicle removal and other government contracts for recycling collection and/or processing of recyclable materials and compost shall be trained in environmental compliance.

Basis: 10 GCA Section 51104; solid waste facility permits; Guam solid waste regulations; and government contracts.

CHAPTER FOUR: EXTENDED SOLID WASTE PROJECTIONS

Data provided by the government and used for the *2000 Integrated Solid Waste Management Plan for the Island of Guam,* approved by the Legislature, were updated to provide the following:

- Corrected municipal solid waste (MSW) generation rates (based on *Guam Solid Waste Weight Composition and Recycling Feasibility Study* by Barrett Consulting Group [Guam EPA, 1995] and *Guam Landfill Final Site Selection Report* by Duenas and Associates, Inc. [Department of Public Works, 2005]).

- Population projections (based on U.S. Census data and projections by Department of Public Works, [2005] and D.E. Consulting [2005]).

- MSW composition projections (based on Department of Public Works, [2005[.

- MSW source projections (based on Department of Public Works, [2005])

These criteria were developed for the planning horizons of five, ten, fifteen, and twenty years. However, the key components of municipal solid waste management implementation often have life spans of greater than twenty years. Analyses of these components, especially in regard to their role in disposal and volume reduction of the waste stream, requires projections beyond the planning horizons stated. For this reason additional projections were made, arriving at the data detailed in the following Sections.

4.1 Population Projections

Solid waste load projections for this 2006 ISWMP are based on the population contributing to the waste stream. In order to make the necessary projections for the analysis and comparison of disposal and volume reduction alternatives, annual population numbers were needed to the year 2035. For determining the final numbers to be used in evaluating disposal options, the military populations are included. This is in contrast with the 2000 ISWMP, which used the sum of resident and non-resident populations, less the on-base military component.

Table 4.1: Population of Guam: 1960 to 2000 based on US Census results

Year	1960	1970	1980	1990	2000
Population	67,024	84,996	105,979	133,152	154,805
Increase	n/a	26.8%	24.7%	25.6%	16.3%

For this 2006 ISWMP, it was noted that population growth for Guam over the last sixty years, which appears to consistently increase through census periods, has not really been linear or fitting a typical formula for many reasons. It has,

therefore, been unpredictable. Military build-ups in World War II, the Vietnam War, and expected increases due to Asian political tensions have been countered by military downsizings affecting the military sector of the total population. These updated projections consider that the Department of Defense installations should not have separate landfills, as their current facilities become filled, but their populations and waste generation are included in the island-wide projections. Greatly increased immigration from the Federated States of Micronesia and the Republic of the Marshall Islands has arisen since their independence and treaty status as Freely Associated States of the U.S. in 1986 and likewise from Palau since 1994. Also flows of immigrants able to enter the U.S. are not limited as to numbers entering Guam, which is an easy and cheap entry point for nearby Asian countries. But, as the economy slowed in the last decade, there has been a major out-migration of Guam residents, often finding improved conditions elsewhere in the U.S.

Guam is facing the proposal of rapid development to accommodate the increase of tens of thousands of Department of Defense employees and families on Guam over the next decade. Therefore, forecasts for future populations cannot be as accurate as one might desire. It is safer for these to be considered between ranges of likely numbers.

In 2000 the population was 154,805. Based on the projections of the 2005 DPW Final Site Selection Report (FSSR) that twelve percent of Guam's population relocated off-island between 2000 and 2003, and factoring an annual increase of two percent since then, the population in 2005 was estimated to be 141,732. Projections to 2010, excluding possible large influxes of military residents, indicate the population will continue to grow to 156,484. A continued application of this annual rate of growth gives populations of 172,771 for 2015, and 190,753 for 2020. These projections are shown in Table 4.2, with the additions of estimated equivalent daily visitor populations, based on increasing visitor numbers. The annual visitor arrivals for 2010 are estimated to be 1.5 million and increases per decade after then are set at 0.5 million.

Table 4.2: Guam Population Projections for years 2010, 2015 and 2020

YEAR	2010	2015	2020
POPULATION + VISITORS	160,319	177,565	196,232

For more distant future projections, ranges are safer to use. Recognizing longer decennial trends from past censuses of 16%, 20% and 25% increase rates, and Guam's potential to sustain growth, these rates are applied to projections in Table 4.3 for years 2025, 2030, and 2035 [Department of Public Works, 2005].

Table 4.3: Guam Population Projections for years 2025, 2030 and 2035

YEAR	16%/decade	20%/decade	25%/decade
2025	205,819	209,630	214,395
2030	221,065	228,688	238,216
2035	238,750	251,556	267,993

4.2 Solid Waste Generation Rates

Once population is known, a per capita per day (pcd) solid waste generation rate can then be applied to the population figure to develop total generation for any given period. DPW's revised estimates of generation rates use a low value of 4.4 pounds pcd which is the national average, and a high value of 5.28 pcd, which is 20% over the national average. This 2006 ISWMP uses the high value of 5.28 pcd. The projected generation data are presented in Tables 4.4 and 4.5 on the following two pages.

Table 4.4: Waste Generation at 5.28 pcd, diversion 2% and soil cover 20%

YEAR	Total Population	Tons/Year Waste Generated (High Rate in Tons per Yr)	Tons/Year Waste Diverted from Waste Stream	Tons/Year of Residual Waste from MRF (To Be Landfilled)	C.Y./Year Waste to MSWLF from MRF (1,100 lbs/C.Y. in MSWLF)	Landfill Volume Required C.Y./Yr (Waste + Soil)	Landfill Accumulated Volume C.Y. (Waste+Soil)
2007	150,717	145,231	2,905	142,327	285,776	323,470	323,470
2008	153,656	148,258	2,965	145,293	264,169	330,211	653,681
2009	157,058	151,342	3,027	148,315	269,663	337,079	990,759
2010	160,319	154,483	3,090	151,393	275,261	344,076	1,334,835
2011	163,640	157,684	3,154	154,530	280,964	351,205	1,686,040
2012	167,024	160,945	3,219	157,726	286,774	359,468	2,044,508
2013	170,472	164,267	3,285	160,982	292,694	365,868	2,410,376
2014	173,986	167,652	3,353	164,299	298,726	373,408	2,783,783
2015	177,565	171,102	3,422	167,680	304,872	381,090	3,164,873
2016	181,157	174,563	3,491	171,072	311,040	388,800	3,553,674
2017	184,819	178,092	3,562	174,530	317,327	396,658	3,950,332
2018	188,551	181,688	3,634	178,054	323,734	404,668	4,355,000
2019	192,355	185,353	3,707	181,646	330,266	412,832	4,767,832
2020	196,232	189,089	3,782	185,307	336,923	421,153	5,188,986
2021	200,880	193,568	3,871	189,696	344,903	431,128	5,620,114
2022	205,634	198,149	3,963	194,186	353,066	441,332	6,061,446
2023	210,498	202,836	4,057	198,779	361,416	451,770	6,513,216
2024	215,473	207,630	4,153	203,477	369,959	462,448	6,975,665
2025	220,563	212,534	4,251	208,284	378,698	473,372	7,449,037
2026	225,267	217,067	4,341	212,725	386,774	483,467	7,932,504
2027	230,067	221,693	4,434	217,259	395,017	493,771	8,426,274
2028	234,968	226,415	4,528	221,887	403,430	504,288	8,930,562
2029	239,969	231,235	4,625	226,610	412,018	515,023	9,445,585
2030	245,075	236,154	4,723	231,431	420,784	525,980	9,971,564
2031	250,882	241,750	4,835	236,915	430,754	538,442	10,510,006
2032	256,823	247,475	4,949	242,525	440,955	551,194	11,061,201
2033	262,903	253,333	5,067	248,267	451,394	564,243	11,626,443
2034	269,124	259,328	5,187	254,142	462,076	577,595	12,203,038
2035	275,491	265,463	5,309	260,153	473,006	591,258	12,794,296
2036	282,005	271,740	5,435	266,305	484,191	605,239	13,399,535
2037	288,671	278,163	5,563	272,600	495,637	619,546	14,019,081

Table 4.5: Waste Generation at 5.28 pcd, diversion 15 to 42% and soil cover 20%

YEAR	Total Population	Tons/Year	Percentage of Waste Diverted	Tons/year Diverted	Tons/Year to Landfill	C.Y./Year to Landfill	C.Y. Waste+ Soil/Year	Accum. C.Y./Year
2007	150,717	145,231	15%	21,059	127,173	225,769	282,211	282,211
2008	153,858	148,258	15%	21,497	126,761	230,474	288,092	570,303
2009	157,058	151,342	15%	21,945	129,397	235,267	294,084	864,303
2010	160,319	154,483	15%	22,400	132,083	240,151	300,189	1,164,576
2011	163,640	157,684	19%	29,960	127,724	232,225	290,182	1,454,857
2012	167,024	160,945	19%	30,579	130,365	237,028	296,285	1,751,142
2013	170,472	164,267	19%	31,211	133,056	241,921	302,401	2,053,543
2014	173,986	167,652	19%	31,854	135,798	246,906	308,633	2,362,176
2015	177,565	171,102	19%	32,509	138,592	251,986	314,983	2,677,158
2016	181,157	174,563	24%	41,022	133,541	242,802	303,502	2,980,660
2017	184,819	178,092	24%	41,852	136,240	247,709	309,636	3,290,297
2018	188,551	181,688	24%	42,697	138,991	252,711	315,889	3,606,186
2019	192,355	185,353	24%	43,558	141,795	257,809	322,262	3,928,447
2020	196,232	189,089	24%	44,436	144,653	263,006	328,757	4,257,205
2021	200,880	193,568	28%	54,199	139,369	253,398	316,747	4,573,952
2022	205,634	198,149	28%	55,482	142,667	259,395	324,244	4,898,196
2023	210,498	202,836	28%	56,794	146,042	265,530	331,913	5,230,109
2024	215,473	207,630	28%	58,136	149,494	271,806	339,758	5,569,867
2025	220,563	212,534	28%	59,510	153,025	278,227	347,783	5,917,651
2026	225,267	217,067	33%	70,547	146,520	266,400	333,000	6,250,651
2027	230,067	221,693	33%	72,050	149,643	272,078	340,097	6,590,748
2028	234,968	226,415	33%	73,585	152,830	277,873	347,341	6,938,089
2029	239,969	231,235	33%	75,151	156,083	283,788	354,735	7,292,824
2030	245,075	236,154	33%	76,750	159,404	289,826	362,282	7,655,106
2031	250,882	241,750	37%	89,447	152,302	276,913	346,141	8,001,247
2032	256,823	247,475	37%	94,566	155,909	283,471	354,339	8,355,586
2033	262,903	253,333	37%	93,733	159,600	290,182	362,727	8,718,314
2034	269,124	259,328	37%	95,951	163,377	297,049	371,311	9,089,624
2035	275,491	265,463	37%	98,221	167,241	304,075	380,094	9,469,719
2036	282,005	271,740	42%	112,772	158,968	289,032	361,291	9,831,010
2037	288,671	278,163	42%	115,438	162,726	295,865	369,831	10,200,841

4.3 Projected Landfill Capacity Requirements

4.3.1 Factors Affecting Landfill Capacity

It is the ultimate goal of solid waste management to properly dispose of waste that survives diversion, source reduction and volume reduction systems. Deposition of such waste in a sanitary landfill in compliance with Guam law is the proper means of disposal. It is therefore important to understand the magnitude of the quantity of solid waste that must be managed, a portion of which will eventually be disposed of in a sanitary landfill. This waste quantity is best expressed in terms of the projected landfill capacity or volume in cubic yards for the planned life of the landfill in years.

Projected landfill capacity/volume is determined by the following factors:

1. The quantity of municipal solid waste projected to be generated within the planning period, commonly expressed in terms of tons per year.

2. The volume of the solid waste stream, which is reduced through diversion, recycling, composting and/or incineration, expressed in terms of tons per year.

3. The density of properly compacted, landfilled solid waste, commonly expressed in terms of pounds per cubic yard. The density of compacted solid waste varies from 750 to 1,200 pounds per cubic yard, depending on the degree of compaction. Light compaction of waste will yield densities at the lower end of the range and heavy compaction at the upper end of the range. An average density of 1,100 pounds per cubic yard (0.55 tons/cy) of compacted solid waste was used to project landfill volumes [Guam DPW 2005(a)].

4. Daily soil cover volume expressed in terms of a percentage of the total compacted waste plus soil cover volume or:

   [daily soil cover (cubic yards) x 100] divided by [daily soil cover (cubic yards) + compacted waste (cubic yards)]

   Twenty percent of the total volume of waste plus compacted waste will be used to determine the volume of daily soil cover.

5. The solid waste disposal planning period expressed in terms of years. A term of thirty years was used as the basis for determining required landfill capacity/volume.

4.3.2 Landfill Capacity Projections

4.3.2.1 Landfill Volume Projections

Landfill volume requirements were generated as a part of the Department of Public Works 2005 Guam Landfill Final Site Selection Report (FSSR). The FSSR's volumetric projections are for the years 2007 to 2037 located in Tables 4.4 and 4.5. The information in Tables 4.4 and 4.5 is based on the following assumptions and industry standards:

1. Population projections by Department of Public Works (2005a).

2. For Table 4.4, a nominal two percent waste reduction through composting, recycling, etc. It is anticipated that Guam currently achieves a waste reduction rate greater than two percent. In Table 4.5, waste reduction increases over time from 15% to 42%.

3. A compacted solid waste density of 1,100 lbs/yd^3 or 0.55 tons/ yd^3.

4. A 20% ratio of (compacted soil cover) to (compacted soil cover + compacted waste).

5. A minimum landfill life of thirty years.

6. A waste generation rate of 5.28 lbs/capita/day (pcd). The 5.28 pcd waste generation rate is 20% above the national average.

Based on the above parameters, the landfill must have a minimum capacity of approximately 14.0 million cubic yards.

4.3.2.2 Landfill Volume and Life Expectancy

The 40% Layon Landfill Design of August 2005 (TG Engineers, 2005) provides approximately 18.1 million cubic yards of capacity assuming a compacted solid waste density of 1,200 lbs/yd^3. This is a 4.1 million cubic yard increase over the minimum required capacity of 14.0 million cubic yards. This increases the projected landfill life to approximately 51 years, which is 20 years greater than the minimum 30-year life.

As the Layon Landfill Design progresses to a 100% stage, the volume and life expectancy for the landfill will be refined. In addition to this, obtaining accurate and consistent solid waste generation and composition data at the Ordot Dump until closure in September 2007 will provide essential data for solid waste planning and management on Guam

4.3.2.3 Updated Landfill Volume Requirements

We have updated the solid waste generation projections and have determined landfill volume requirements based on the following assumptions:

1. Updated population and solid waste generation rates and volumes as presented in §§4.1 and 4.2.

2. Continuation of the minimal solid waste diversion rate of two percent of the solid waste stream. The use of a minimal diversion rate will reveal the magnitude of the volume of solid waste which Guam must dispose in a landfill if no significant volume reduction systems are implemented.

3. A density of 1,100 pounds per cubic yard of compacted solid waste.
4. A daily soil cover volume percentage of waste plus cover volume of twenty percent.
5. A landfill life or planning period of thirty years, with 2007 as the base year for the opening of the new MSW landfill at Layon.

A volume of 14.0 million cubic yards of landfill capacity is projected to be used by the year 2037.

4.4 Volume of Recyclables in Guam's Solid Waste Stream

The percentage of Guam's civilian municipal solid waste stream consisting of materials which are considered to be recyclable or compostable is substantial. Calculations based on the latest data, which depends on the old 1993 data from W.B. Flores and Associates work (Guam Environmental Protection Agency, 1995), is estimated to exceed three-fourths of the waste stream over the planning period. Among the recyclables and compostables, paper and paperboard make up between thirty-eight percent (38%) to forty percent (40%) of the total MSW stream, followed by plastics (13.5% to 15.9%) and food wastes (10% to 12%). The large percentage of recyclable/compostable material in the waste stream provides optimism that large-scale, integrated, and well-executed programs for recycling and composting will significantly reduce the volume of Guam's solid waste.

CHAPTER FIVE: COLLECTION AND TRANSPORT

5.1 Collection and Transport

In order to assure the successful implementation of this plan through waste diversion and minimization of the waste to be landfilled, the collection and transport methods must support source separation, recycling, and composting. Through the use of appropriate collection strategies, waste diversion, user fee billing and collection, data collection, and other key components should be enhanced. Final implementation of the selected collection and transport methods must be coordinated with the specific requirements of the receiving facility [Materials Resource Recovery Facility (MRRF), transfer station, and landfill] to ensure proper integration. The current plan for collection and transport requires the discussion and evaluation of three (3) categories of collection and transport: commercial, residential and government. This discussion is presented in the following sections.

5.2 Commercial Collection

Currently, commercial collection poses a multitude of options with regard to methods, as these services are provided by private, non-government haulers. However, the need for these services to support and promote recycling is crucial to the success of Guam's recycling-based ISWMP. The extent to which the commercial collection operations can be controlled or modified, to enhance recycling and composting, is limited to: (1) conditions placed upon the operations as part of the Guam EPA solid waste management permitting process; (2) rules and regulations of the MSW receiving facility (i.e., transfer station, MRRFs, and landfill); and (3) laws or mandates promulgated by *I Liheslaturan Guåhan* applicable to commercial generators.

This planning document is not intended to dictate the style and methods of operation for private business enterprises. However, the development of an integrated solid waste management plan requires the establishment of standards, rules, or procedures that relate to the collection of solid waste with the intended waste diversion and disposal operation to ensure that the ISWMP objectives for recycling and composting are achieved and maximum benefit is derived. Adaptation of existing commercial collection operations to these standards, procedures, and objectives is left to the forces of market competition.

As we have selected recycling, composting and landfilling as the recommended waste diversion and disposal options, the collection and transport methods must maximize diversion of recyclables and compostables prior to their introduction into the municipal solid waste stream, and also maximize the extent to which the waste delivered to the receiving facility is amenable to material recovery. Reduction of total waste stream volume prior to collection implies the application of source separation of recyclable materials and compostable wastes. This type of activity conducted for the outgoing waste stream can be considered as preparatory work for the material entering the MRRFs. The execution of such preparatory work will greatly increase the amount of recoverables by avoiding

volume lost due to poor condition and will reduce operational and maintenance expenses by reducing processing required prior to shipment of recyclables to market. Commercial collection shall incorporate these activities or be controlled and modified so as to ensure that they are performed.
The waste management strategy for this component will be influenced and managed through the implementation of mandatory source separation regulations and solid waste management operation (collection, transfer and landfilling) permit requirements. These management tools can effectively require commercial "curbside" collection to capture large quantities of recyclables and raw compost before they enter the solid waste stream as discards or are mixed with other components of the MSW stream. Many commercial generators are currently working with waste haulers to source separate their waste voluntarily.

The collection and transport of commercial MSW will be more clearly understood by examining the requirements of collection from the generators' point of view. Commercial generators will be required to separate wastes into seven categories:

1. Recyclables: Aluminum, glass, tin cans, plastic, paper
2. Green Waste: Vegetation cuttings from landscaping
3. Bulky Waste: Furniture, electronics
4. White Goods: Refrigerators, washer/dryer, air conditioning units, dishwashers, microwaves, ovens/stoves
5. Refuse: Solid waste that is either putrescible or does not belong in the other waste streams
6. Metal: Metal waste other than automobiles or does not belong in the other waste streams
7. Hazardous Waste: Waste defined to be hazardous according to regulations.

The commercial community is somewhat familiar with the majority of these categories because source separation is ongoing. However, this plan recognizes that education and a phased approach will be necessary. Transfer stations will be used to consolidate and transfer wastes from collection vehicles to transport vehicles or direct haul will be utilized for landfilled waste. Means and methods for collection and transport of commercially generated source separated wastes will be determined by market competition. They may also outsource to private companies for collection and transport of waste. New legislation is needed for the mandate of waste separation at commercial establishments to include the definition of specific waste streams.

5.2.1 Mandatory Source Separation

Currently commercial generators are not required to separate recyclable materials from their solid waste. This Plan advocates universal source separation and collection to the greatest extent possible. There are two approaches to achieve source separation: mandatory requirements and market incentives. Mandatory requirements would be implemented through laws or permit

conditions. Market incentives could include purchase of recyclable materials, refunds, higher disposal fees, a beautification tax, or other tax incentive.

Source separation legislation will serve to ensure that recycling and composting become the primary focus of solid waste operations at commercial establishments (Public Law 24-313 addresses residential mandatory recycling). The purpose of such legislation should be to facilitate the effective and efficient operation of the selected volume reduction or disposal method. It should incorporate general requirements of the receiving waste facility in terms of incoming waste categories (dry recyclables, wet compostable wastes, other MSW), and it should allow for more intensive voluntary separation. The legislation should also provide penalties for those establishments whose waste streams delivered to the facility do not meet established standards for incoming wastes.

Passing legislation that will require the source separation of recyclable and compostable wastes at commercial establishments will accomplish the following:

- **Increased Recycling and Composting:** The implementation of source separation practices will result in the immediate availability of more recyclable commodities than has ever been achieved previously. There will be a dramatic increase in "supply" of products available for brokers or recyclers. It will also mean the availability of material for composting operations.

- **Avoided Costs:** Source separation has the potential to lead to lower or avoided landfill tipping fee costs to the commercial entity should the separated wastes be diverted from the MSW waste stream to the transfer station or MRRF.

- **Provide Incentives for Recycling-Based Industries:** The immediate increase in supply of recyclable commodities may act to remove constraints upon businesses or industries that rely upon a continuous supply of such commodities for the success of their operation. Without such a supply, these enterprises will not be able to establish efficient and sustainable business operations.

- **Disposal Practices and Awareness of Solid Waste Management Issues:** Requiring source separation will impose changes upon the operations at commercial establishments. More attention will have to be paid to what is disposed and how it is disposed. This simple change will bring about more awareness of conditions surrounding the solid waste system. Disposal practices at the workplace will change, and such changes will make their way to the home and have a beneficial effect on residential waste disposal practices.

5.2.2 The Recommended Commercial Collection and Transport Method

Commercial generators are encouraged to implement source separation of as many recyclable materials as possible. Guam EPA and DPW should explore partnerships with commercial generators and are encouraged to include collection of recyclable materials in the contracts with commercial collectors. If source separation of commercial waste has not progressed significantly by October 2007, then Guam EPA should pursue mandatory source separation requirements through regulations and legislation, such as excluding recyclable material from the landfill, mandatory separation statutes, beautification taxes, and special fees.

5.3 Residential Collection

Residential collection of MSW has historically been performed by the local government and provided free of charge to single family homes. However, over the last several years the Department of Public Works has been under mandates (PL No. 24-272, 24-313, 26-99) to incorporate the privatization of residential solid waste management and recycle twenty percent of this waste. The legislative mandates embodied in Public Laws 23-64, 24-272, and 26-99 call for the privatization of residential collection operations. The Department of Public Works shall implement the Solid Waste Management Plan and privatize Guam's Solid Waste Management System subject to all applicable laws, including Public Laws 24-06 and 26-99. Public Law 24-313 adopted DPW's regulations for solid waste collection and transport. It specifies in Section 104 that recyclables will be collected separately, and Section 109 (a) states that the contracting of services shall be made to meet service requirements that cannot be met by the Department of Public Works (i.e., comprehensive residential waste collection throughout the island).

As a result of the development of this 2006 ISWMP, the following collection model for residential waste management should be put into operation as the various components of the integrated solid waste management system become operational over the next several years.

The collection and transport of residential MSW will be more clearly understood by examining the requirements of collection from the generator's point of view. Residential generators will be required to separate waste into seven categories:

1. Recyclables: Aluminum, glass, tin cans, plastic, paper
2. Green Waste: Vegetation cuttings from trees, plants, grass and leaves
3. Bulky Waste: Furniture, electronics
4. White Goods: Refrigerators, washers/dryers, air-conditioning units, dishwashers, microwaves, ovens/stoves
5. Refuse: Solid waste that is either putrescible or does not belong in the other waste streams
6. Metals: Metal waste other than automobiles or that does not belong in the other waste streams

7. Household Hazardous Waste: Waste defined to be hazardous according to regulations.

The residential community is somewhat familiar with the majority of these categories as a result of recent storm debris cleanups. However, it is recognized in this plan that education and a phased approach will be necessary. Collection will likely be conducted by regional contractors. Transfer stations will be used to consolidate and transfer waste from collection vehicles to transport vehicles. New legislation is needed for the mandate of waste separation at the curbside, to include the definition of specific waste streams.

5.3.1 Mandatory Source Separation with Curbside Collection of All Waste Streams, and Drop-Off and Collection Capability at Transfer Stations

This Plan for collection will involve the separation of MSW at the source (residential customer) into a number of predetermined categories of waste with the addition of dedicated recyclable drop-off and collection facilities at all transfer stations (and possibly other locations as well). The purpose of source separation is to facilitate the sorting of recyclable commodities and compostable materials and to minimize the adverse effects associated with mixed MSW. Examples of these categories include dry recyclables (paper/paperboard, cans, bottles, and plastics), wet compostable material (green waste), white goods, bulky waste, metals, household hazardous waste, and the remaining MSW.

These separated wastes may be placed into designated containers or location, supplied by the collector and stationed on the curbside at the scheduled time for regular collection. Multi-compartment collection vehicles may be used to gather separated wastes for transport to either the MRRF or a regional solid waste transfer station. MSW can be collected using typical packer trucks. If the wastes are taken to a regional solid waste transfer station, the compartments for recyclables will be emptied into roll-off containers for transport to the MRRF. For MSW and wet compostable materials, roll-off compactors or other means of compaction may be used to maximize transport efficiency.

The general public will be required to make a shift in the manner in which they dispose of their MSW. Separation at the source will require extra effort on the part of the consumer. People will have to be more aware of what they are throwing away and where they throw it. They will need to learn the types of materials that are acceptable for each category of waste – what is recyclable, what is compostable, what should be landfilled, what can be reused. In short, there will need to be an increase in the awareness of solid waste management issues. Public acceptance of this may be more challenging than the historical practice; however, acceptance and understanding will increase over time as increased awareness and public education take effect.

As with mixed MSW, dedicated containers will be provided for each waste category as appropriate. Other waste containers should be appropriate for the collection vehicle. User fees for the collection of the separated wastes could be

charged on a unit cost basis with increases in price for collection of containers beyond the allocated number. These user charges can also be structured to provide for credits for recyclables diverted from the collected waste stream through private recycling facilities or the MRRFs.

The residential collection schedules will continue for municipal solid waste destined for the landfill. However, additional, less frequent, collection schedules for white goods, green waste, and bulky waste will be added so that pickup is comprehensive at the "curbside" of each residential location.

The drop-off and collection service at transfer stations is the alternative to curbside service. The transfer stations will be equipped with containers for specific recyclable commodities, serviced regularly by either a commercial recycler or a commercial hauler as part of a contract for such services. These services, at a minimum, will be located at transfer stations.
If the transfer stations are operated by commercial recyclers, they may take all recyclable commodities obtained to their own processing facility. If the transfer stations are operated by a commercial hauler under a contract to provide regional collection and
transport services, the recyclables will be transported to the MRRFs.

The inclusion of drop-off and collection of compostable wastes at facilities such as these is possible if strict adherence to storage rules and regulations is observed to control odors and disease vectors. Ideally, managed facilities, such as the transfer stations, will be primary drop-off and collection locations of compostable wastes.

Judicious placement of these transfer stations and supporting public education efforts will go a long way in changing the disposal habits and practices of Guam residents. While it is anticipated that the drop-off and collection locations will be useful for those who elect to recycle and may not want curbside collection services, these types of users are already aware of solid waste issues and are doing their part. The potential to promote awareness and change disposal patterns among the public park, beach, and baseball field users, as an example, is perhaps the greater benefit and incentive to implement this collection and transport option.

This collection and transport method will certainly improve the capture rates and effectiveness of recycling and composting operations. At home, some residents recycle voluntarily, but most do not. With the implementation of curbside collection of recyclables, this will change. Away from home (at the beach, public park, and baseball field), many groups do not even pick up their garbage. Implementing this option will provide them with the knowledge and behavior to act as they do when at home. This will result in the capture of what otherwise would have been a large quantity of mixed MSW.

5.3.2 Division of Residential Collection into Service Districts

The implementation of privatized collection of residential wastes will be handled through the letting of contracts. The nature of the contract in terms of size (collection area), length (time), and cost will be determined based on several factors that will have to be examined by the implementing agency. Collection area will have the most significant effect on the contract and will also affect the other terms. The length of the contract will be affected by the time required to recuperate capital outlay for equipment appropriate for the collection area. This in turn will affect the cost of services. Another key consideration is ensuring that local businesses can compete for contracts, thereby stimulating the local economy and assuring the creation of jobs and recirculation of monies within the local economy. Taking these factors into consideration, it is recommended and assumed that residential collection will be provided through contracts for distinct solid waste management regions, established on the basis of, at a minimum, population, projected generation rates, distance and routes, and efficient service intervals. These considerations are handled on a general level here, but should be the subject of greater detail and analysis as part of the mandated privatization plan required by PL 24-272.

The privatization of waste collection was addressed in Public Laws 24-139 and 24-272. However, the contract to privatize the collection of solid waste was never implemented. Public Law 26-99 mandated DPW to divide the collection into three districts by July 3, 2002. The privatization process had not been implemented by September 2006.

5.4 Government Collection

Currently the majority of Government of Guam agencies contract with commercial haulers for collection and transportation and waste. The Department of Public Works and the Mayors self-haul their waste. The Department of Parks, Recreation and Historic Preservation collects and transports waste from public parks and recreational facilities. Implementation of commercial and residential collection alternatives described in the preceding Sections will result in the reduction of Government collection operations. However, this diminishment should not be construed to mean that the MSW generated by Government facilities should not be subject to the same requirements applied to other facilities or generators. As with commercial collection operations, the need for Government collection to support and promote recycling and composting is crucial to the success of Guam's recycling-based integrated solid waste management system. Government collection, with respect to this Section, is intended to be what remains of the Solid Waste Management Division of DPW after the privatization of residential collection occurs. As solid waste operations continue to be privatized, it is appropriate that most, if not all, of the government waste be handled by private entities. A small operation may be maintained for the collection and transport of MSW from government agencies, institutions, and public facilities.

The collection and transport of MSW will be more clearly understood by examining the requirements of collection from the generators' point of view. Government generators will be required to separate wastes into seven categories:

1. Recyclables: Aluminum, glass, tin cans, plastic, paper
2. Green Waste: Vegetation cuttings from trees, plants, grass and leaves
3. Bulky Waste: Furniture, electronics
4. White Goods: Refrigerators, washer/dryer, air-conditioning units, dishwashers, microwaves, ovens/stoves
5. Refuse: Solid waste that is either putrescible or does not belong in the other waste streams
6. Metals: Metal waste other than automobiles or does not belong in the other waste streams
7. Hazardous Waste: Waste defined to be hazardous according to regulations.

The government institutions are somewhat familiar with the majority of these categories as a result of recent storm debris cleanups. However, it is recognized in this plan that education and a phased approach will be necessary. Transfer stations will be used to consolidate and transfer wastes from collection vehicles to transport vehicles. New legislation is needed for the mandate of waste separation at the institution to include the definition of specific waste streams. Means and methods for collection and transport of government generated source-separated wastes will be determined by market competition. They are anticipated to be outsourced to private companies for collection and transport of waste. Current government collection and transport will need to adjust to its downsizing, changes to promote recycling and possible phasing out.

5.4.1 Mandatory Source Separation with Regular MSW Collection

As discussed initially in Section 5.1, mandatory source separation is recommended as a part of the collection and transport component. Government facilities serviced by the Government collection operation should separate their waste by types as specified by the receiving facility. All wastes generated from these facilities shall be processed at the MRRFs. All containers used in the storage, collection and transport of the MSW (including recyclables and compostable waste) should meet any standards developed by DPW. Collection of wastes at government facilities shall be taken to include servicing of any recycling drop-off and collection centers at these facilities

5.5 Regional Solid Waste Transfer Stations

There are currently three solid waste transfer stations used in the collection and transport of MSW. However, these stations are used primarily for the transfer of MSW from self-haul vehicles to the Ordot Dump facility. They are not used for transfer of MSW from collection fleet vehicles to transport vehicles (dedicated to transporting waste from transfer station to an MRRF or disposal facility).

These solid waste transfer stations currently accept all municipal solid waste and green wastes; there is no waste sorting taking place at the transfer stations. The Department of Public Works also sets its own policies on the hours of operation, types of waste accepted, and how the waste must be packaged. The current cost varies from two dollars per load to four dollars. Only residential waste is being accepted.

During the operation of the landfill at Layon, only commercial hauling trucks will be accepted at the landfill. Transfer from fleet vehicles to the larger hauling vehicles will then become the accepted operational mode. The transfer stations will become the integral and pivotal component of the management system. A new fee schedule must be in place, and all types of waste must also be accepted. A ban on green waste and construction waste at the landfill will be part of its operating conditions.

For the privatization plan for residential collection and servicing of existing commercial and government collection streams, the operations at the existing transfer stations must be re-evaluated in terms of efficiency of operation, services, location, configuration, capacity, and number of stations. This re-evaluation will include the incorporation of recyclable collection and buy-back, compost distribution, weighing and fee collection facilities and other components of this ISWM plan.

When the Layon Landfill becomes operational, solid waste operations will be conducted in ways quite different from what is currently practiced. With respect to the solid waste transfer stations, two major differences will impact their operation. First, the number of different solid waste activities will increase. Second, these activities will be performed by potentially different entities by region. This will require functional and spatial expansion at the solid waste transfer stations. If such expansion is not possible within the boundaries of the existing stations, new sites may have to be found. At a minimum, the transfer stations should incorporate the following:

- Weighing, billing and fee collection facilities
- Data collection facilities
- Non-recyclable solid waste receiving, storage, and transport
- Recyclable collection (and potential processing: baling, packaging, etc.)
- Compostable waste receiving, storage, and transport (and possibly processing)
- Transfer facilities for all incoming components of MSW (recyclables, compostables, non-recyclable MSW)
- Finished compost distribution facilities.

A feasibility study is urgently required to identify the number and locations of transfer stations. This feasibility study should re-evaluate the number of transfer stations (currently three) needed on the island and their location relative, primarily, to population densities and haul routes to arrive at the number of transfer station(s), location(s), and size(s) that will be cost effective, flexible, and

convenient for operators, waste haulers and residential drop-off services. A detailed scope of work is required for this feasibility study.

5.6 Performance Standards

5.6.1 Collection and Transport Performance Standards

Currently, collection of municipal solid waste (MSW) on Guam is conducted through a combination of government operated and commercially operated fleets. What MSW collection will consist of, with the continued implementation of this plan, is source separation and collection of recyclables from residential, commercial, government and federal agency waste streams incorporating the use of transfer stations, with drop-off and collection center capabilities, for waste consolidation and diversion. To the maximum extent possible under the conditions as identified in this plan, waste diversion of recyclables and compostables will be required. The final residual MSW stream will then be transported to the sanitary landfill for final disposal.

5.6.2 Municipal Solid Waste Collection

The collection component of the ISWM system will, by mandate of PL 26-99, be performed primarily by private entities and will involve only minimal collection by the government. The performance criteria required for this component were developed with this in mind.

5.6.2. Functional Standards

A. Collection system shall include provisions for self-haul of wastes to transfer stations.

Basis: As private collection will involve costs for collection as well as disposal (tipping fees), there may be a movement among the business community, especially smaller business, to employ self-haul practices for MSW disposal. Also for the convenience of the residential community, self-haul should remain an appropriate option to transport waste from homes to the transfer stations.

B. DPW shall re-evaluate sites for regional solid waste transfer stations.

Basis: As part of the implementation of the integrated solid waste management system, the functional expansion of solid waste transfer stations will occur. This functional expansion will likely necessitate a spatial expansion of facilities as well. Interim activities should include verification of the boundaries of each existing transfer station, determination of actual area, estimate of usable area at each station (based on topography or other constraints) and preliminary space estimates for the component to be implemented.

C. Privatization of residential collection shall be such that any division or grouping of routes shall not adversely affect the rapid and efficient removal of solid waste from dwellings in all villages.

Basis: It is anticipated that the privatization strategy employed for the collection and transport component will involve the letting of several contracts for collection. In establishing the areas covered by each contract, care should be taken to avoid groupings or routings that will be difficult to maintain, or which will cause delays in collection. Operationally it shall be the most cost effective approach available.

D. Privatization of residential collection shall be such that costs for collection and disposal will increase, and, therefore, costs to the consumer are to be minimized while still providing the minimum level of service specified herein.

Basis: Establishment of collection areas should be optimized to minimize costs, considering such factors as haul distance, housing density, etc. While collection rates will be determined by the Public Utilities Commission based upon actual costs, the actual costs can be minimized by optimizing layout of collection routes and contracts.

5.6.2.2 Operational Standards

A. Residential collection shall be performed at each dwelling at least once per week on pre-scheduled days for the refuse waste stream as defined below. Collection services for other waste streams are to be collected based on the anticipated volume of the other waste streams and the needs of the community, taking into account the most efficient and economical frequency of collection that is appropriate.

Basis: In order to ensure that residential solid waste storage meets applicable regulations (Public Law 24-313) and does not pose health concerns, consistent collection frequency in accordance with publicly announced schedules must be accomplished. Frequency of collection must be at least once per week for the refuse waste stream, but may be changed as appropriate considering the collection and storage standards developed (type and size of container, etc.).

B. For residential collection, to ensure continuity and consistent collection practices for the consumer, regardless of changes in the collection system operator, all residential dwellings in every village island-wide should utilize a standard for collection procedures (separation categories, set-out and set-back, etc.) and container types for the implementation of source separation and collection of the various waste streams generated. Standards should be determined by DPW through the process of

outsourcing the solid waste collection services of the residential community. However, at a minimum, services for collection shall indude the following separated waste streams:

1. Recyclables: Aluminum, glass, tin cans, plastic, paper
2. Green Waste: Vegetation cuttings from trees, plants, grass and leaves
3. Bulky Waste: Furniture, electronics
4. White Goods: Refrigerators, washer/dryer, air-conditioning units, dishwashers, microwaves, ovens/stoves
5. Refuse: Solid waste that is either putrescible or does not belong in the other waste streams
6. Metals: Metal waste other than automobiles or does not belong in the other waste streams
7. Hazardous Waste: Waste defined to be hazardous according to regulations.

Basis: Ease of use for the customer, in terms of storage and collection, is a crucial factor in the success of the volume reduction and disposal strategy. For this reason, the collection and storage procedures the residential customer will be asked to perform must remain unchanged even though the contractor providing collection services may change. Establishing of standards for collection and container type will accomplish this.

C. Refinement of Container Standards.

Basis: The container standards in DPW regulations (Public Law 24-313) should be reviewed and updated. The legislative mandate for the privatization of residential solid waste collection will involve the letting of contracts. There may be a different contractor or contractors providing MSW and recyclable collection services for residents. Each contract will have a limited term, and, therefore, the possibility exists that different contractors will provide these services over time. In the interest of providing consistent service to the consumer and minimizing the costs associated with the collection of MSW and recyclables, a standard will be developed which specifies the exact type of container and collection system to be used to implement this Plan. The standard will take into consideration performance criteria developed for this Plan. All residents, regardless of location and region, will be able to use the same containers for MSW and recyclable collection. Research into this aspect of collection and transport can be initiated by DPW and continued (if necessary) by any succeeding management entity.

D. Development of Collection Standards, Rules, and Regulations.

Basis: With the refinement of the container standard, the manner in which MSW will be stored at and collected from each residence will change dramatically. In order to meet the performance standards specified for the collection and transport component of the integrated solid waste management system, the current practice of using any container and placing them in homemade container stands will have to be changed. DPW has developed a collection standard for containers, specifying that all residential waste must be placed in acceptable containers and all containers must be covered with a proper lid. DPW should initiate the development of a collection standard that specifies the acceptable placement of containers during collection and non-collection periods, acceptable number of containers per household, method of setting out containers and setting them back, as well as responsibilities of both the collection contractor and the resident.

E. Assessment of Government Service Fleet.

Basis: In anticipation of the transfer of residential collection responsibilities to a contractor, DPW should assess the condition, value, and applicability of its remaining service fleet to meet the diminished service requirements this transfer will bring. The need for packer trucks used for residential collection will be decreased, depending on how soon contracts are implemented and when container and collection standards are developed and implemented.

5.6.2.3 Legal/Regulatory Standards

A. DPW shall privatize collection, transportation, and disposal of solid waste from all dwellings in all villages of Guam.

Basis: Public Laws 24-06, 24-272, and 26-94, and 2006 ISWMP.

B. DPW will administer, supervise, and fulfill the responsibility of the Government of Guam in any legally established contract for solid waste collection activities and operations.

Basis: Public Laws 23-64 and 26-99.

C. Guam EPA to issue permits for the operation and modification of all solid waste collection systems.

Basis: Public Law 23-64.

D. Fees for residential collection to be set by the Public Utilities Commission (see performance standards for billing and collection).

Basis: Public Laws 25-70 and 28-56.

E. All collection shall in no way violate any applicable rule or regulation of the Department of Public Health and Social Services (DPHSS).

Basis: DPHSS Regulations, DPW Rules and Regulations, Public Law 24-313,
29 GAR Chapter 2 Article 1.

F. Collection contracts shall be for five years or less.

Basis: DPW regulations, Public Law 24-313, 29 GAR Section 2109.

CHAPTER SIX: DISPOSAL AND WASTE DIVERSION

Landfilling is currently the only viable and proper option for disposal of solid waste on Guam. Sending our waste off-island for disposal or ocean dumping are not considered viable or acceptable solid waste disposal methods. In contrast, recycling and composting of solid waste are waste diversion methods and should not be confused with ultimate waste disposal. Recycling and composting are two practical options available to Guam that, in suitable combinations, will divert a significant portion of and reduce the waste stream through the recovery of resources. The following briefly describes these options.

"Recycling" is the process by which materials are collected and used as raw materials for new products. There are several steps in recycling: collecting the recyclable components, separating recyclable materials by type (before or after collection), processing them into reusable goods, and purchasing and using the reprocessed materials to complete the recycling process. Recycling prevents potentially useful materials from being landfilled or incinerated, thereby preserving landfill space and conserving natural resources. Additionally, recycling removes some potentially hazardous waste from being improperly disposed or released into the environment.

A "Materials Resource Recovery Facility" (MRRF) is a centralized facility where recyclable waste streams are received in bulk from trucks, recyclables are sorted and separated, and then processed for shipping to available markets.

"Regional Transfer Stations" serve as consolidation stations for packer trucks and haulers of waste streams as well as self-haulers. At these sites, wastes streams are consolidated. The residual waste stream is transferred for disposal to larger transport vehicles to reduce traffic volume for delivery to the landfill. Recyclable materials are transferred to composting, recycling, or household hazardous waste facilities.

"Composting" is a form of recycling whereby organic waste is diverted from disposal and converted through a biological process (an accelerated form of natural decomposition) to useful soil-related products. Guam's municipal solid waste stream, similar to other industrialized communities, contains a high percentage of recyclable or compostable material as discussed in Chapter 7.

It is essential that solid waste disposal and practical volume reduction methods be considered together as the volume of solid waste that Guam must manage over the next twenty-five to thirty years will demand that significant volume and source reduction be part of the overall solid waste management strategy. Landfilling, in combination with alternative forms of solid waste source and volume reduction methods, must be analyzed in terms of effectiveness, costs, and environmental impacts, with the results compared and measured against the projected capacity of the Layon Landfill and other future landfill sites. Broad options considered include:

- Landfill + Minimal Waste Recycling (2% - 10%)
- Landfill + Moderate to Aggressive Recycling and Composting (15% to 42%)

6.1 Landfill

For many years, Guam has been plagued with the problems associated with the operation, maintenance, and violations of the Ordot Dump. Numerous Notices of Violation/Orders of Compliance (NOV/OC) from Guam EPA and an Administrative Order issued by U.S. EPA were not able to rectify the serious violations at this half-century old dump. Residents in the surrounding area have requested the immediate closure of the dump. Public laws 22-115 and 24-272 mandated its closure. Operational violations such as the lack of leachate management, lack of compaction, lack of daily cover, lack of vector control, and lack of gas control were magnified with occasional underground fires.

The 2000 ISWMP (Guam Legislature, 2000) identified Guatali in the Apra Harbor watershed as the site for the new landfill. However, Public Law 24-06 identifies both Malaa and Guatali as potential sites for the new landfill. The preferred site was the Malaa site. There were numerous problems associated with the location and the contract to build the landfill. Based on experts from U.S. EPA wetland programs, the Guatali site has more "better quality" wetlands than the Malaa site and the mitigation for the wetlands was enormous and costly. The access road must pass through Shell's property. There was a need to construct at least two bridges across some streams as part of the access road. On top of this problem was the contract with Guam Resource Recovery Partners (GRRP) to operate a waste-to-energy facility for the island. Additionally, the contract also gave the Government the option to have GRRP design and build a landfill for disposal of incinerator residues and waste not processed or reduced by the incinerator. While an ideal integrated solid waste management system would have recycling at the top of the waste reduction hierarchy and have incineration and landfill at the bottom, this contract provided for the opposite. As part of the contract, the Government of Guam must guarantee that waste reduction would be accomplished through waste-to-energy. As a result, the Guam Legislature passed Public Law 25-175 to make it illegal to reduce household waste by incineration and no public funds were to be used for any incineration. However, waste reduction by incineration has proven to be economical and environmentally safe in Hawaii and in many countries and can extend the life of a landfill.

As part of the Consent Decree, Guam is required to site and must design, construct, and operate a landfill that is fully compliant with Guam Solid Waste Disposal Rules and Regulations. As part of the agreement, the landfill must be in operation on September 23, 2007, or earlier. Within the constraints of the Consent Decree and in accordance with the 2000 ISWMP, the Government engaged in a site screening and site selection process. Based on the selection process, an area in Layon, Dandan, Inarajan, was selected for the future landfill site. An environmental impact statement and 40% design for the new landfill were completed as of August 4, 2005. The pre-Final (100%) Submittal Plans,

Specifications & Estimates for Layon Municipal sanitary Landfill, Inarajan, Guam, was submitted to Guam EPA in March 2006. The following environmental considerations were incorporated in the site selection process:

Water Protection
- Aquifer
- Ground Water
- Flood Plains
- Proximity to Drinking Water
- Surface Hydrology
- Wetlands
- Water Quality

Geology
- Bedrock
- Cover Soil Availability
- Fault Areas
- Hydrogeology
- Seismic Impact Zones
- Soils
- Topography
- Unstable Areas

On-Site Environment
- Air Quality and Wind Direction
- Wildlife Resources
- Archeological/Historical Resources
- Biological Resources (Habitat)
- Support Infrastructure
- Threatened and Endangered Species

Transportation
- Access
- Haul Routes
- Proximity to Waste Source
- Traffic Congestion
- Traffic Safety

Land Use
- Aesthetics
- Acreage Available
- Airport Safety
- Buffer Area Availability
- Existing Land Use
- Incompatible Adjacent Land Uses
- Mitigation Issues
- Noise Concerns
- Property Acquisition
- Property Devaluation
- Proximity to Sensitive Receptors
- Utility Availability
- Zoning

The Layon, Inarajan site will be designed, built, and operated in compliance with Guam Solid Waste Disposal Rules and Regulations and will incorporate the following:

- Access road
- Berms
- Liner system
- Leachate collection system
- Stormwater collection and disposal system
- Seismic design appropriate to site conditions
- Monitoring wells
- Security system.
- On-site soil cover source.
- Buffer zone.

More detail on the requirements for the landfill is contained in the performance standards section of this chapter.

6.2 Landfill With Minimal Waste Recycling

This solid waste disposal and waste diversion option addresses the scenario of continuing Guam's current practice consisting of the minimal recycling of two percent of generated waste, then landfilling the remainder as shown in Table 4.4. Although reliable recycling volume figures are not available at this time, the significant increase in recycling permits suggest that more than two percent of the total waste stream (municipal and others) is actually being recycled.

Relying solely on landfilling in combination with token minimal waste diversion will require a projected thirty-year landfill capacity of 14.0 million cubic yards (Chapter 4, Section 4.3.2.1). Based on a landfill and minimal recycling only scenario, the Layon Landfill site will have a capacity of approximately 18.1 million cubic yards based on the total footprint of 134.5 acres and a total site area of 330 acres, which will last for over thirty years. At this time, there are no plans to expand the Layon Landfill; however, significant additional capacity may be realized through efficient landfill operations, waste diversion, and advancements in future cell design technology. Preliminary design efforts suggest that as many as 40-50 years of landfill volume may be achieved without expanding the facility footprint.

Capital costs to construct the new MSWLF at $60 per ton are based on initial startup costs for landfill development, equipment, and two landfill cells. Each cell has a capacity of 500,000 tons and a lifespan of three years.

The cost for operating a sanitary landfill is estimated to be $20 per ton of waste, and must prudently include a sinking fund reserve to finance eventual closure and post-closure site improvements. Tipping fees are normally derived from sanitary landfill operating costs. In any event, landfill development and operating costs will be incurred under any combination of solid waste disposal and volume reduction schemes.

6.3 Landfill with Moderate to Aggressive Recycling and Composting

This scenario addresses the use of recycling and composting to achieve a significant diversion in solid waste volume and assumes the following:

1. The percentage and volume of recyclables and compostable material in the Guam solid waste stream is substantial and will support the use of recycling and composting programs to achieve significant MSW diversion.

2. The objective of achieving significant waste diversion through recycling and composting will require mandatory participation by commercial, institutional, and residential waste generators. Accordingly, for recycling and composting to be the primary solid waste diversion method, source separation, as follows, is expected to be mandatory:

    - Commercial solid waste generators will separate recyclables by category, non-recyclable dry waste, and wet wastes (food and green waste) for composting.

    - Residential solid waste generators will practice "curbside" separation and will separate dry recyclable and non-recyclable waste from wet waste, with the wet waste being suitable for composting.

3. A percentage of the solid waste stream will be diverted through source reduction and private recycling initiatives before waste is processed at the transfer stations.

4. Based on recent plans by DPW for the construction of the landfill in Layon, there is no proposed MRRF at the site. The waste transfer stations will be used as sorting stations, similar to MRRF's, as well as sites for the transfer of waste to be landfilled from collection trucks to larger transport vehicles. Tipping fees will be charged as required to fund construction, operation, and maintenance costs of the transfer stations and the landfill, as a profit-making enterprise.

5. Recyclables from commercial and residential waste generators will be collected by private haulers and will be delivered to either the transfer stations, MRRFs, or to private recycling enterprises.

6. The overall cost of recycling will be reduced by supporting recycling business enterprises through government-supported incentives such as GEDCA qualifying certificates, provision of land for operations, reduced tariffs, and other financial incentives.

The landfill capacity requirement for thirty years without increased recycling will be about 14 million cubic yards, with the Layon site providing for the ultimate disposal of waste. The life of this landfill will be greatly extended

beyond this design period as recycling and composting are implemented island-wide.

Landfilling in tandem with significant solid waste source diversion, household hazardous waste separation and separate disposal, recycling and centralized composting programs create an ecologically ideal MSW waste diversion and disposal reduction strategy for the following reasons:

1. Waste diversion will reduce the amount and toxicity of materials before they enter the waste stream and create benefits in terms of product reuse, reduced material volume, reduced toxicity, increased product lifetime and decreased consumption (See §7.8.5 for further discussion).

2. Growing public support for increased recycling and composting efforts is evident by recent public laws (e.g., PL 25-127, 27-37, and 27-38), which support recycling and composting programs and demonstration projects, and by the increase in number and size of recycling businesses.
3. Diversion of waste through recycling and composting will extend the useful life of the new MSW landfill for more than its thirty-year design.

4. Recycling promotes and supports the recovery of resources and the separation and removal of toxic and hazardous waste from the waste stream.

5. Composting transforms waste into soil conditioning products, which can be used by the community and Government of Guam agencies such as the Departments of Agriculture, Public Works, and Parks and Recreation, or be used to supplement soil cover material at the landfill.

6. Recycling and composting are environmentally friendly and treat solid waste as a renewable resource rather than a problem to be dealt with.

7. A full-fledged recycling industry will have a positive impact on the Guam economy through the creation of jobs and support services, such as trucking, storage, processing, and shipping of recycled products. Based on Guam EPA's research, there are currently 11 recycling facilities on Guam and the industry employs approximately 165 individuals. There are no materials recycling facilities on Guam, but storage and processing facilities collect, store, process, and ship recyclable materials overseas.

The biggest obstacles to establishing a recycling industry on Guam are the quality of recoverable recyclables and costs: cost for source separation, transport, waste processing, and shipping to markets in Asia and/or the U.S. mainland. The quality of recoverable recyclables will be significantly enhanced by mandatory source separation and materials recovery at transfer stations. Public Law 27-74 allows qualified companies engaging in recycling and transshipment of recyclable materials to receive qualifying certificates as per Public Law 25-127. Currently the market for all metals (ferrous and non-ferrous) is one of the highest. During the writing of the 2000 ISWMP, only two companies were

actively collecting metallic waste. Now there are 11 private collection sites that are permitted by Guam EPA. The overall cost for desired levels of recycling and composting might not be cost-effective. The planned approach here will be to privatize the collection, processing (through construction and operation of appropriate transfer station facilities), packaging, and shipment of recyclables to available markets that consistently produce the highest financial returns. The recycling process, in effect, will be a pay-as-you-go system. More to the point, the civilian community of Guam will pay for reduction of the solid waste stream by residential collection and transfer station or landfill tipping fees.

6.4 Recommended Disposal, Waste Diversion, and Reduction Approach

In order to arrive at an approach to the problem of proper and cost effective disposal and waste diversion, the combination of components to be considered must be evaluated on the basis of criteria, which are relevant to the attainment of the solid waste management goals and objectives. The evaluation criteria were grouped into five broad categories: (1) legal, (2) economic, (3) environmental, (4) social, and (5) political. Detailed discussions on each broad category, with respect to the recommended approach, are contained in the following sections.

6.4.1 Legal Considerations

Overriding criteria for selection of alternatives for waste diversion, recycling, and disposal are found in the federal and Guam laws and regulations and specifically in the Guam Consent Decree. These include PL 25-175, which prevents waste reduction by incineration. The laws and regulations are subject to change.

6.4.2 Economic Considerations

The policy of privatizing the collection, separation, recycling, and disposal of solid waste, including capitalization and costs of operations and maintenance, allows basic economic evaluations, assessments, and decisions to be made by the private companies involved. Although the Government of Guam will be expected to contribute some economic resources to the implementation of the 2006 ISWMP and will regulate the costs and fees for waste management services, the private companies licensed, contracted, and approved to implement waste management must be allowed to determine costs of doing business while meeting Government requirements. Their competitive bids based on their choices of alternatives will be grounded on economic considerations. Information on the economic factors considered by private bidders for management services can be provided under confidence to the Government during bidding processes. However, there should be no obstacle to independent, competitive, private development and operation of waste management facilities that meet legal requirements. Government requirements may include legal specifications on levels and methods of waste reduction, recycling, and disposal, with related costs being considered in the assessments and proposals by private operators.

6.4.2.1 Landfilling

Landfilling is unique in this analysis because it must occur as an integral part of any integrated solid waste system. The only true form of disposal for municipal solid waste is landfilling. Given that the recommended approach for solid waste management on Guam requires disposal of wastes in a landfill, it follows then that costs for landfilling will be required regardless of the combination of waste diversion selected. As the Government proceeds with development of the Layon Landfill, its development costs will be provided for. Operational cost alternatives will be proposed by the private companies bidding to operate the facility. For this reason, landfilling, and its attendant costs, was removed from the evaluation as an alternative in itself.

6.4.2.2 Landfill With Recycling and Composting (MSWLF/Recycle/Compost)

This recommended combination employs recycling and composting as the major methods of waste diversion, retaining landfilling of residuals and non-recoverable materials as the sole disposal option. Capital costs of land, facilities, equipment, etc., for recycling and for composting, and costs for operations and maintenance, will vary with Government requirements on timing, methods and relative amounts of waste to be recycled and composted and with subsidies and support by the Government.

6.4.3 Environmental Considerations

The evaluation of the recommended approach for waste diversion and disposal was based on following environmental criteria: (1) resource recovery; (2) production of useful material; (3) volume reduction; (4) impacts to air and land resources; (5) impacts to water resources; (6) impacts to living resources; (7) impacts to historical resources; and (8) sustainability.

Note: This evaluation was not a rigorous environmental impact analysis in the form of an assessment or study (i.e., EIA or EIS). An EIA must be project specific. The approach selected is therefore subjected to all applicable statutes, rules, and regulations, both local and federal.

6.4.3.1 Landfill with Recycling and Composting

This recommended combination of waste diversion methods achieves the best performance with respect to resource recovery and production of useful materials. The capture and beneficial reuse of recyclable commodities spans the spectrum of materials comprising Guam's MSW stream. The recovered materials can either be processed and reused (paper, aluminum) or converted into some other useful form (crushed glass aggregate, compost).

Recycling and composting operations will have minimal impacts to air, land, and water resources. Recycling involves limited processing, the majority of which is packaging-related and generates no emissions. Composting has the potential to generate noxious odors if not properly performed.

6.4.3.2 Landfill with Recycling, Volume Reduction, Incineration, and Composting

As a means of volume reduction, landfill with recycling and composting performs well, significantly extending landfill capacity. They do not achieve the best level of volume reduction as that afforded by incineration. However, incineration is eliminated from consideration on Guam by Public Law 25-175. Other technologies for waste reduction, which are established in the United States, are available and are being implemented on Guam. For example, in 2005 grinding and shredding methods were under development for reduction of tires, glass, green waste, and construction waste. The market for these volume-reducing technologies is expected to grow rapidly over the next five years. Maeda Pacific has been grinding concrete waste prior to hardfilling. These and other reduction methods are expected to become practical and economical for use on Guam.

6.4.4 Social Considerations

6.4.4.1 Landfill with Recycling and Composting

In light of the tremendous controversy and public debate surrounding the Waste to Energy (WTE) facility, which was eliminated by the Guam Legislature as an alternative from the 2000 ISWMP, increasing public acceptance of the recycling and composting alternative will likely be met with greater enthusiasm. In addition, the attention placed on the Ordot Dump has primed the general population for the impending waste diversion programs in which they will be asked to participate. However, the success of this alternative is dependent on a strong economic market for the practice. This cannot be discounted amidst the exuberance of a population which has indeed adjusted to a "recycling" mindset. If implemented, the requirement to recycle and pay attention to the disposal of MSW will result in an increased awareness of solid waste management issues.

6.4.5 Political Considerations

Political constraints bear on solid waste management facilities through political posturing, both within and between parties, regarding the proposed solutions to a variety of issues. There exists an atmosphere of general reservation between the executive and legislative branches that renders immediate, critical suspicion about any initiative for facility improvement. This often deeply contested process of checks and balances rarely yields better answers as a result of bona fide debate and critique; rather, the proposals often become so emasculated by opponents that, in the end, they fail to adequately address the very problems intended to be solved. Fortunately, the nature of these particular political constraints are subject to change without notice, and the possibility for forging successful alliances always exists. The impositions of the Consent Decree have somewhat diminished the impacts of political considerations. In any case, the political arena, from which policy and implementation strategies emanate, must be taken into account. The following analysis is done given the current political climate.

6.4.5.1 Landfill with Recycling and Composting

The implementation of this combination will achieve the best performance with respect to the satisfaction of legislative mandates for solid waste management. Any initiatives to implement this alternative should continue to be met with legislative support necessary to carry out the mandate of law. Such support makes this combination the easiest to implement.

6.5 Performance Standards

6.5.1 Ordot Dump

The Ordot Dump Closure consists of four major tasks that are identified in the Ordot Dump Permit for Conditional Use. These major tasks are as follows: (1) interim operations until closure, (2) dump closure design, (3) dump closure construction, and (4) post-closure remediation, maintenance, and monitoring. Each major task includes numerous subtasks that are detailed in the permit's compliance schedule.

Guam must undertake a new solid waste composition study (SWCS) to characterize the types and quantity of municipal solid waste generated to guide future landfill facility and recycling program design. At a minimum, a SWCS must be completed at least one year before this plan is updated in 2010, but more importantly, a SWCS should be completed over the next 2 years to guide recycling efforts and the design of future waste cells at the Layon Landfill. It is recommended that Guam EPA take the initiative to produce this study.

The functional and operational criteria for the Ordot Dump are incorporated into Guam EPA permit no. 05-060-LFL (December 2005). The legal and regulatory criteria, including the Consent Decree requirement, are also applicable to the Ordot Dump. The Consent Decree requires that the Dump cease to receive waste on the day the landfill opens or September 23, 2007, whichever is earlier.

6.5.2 Guam Municipal Solid Waste Landfill Facility

The Guam Municipal Solid Waste Landfill Facility (MSWLF) will be located in Layon, Inarajan. Modern municipal solid waste sanitary landfills are designed to protect the environment from the hazards associated with deposited waste. Primary consideration is given to the protection of subsurface resources (soil and groundwater), as well as vector control. The protection against subsurface contamination is accomplished through the use of engineering and operational controls. Vector control is accomplished through operation procedures designed to ensure adequate daily cover of filled material. The execution of design and construction efforts will be subject to the following performance criteria.

6.5.2.1 Functional Standards

A. The Layon facility is sized to receive thirty to fifty years of municipal solid waste.

Basis: The ISWMP and the Landfill Final Site Selection Report.

B. DPW must ensure a smooth transition for all billing and collection operations from the Ordot Dump to the Layon facility.

Basis: ISWMP

C. Design of the Layon facility should incorporate data collection systems recommended as part of this ISWMP.

Basis: ISWMP. The regular and consistent collection of data should be performed at all solid waste management facilities that receive and dispose, recycle, compost or otherwise handle solid waste. Such data can be used to verify or confirm estimated throughput, plan for future expansion or improvements, and as a management tool for streamlining operations.

6.5.2.2 Operational Standards

A. The Layon facility should be open for operation daily.

Basis: ISWMP

B. The Layon facility and all MSWLFs shall accept municipal solid waste from all on-island sources.

Basis: ISWMP. The MSWLF is sized for civilian, tourist, and military waste assuming minimal source reduction of 2%, an inflated (20% greater than the national average) waste generation rate of 5.28 pounds per capita per day (pcd), and a lifespan of at least thirty years, yielding a total capacity of 14,091,081 cubic yards, or greater. Source: DPW designs, plans, specifications, and estimates (Dec. 19, 2005).

C. Operation of the Layon MSWLF must achieve a minimum compacted landfill density of 1,100 to 1,200 pounds per cubic yard.

Basis: The Layon facility is sized based on a compaction rate of 1,100 to 1,200 pounds per cubic yard for a 30-year lifespan.

6.5.2.3 Legal and Regulatory Standards

A. All MSWLFs must meet siting and location requirements in terms of location, which address airports, wetlands, floodplains, seismic impact zones, fault zones, and unstable areas.

Basis: 22 GAR Artide 2, Section 23201-07.

B. All MSWLFs must be designed and constructed to ensure that contaminant levels in the uppermost aquifer at the relevant point of compliance are below those values listed in Table 1 of that section of the regulation, where the relevant point of compliance is defined as some point within one hundred fifty meters of the waste management unit boundary on land owned by the owner or operator.

Basis: 22 GAR Chapter 23, Article 4, Sections 23401 and 23403.

C. As an option to Item B above, the MSWLF may be constructed with a composite liner, consisting of a flexible membrane liner (FML) and an underlying compacted soil layer with hydraulic conductivity of no more than 1×10^{-7} cm/sec.

Basis: 22 GAR Section 23401

D. MSWLF units must be designed and constructed with an approved groundwater monitoring system.

Basis: 22 GAR Chapter 23, Article 5.

E. All MSWLFs must be designed, constructed, and maintained with stormwater (run-on/run-off) control systems for discharge from a twenty-five year storm.

Basis: 22 GAR, Section 23309.

F. Operation of all MSWLF units must include provisions for excluding the receipt of hazardous waste, cover material, disease vector control, explosive gas control, air criteria, access requirements, preventing impacts to surface water, restricting receipt of liquids, and record-keeping.

Basis: RCRA Subtitle D - 258.20.

G. Operation of MSWLF units must include groundwater monitoring that addresses detection monitoring, assessment monitoring, and corrective action.

Basis: 22 GAR Chapter 23, Article 5.

H. Landfill facilities and operations shall be privatized in accordance with the laws of Guam.

Basis: Public Laws 24-06 and 24-272.

I. DPW to administer, supervise, and fulfill the responsibility of Government of Guam in any contract for the development and operation of new landfill.

Basis: Public Laws 24-06 and 24-272.

J. Guam EPA to issue permits for the design, operation, maintenance, and modification of all solid waste management facilities.

Basis: 10 GCA, Chapter 51, Sections 51103 and 51104.

K. Request for Proposals for new landfill facility to be finalized through the bidding process under Guam procurement law.

Basis: Public Law 24-06.

CHAPTER SEVEN: RECYCLING, COMPOSTING, AND SPECIAL WASTE

This Chapter focuses on the activities of recycling, composting, and proper disposal of special waste; it also focuses on the special considerations of waste reduction opportunities and curtailing of illegal dumping, all of which are components of integrated solid waste management. In general, waste separation and diversion allows for the activities of recycling, composting, and proper disposal of special waste. These activities lead to waste reduction prior to landfilling. Waste separation is the separation of recyclable, compostable, and special waste materials and occurs either at the source, or point, of waste generation, or at transfer stations and materials recovery facilities or at the final disposal site. Recyclable materials are then sent to processing facilities. Likewise, compostable materials are then sent to composting facilities. Special wastes such as white goods, household hazardous waste, automotive batteries, and abandoned vehicles are handled differently from recycling of other municipal solid waste. Other considerations include other waste reduction opportunities and addressing illegal dumping.

7.1 Recycling

Public Laws 24-304, 24-272, and 21-22 require the reduction of Guam's solid waste stream through various means. Recycling is the most effective and environmentally acceptable means of reducing the municipal solid waste stream. Based on a recent study, the average national recycling rate was thirty percent (U.S. EPA 2005). Guam's recycling rate is estimated to be between two and six percent.

7.1.1 Guam's Recycling Facts and Figures

Recycling practices on Guam provide for the recovery of paper and paperboard, non-ferrous metals (post-consumer aluminum, scrap copper, brass, lead), ferrous metals (vehicles and other ferrous metallic waste), waste tires, and waste oil from the municipal and non-municipal solid waste stream. The recycling efforts appear to have increased and improved since the 2000 ISWMP.

The atmosphere is right for doing recycling on Guam now. The Asian market for both metal and waste paper is bright. Thousands of junk cars have been removed and shipped to recyclers since the 2000 ISWMP. The Guam Public School System (GPSS) is creating environmental clubs to collect aluminum cans. Ambros, Inc., of Guam, in conjunction with other local businesses and in coordination with Guam EPA, is currently sponsoring a project to place aluminum recycling bins in most of the public schools, some private schools by fall of 2006, and ultimately in all the schools on Guam. There is an increase in the recycling of paper, paperboard, nonferrous metals and ferrous metals. Based on data obtained from the companies that receive recyclable materials (see Table 7.1), both the type of recycling activities and the amount of recyclables processed and diverted from the Ordot Dump increased from 2000 to 2005.

Table 7.1 Solid Waste Recycling from Recycling Facilities

Waste Item	1999	2000	2001	2002	2003	2004	2005
C&D (yd^3)	24,577	54,169	52,968	64,846	374,485	301,061	231,222
Cardboard (tons)	600	600	960	1569	1230	1911	1615
Newsprint (lbs)							145,700
Loose Paper (lbs)							232,542
Automobiles (tons)				10	4,035	4,061	4,081
Automobiles (units)					6,025	6,127	6,335
Heavy Equipment					2,000	2,100	2,200
Scrap metals (tons)				240	2,000	2,673	7,042
White Goods (tons)					2,003	2,070	2,016
Alum. Cans (tons)					37	14	200
Other Alum (tons)					108	55	97
Copper (tons)					15	15	97
Brass (tons)					15	15	55
Automobile Batteries (units)					1016	13,904	5348

However, there is a need to increase recycling activities to address plastics, green waste, and other recyclable materials. In addition, one must anticipate the rising and falling or the buying and selling power of recyclable materials, thereby requiring the need to support recycling activities of these unmarketable materials at such times. This could be accomplished through additional funding support from importers, businesses, consumers, governments, and grants.

7.1.2 Recycling Efforts within the Community

Behavioral change by residents, businesses, and government is one aspect of improving recycling on Guam. Through public outreach programs and incentives, as well as providing the convenience of recycling, the community of Guam must share its responsibility to recycle.

Residential recycling is currently voluntary. Residential recycling includes non-ferrous metals, scrap metals (including automobiles) and white goods, cardboard, and some newsprint. One of the driving forces for most residents to recycle is the "selling power" of recyclable materials. In the past, in order to recycle or dispose of bulky waste, one had to pay for the proper disposal, such as with metallic waste. Currently, some recycling companies are offering to pay consumers a small fee for bringing in certain types of recyclable materials to their recycling facilities, such as car batteries, computers, and ferrous metals. However, illegal dumping still exists due to the inconvenience of transporting these types of waste to recycling facilities.

Commercial recycling is also currently voluntary. Many businesses recycle cardboard, newsprint, and loose paper. The major reason for the limited recycling effort by the business sector is the need to generate sufficient quantities of recyclable materials to be cost effective. In addition, there is the need to provide convenient locations and facilities for recycling of other materials.

Guam EPA commenced a pilot project in late 2005 for the purpose of implementing various recycling and waste reduction laws within Government of Guam agencies. The program expanded in early 2006 to include all Government of Guam departments and agencies. Public Law 24-304 requires all Government of Guam agencies to recycle aluminum cans and paper and to assign a recycling officer within each agency. Previously, two laws were passed which also require Government of Guam agencies to recycle. Public Law 21-22 requires GSA to purchase biodegradable materials, and Public Law 21-73, known as the Government of Guam Aluminum Container Recycling Act, also requires the Government of Guam to recycle aluminum cans at all offices. Under these mandates, Governor Felix Camacho signed Executive Order 2003-17 (EO 2003-17) on May 13, 2003, for all Government of Guam agencies to implement the following:

1. Source Reduction
2. Pre-Sorting of Waste
3. Designation of a Recycling Compliance Officer (RCO) and alternate.

Each agency or department is required to designate an RCO and alternate whose charge is to educate and oversee implementation of recycling at their respective agency or department.

Guam EPA oversees the implementation of EO 2003-17, and has organized the Recycling Compliance Officer (RCO) group to implement it.

The Government of Guam can set the tone for the rest of the island by taking the lead in implementing recycling programs government-wide and can thus play a significant role in extending the lifespan of the Layon Landfill beyond the 30-year expected usage.

Guam has several groups that have been very active in promoting recycling and waste diversion within the community. There is the Recycling Association of Guam, the Friends United Through The Understanding of Recycling Efforts (FUTURE) Committee, and other groups referenced in Chapter 8 of this Plan update.

7.1.3 Future Recycling Efforts

To ensure that the life of the Layon Landfill is extended, recycling efforts on Guam must increase. Current activities such as public outreach, public support, and public programs must be encouraged to educate the community of Guam regarding the benefits of recycling. These activities may also create new jobs and minimize illegal dumping.

In addition, importers, consumers, businesses, and local and federal government must all do their part in supporting, participating in, and implementing recycling events and activities on Guam. In addition, the cost of recycling will also have to be shared by everyone in the community.

If voluntary recycling is not supported, then laws must be passed to require mandatory recycling. This will also help to ensure that recycling becomes a stable industry, which is critical to the continued implementation of the 2006 ISWMP.

The following laws are Guam's attempts to support recycling activities on Guam:

Public Law 27-37 - An Act to Create a Municipal Recycling Program. All fees collected from recycling activities from the Municipal Recycling Program within each village will be deposited into the respective Municipal Recycling Proceeds Fund. Currently, this law has not been implemented due to lack of funds and lack of trained employees at DPW.

Public Law 27-38, as amended by PL 27-148 and PL 28-05, entitled An Act to Create a Recycling Revolving Fund (also known as the Advance Disposal Fee Law) creates a Recycling Revolving Fund and imposes recycling fees at the point of sale on imported automobiles, buses, trucks, heavy equipment, white goods, and tires where applicable under the Use Tax laws. This law has not been implemented due to administrative difficulties and proposed alternatives.

Bill 232, introduced November 7, 2005, proposes to establish a Recycling Fund under Guam EPA administration, which will receive $25 annually for each motor vehicle registered on Guam. The funds would be administered by Guam EPA for grants and contracts. The contracted work to assist in recycling would be administered by the DPW or the Solid Waste Authority.

7.1.4 Performance Standards

Recycling is integral to long-term effective reduction of waste disposal at the landfill. Recycling will be affected by such factors as social policy, market demand, commodity supply, operational costs (labor, shipping and transport, collection) and tax incentives. In addition, recycling facilities and operations should be able to accomplish the stated objectives subject to applicable local and Federal laws.

7.1.4.1 Functional Standards

A. Recycling must reduce the MSW stream by a minimum of twenty percent (20%) by the Year 2010. (See Chapter 3)

   Basis: PL 24-304 and this ISWMP.

B. Recycling should incorporate the design and development of a Materials Resource Recovery Facility (MRRF) or similar facilities that can achieve the necessary recovery rates.

   Basis: MRRFs are an integral part of the volume reduction and disposal method recommended as part of the ISWM system. The recommended collection and transport method and the integrated

approach to solid waste management require the implementation of materials resource recovery.

C. Recycling operations and facilities should allow for the convenient collection and/or drop-off of recyclable commodities in order to encourage and promote widespread participation.

Basis: By designing the collection of recyclable commodities to be convenient and easy, it encourages the recycling approach to waste reduction. The drop-off of recyclables at the transfer stations and/or other designated locations provides options for those who may not have access to curbside collection services.

D. Recycling collection and drop-off facilities should be provided, at a minimum, at transfer stations and village community centers (or mayor's offices).

Basis: This defines the minimum locations essential to obtain the objective of Item B above. While the transfer stations provide convenience to those who may not have access to curbside collection services, they also promote public awareness and encourage a shift in disposal practices within each village community. Public Law 27-37, Municipal Recycling Law.

E. Design of recycling operations and facilities such as MRRFs shall be coordinated with data collection system activities to ensure that an adequate database exists for design purposes.

Basis: Data collection activities shall include the identification of recyclable commodities (wet and dry), their quantities and collection and recycling methods.

F. The MRRFs and recycling operations shall include provisions for the regular or periodic recovery of the following materials:

- Paper and paperboard,
- Non-ferrous metals: aluminum, brass, copper, lead,
- Ferrous metals,
- White goods,
- Batteries (lead-acid, nickel-cadmium),
- Plastics,
- Glass,
- Rubber and tires,
- Used motor oil.

Basis: Through the attainment of Item E, the collection frequency and recovery of the above items can be determined based on data collected.

G. Recycling operations should include incentives, such as qualifying certificates and waivers of transshipment fees for recycling based industries. Restrictions calling for export of recycled products to obtain incentives should be revised to encourage end use of recycled products on Guam.

Basis: PL 25-127 and 27-74. To encourage recycling, incentive programs should be initiated. Examples would include tax incentives for distributors who purchase recyclable plastics and glass containers; monetary incentives for individuals who transport recyclable commodities directly to any of the collection and/or drop-off facilities.

H. Community, business, consumer, NGO and governmental subsidy and financial support of various recycling operations at certain times when the marketing of certain recyclable materials does not exist, or is not profitable.

Basis: To encourage, support, and maintain recycling companies to continue operations and provide services to the community.

7.1.4.2 Operational Standards

A. The MRRFs shall have a minimum operational capacity of 20% of the MSW stream and shall be expandable to accommodate the requirements of this plan and all future updates.

Basis: 2006 ISWMP.

B. The location determined for the MRRF sites and transfer stations must undergo a comprehensive study to ensure maximum usage and participation.

Basis: 2006 ISWMP.

C. The MRRF facilities must be designed to accommodate drop-offs from self-haulers and commercial haulers.

Basis: 2006 ISWMP.

D. The MRRF facilities must be designed to accept all types of recyclable materials for processing and marketing.

Basis: 2006 ISWMP.

E. The MRRF facilities must be designed to obtain data on the volume and weight of each type of recyclable material received, processed, and transported to on-island or off-island recycling companies.

Basis: 2006 ISWMP.

F. Recycling facility operator(s) must coordinate with Office of Recycling and Guam EPA in the promulgation and execution of a public education strategy.

Basis: Success of the public education strategy will be enhanced by the participation of actual recycling operators with valuable knowledge to pass along to target audiences.

G. Recycling facilities shall be open for the convenience of public access.

Basis: Promotes recycling, and the operating permit requires it.

7.1.4.3 Legal/Regulatory Criteria

A. Operation of recycling facilities must not violate applicable air, water quality, and other environmental standards or regulations, as well as safety, transport, and zoning laws.

Basis: All facilities must comply with federal and local laws and regulations.

B. Guam EPA to issue permits for the design, operation, maintenance, and modification of all solid waste management facilities, including recycling.

Basis: 10 GCA Sections 51103 and 51104.

C. Solid Waste Management Division of DPW to administer contract for selected recycling facilities and operations.

Basis: 10 GCA Chapter 51, Article III-IV, and other recycling laws.

D. Guam EPA and the Solid Waste Management Division shall establish and manage a promotional program for recycling on Guam.

Basis: Public Laws 24-272 and 24-304.

E. Department of Administration General Services Agency and other Government of Guam entities shall amend their procurement regulations and contracts to use recycled and biodegradable products. Guam EPA shall monitor and enforce purchase of biodegradable, reusable, recyclable, or recycled products by the Department of Administration General Services Agency and other Government of Guam entities.

Basis: Public Laws 21-22 and 24-304.

F. The Department of Public Works and other Government of Guam entities shall require paving projects to use crushed glass.

Basis: 5 GCA.

G. All Government of Guam departments, agencies, and instrumentalities shall make every effort to reduce solid waste by recycling and buying recyclable and biodegradable products.

Basis: Public Law 24-304.

H. Each director, manager, or agency head shall insure regular collection of recyclable materials and maintain records and forward recorded data to Guam EPA, which shall post the data each year.

Basis: Public Law 24-304.

7.2 Composting

Composting is an integral part of the volume reduction strategy. Composting is the biological decomposition of the biodegradable organic fraction of MSW under controlled conditions to a state sufficiently stable for nuisance-free storage and handling and for safe use in land applications. It differs from the natural decay of materials that takes place in landfills because it occurs under controlled aerobic conditions. Composting is an accelerated version of the natural decay process, which can include many types of waste in addition to yard waste, clippings, etc. Under certain conditions (i.e., optimal levels of oxygen, nutrients, moisture and temperature, along with small particle size), composting, and the consequent creation of humus, can be accomplished in a minimum of four to six weeks. Humus is the crumbly, pleasant smelling, soil-like final product of the composting process, which can be incorporated into vegetable and flower gardens or added as a soil amendment to lawns or other areas of land to improve soil quality and prevent erosion.

Some of the benefits of composting are:

- Keeps organic wastes out of landfills,
- Provides nutrients to the soil,
- Increases beneficial soil organisms (macro-organisms such as earthworms and centipedes, and micro-organisms such as bacteria, fungi and actinomycetes),
- Suppresses certain plant diseases,
- Reduces the need for fertilizers and pesticides,
- Protects soils from erosion,
- Assists pollution remediation.

Factors to consider in choosing a composting method are speed, labor, and costs. There are four general methods of composting: passive, aerated piles, windrows, and in-vessel. The first two methods are mainly used for home or small-scale operations. Windrows and in-vessel composting are utilized in farm scale or industrial sized operations.

Passive composting is the simplest, lowest cost method, and it requires little or no management. The materials are simply stacked into piles and left to decompose over a long period of time. This method can produce objectionable odors due to anaerobic conditions and is not suitable for large quantities.

Aerated piles are a more productive form of passive composting. Perforated pipes are placed within the pile, which supply the pile with oxygen and thus promote a faster rate of decomposition. Mixing the material well also speeds up the process. Blowers and chippers may be used to provide more efficient composting. Blowers force oxygen through the piles while chippers grind the materials to produce smaller particle size and provide for easier mixing. This method produces compost faster with minimal labor and costs. Costs are increased when blowers and chippers are used.

Windrow composting involves long narrow piles, called windrows, which can vary in height and width depending on the materials and equipment available for turning. Windrows are turned or incorporate forced aeration for efficient composting. This method allows large quantities of waste to be composted. Windrows can range from three feet high for dense materials, to as high as twelve feet for lighter, more porous materials like leaves. The process starts as the materials are mixed together, with the yard waste and paper waste having been processed through a chipper and shredder, respectively. Water is added to aid in decomposition and then the waste is formed into windrows. Windrows are turned periodically to add oxygen, mix the materials, release excess heat, and expose all materials to the high interior heat that kills pathogens. When using forced aeration, materials must initially be mixed well for windrows because they are not regularly turned. When turning windrows to provide oxygenation, it may be necessary to turn daily or even several times a day to maintain sufficient oxygen levels. If objectionable odors develop, that is a signal that turning is required to provide increased aeration and reduce moisture content. Turning can be labor intensive depending on the equipment being used. Turning equipment can include front-end loaders, an old plow and a farm tractor, or specialty machines such as windrow turners. In addition to requiring turning equipment and a large area for the windrows, the operation will also need a source of water, dial thermometers and an oxygen meter. The instruments are placed in the windrow for monitoring temperature and oxygen content and are removed for turning.

With frequent monitoring and essential turning, composting time can vary from weeks to a couple months depending on the material being composted. Once completed, the compost should be stored in large bins for further curing, screened, and either given away or sold. Larger particles that were screened are returned to the windrows. This method allows for large quantities to be composted in a relatively short period of time and produces a high quality product. However, this method requires a large land area, is labor intensive, and costs for equipment can be high.

With in-vessel composting, the materials are composted within a container such as a tank or reactor. This method provides for total control and optimization of

aeration, temperature and mixing. In-vessel composting eliminates weather problems and the dissemination of odors; therefore, operators are able to process compost in highly populated areas. Types of in-vessel composting are reactors in which the air goes in at the bottom and the exhaust is captured for odor control at the top, agitated bed systems, and rotating drums.

7.2.1 Yard Waste Composting Efforts within the Community

Guam residents are beginning to realize the benefits of recycling their leaves and yard waste; not only are these materials taken out of the waste stream, but they are recycled into beneficial products such as compost or mulch that can return nutrients to the soil or be used in residential landscaping projects. However, the residents of Guam are not fully implementing backyard composting, which can be beneficial for their personal use, and can minimize waste generation from their homes.

While we are anticipating industrial type composting, we can continue with wood chipping and grinding programs for residential, landscaping, and agricultural activities. This proved to be very effective following Supertyphoon Pongsona and Typhoon Chata'an, and other previous typhoons. Composting of green waste after typhoons has been successful. Residents, businesses, and government agencies have utilized the compost materials for agricultural and landscaping purposes. A ban on all green waste except those in trash bags will greatly reduce the amount of waste going to the landfill. Nearly forty percent of the waste disposed of at the Ordot Dump is green waste. Guam EPA has required the Department of Public Works to implement a waste diversion program for green waste by July 2006 as part of the Solid Waste Disposal Facility - Ordot Dump Permit.

Although there are no permitted composting facilities on Guam, the University of Guam (UOG) College of Natural and Applied Sciences, under the direction of Soil Scientist Dr. Mohammad Golabi, has been conducting research for the improvement of soil fertility using composted animal waste and green waste as part of the test variables. The Guam Legislature granted $50,000 to UOG for the purchase of a windrow turner in furtherance of this research. The windrow turner will be used to accelerate the composting process. This research could provide the basis for island-wide composting, which could ultimately divert up to 50-60% of the waste stream from entering our landfill.

7.2.2 Future Composting Efforts

Composting must be emphasized and encouraged at the residential and community level, since these are the major sources of yard waste. In addition, backyard composting can also handle other organic and food waste generated by residents. The village mayors and other village businesses should be able to support and participate in community composting efforts.

Composting by landscapers, grounds maintenance companies, nurseries, as well as farmers should also be encouraged and supported. Support of such activity

can be accomplished either through established regional composting facilities or self-composting activities by these companies.

Composting may also take place at the new Layon Landfill site or at local transfer stations. The method of composting that seems most suitable for application at these sites appears to be either windrow or in-vessel composting. Selection of the appropriate method will require a detailed analysis of the conditions at these sites and the available space. Such analysis should be conducted prior to final negotiations with a private contractor or during the design phase. More detailed information regarding specific performance requirements is included at the end of this chapter.

7.2.3 Performance Standards – Composting Operations

7.2.3.1 Functional Standards

A. A minimum of 5% of the green waste stream must be composted by July 1, 2007, and a minimum of 15% must be composted by July 1, 2010.

Basis: 2006 ISWMP

B. Design of composting operations and facilities shall be coordinated with data collection system activities as support for design purposes.

Basis: Data collected can confirm or verify the estimated throughput for a given period, the moisture content of the waste stream to be processed, and can be used to determine the most appropriate composting method for the site.

C. Composting operations shall provide and encourage the use of their product in home gardening and farming to promote reuse of organic waste in the community.

Basis: Encouraging the use of finished compost material by consumers creates demand for the finished material and contributes to the continued success of the program.

D. Composting facilities shall include contingency provisions for the effects and after-effects of typhoons and earthquakes, which occur frequently on Guam.

Basis: Green waste, such as yard landscaping debris and roadway maintenance debris, is generated at elevated quantities immediately after typhoons and earthquakes. Composting facilities should be designed and operated to manage these peaks in volume.

7.2.3.2 Operational Standards

A. The composting facilities shall accept green waste from all on-island sources.

Basis: To accommodate 15% of the island-wide green waste stream.

B. Operation of composting facilities must not violate applicable air and water quality standards or regulations.

Basis: All facilities must comply with federal and local laws and regulations.

7.2.3.3 Legal and Regulatory Standards

A. Composting, in combination with recycling, must account for a minimum 20% reduction in volume of MSW on Guam.

Basis: 2006 ISWMP

B. The composting facilities must meet siting requirements in terms of location, with respect to flood plains and wetlands, etc.

Basis: Local and federal land use and wetland laws and ISWMP. Composting facilities and landfills share functional concerns, such as odor and vector control.

C. Composting rules and regulations shall be in place prior to the development of the facility.

Basis: In order to effectively manage the design, construction, permitting and operation of the facilities, there will need to be, at the very least, interim operating rules and regulations against which to evaluate performance of the system.

7.3 Special Waste

7.3.1 White Goods

"White goods" are defined as household appliances such as washers, dryers, refrigerators, air conditioners, etc. Although the disposal of white goods has been historically problematic, currently Asian markets for metallic wastes have made it more convenient and profitable for customers to recycle their white goods. The biggest problem with the redemption of white goods is the requirement to have freon in the units removed prior to delivery to the metal processing facilities. In the past years local processing companies have charged $25 for each unit. A pick-up truck full could cost nearly $200. In 2005, companies were buying air conditioners at nine cents a pound. A unit now has a value of about $6. Two metal recycling companies are now buying both ferrous and non-

ferrous metal. The general public should take advantage of the current market situation in Asia. Guam EPA has recently updated its Guam Recycling Guide, which identifies recycling companies and what recyclables they accept from the public.

In 2003, Public Law 27-38 and its amendments (PL 27-148 and PL 28-07) were passed to establish a recycling revolving fund to provide for proper disposal of white goods and other recyclable materials. In addition, this law required Guam EPA to establish regulations for the administration of the fund, for collection of recycling fees by the Guam Customs and Quarantine Agency, for creation of standards for recycling centers and recycling facilities, and at the same time provide for refunds for the recycling of recyclable materials to consumers. Guam EPA did create and submit regulations based on this law; however, due to concerns regarding the increased administrative responsibilities placed on those affected, the regulations were disapproved and new revisions to the law have been proposed in bill form by the Guam Legislature.

Proper disposal of white goods by residents has been inconsistent, just like the disposal of any recyclable material. The availability and convenience of disposal sites for white goods have always been a challenge. This leads to the illegal dumping of white goods, which are visible around our island. Unless curbside collection of white goods and other bulky materials is in place, illegal dumping will still occur.

Therefore, as required by Article 3 of 10 GCA Chapter 51, the Department of Public Works must also include the collection of white goods as part of its collection of abandoned vehicles.

7.3.2 Household Hazardous Waste and Automotive Batteries

Household hazardous waste, to include automotive batteries, is special waste generated by individual homes. This waste is excluded from sanitary landfills. Improper storage and disposal of household hazardous waste (HHW) is associated with accidental poisonings, worker health and safety, equipment damage, and environmental contamination of surface and groundwater. Heavy metals such as lead, zinc, copper, nickel, mercury and cadmium enter the waste stream via residential sewage and urban run-off. Because of its impact to the island's surface and groundwater, diversion of household hazardous waste must be implemented. Since the implementation of *Hasso Guam!* in 1993, Guam EPA has provided to the community a proper method for household hazardous waste disposal. Through this program of education and outreach, community awareness and participation has increased dramatically over the years.

The collection of household hazardous waste was implemented in 1993 and has continued on an annual or semi-annual basis since then. Table 7.2 provides a summary of some types of household hazardous waste collected in the *Hasso Guam!* events in 2004 and 2005. Combining the quantities collected each year, approximately 8,325 gallons of used oil, 9,745 gallons of used paint, and 6,776 lead acid batteries were diverted from the dump and recycled. Consolidated

grant funds from U.S. EPA have played a crucial role in funding this collection program. However, as part of the Consent Decree settlement, Government of Guam must perform a one million dollar supplemental environmental project (SEP) for the diversion of household waste. Guam must develop an interim collection system, establish a permanent collection facility for all household hazardous wastes, and prepare a *Household Hazardous Waste Diversion for Island Communities Guide*. The funding for this SEP program must be local.

Table 7.2 Household Hazardous Waste Collection

Description of HHW	2004	2005
Used Oil (gallons)	4200	4125
Flammable Paints (gallons)	2365	1480
Latex Paints (gallons)	2475	3425
Lead Acid Batteries (Automobile) (pieces)	3681	3095
Fluorescent Light Bulbs (pieces)	1151	2100

In addition to the Guam EPA's *Hasso Guam!* collection events, there is ongoing collection and acceptance by other local environmental companies of these waste items, but a fee is assessed.

7.3.3 Abandoned Vehicles

Recent experience on Guam has shown that the abandoned vehicle problem is quite significant. There have been major attempts by Guam EPA, DPW, and the Attorney General's Office to resolve this problem of abandoned vehicles. Within the last two years, the battle over the streetlight fund and recycling fees created much interest, as well as awareness for the need for a permanent funding program for the collection of special wastes. The so-called "Abandoned Vehicle Fund" (AVF) was for many years a misnomer. The name suggests that it is for the collection of all vehicles that are abandoned. Every automobile owner pays a fee every year for this program. However, only ten percent of the funds collected were to be used for the collection of abandoned vehicles. Unfortunately, the collection of abandoned vehicles under the program was a failure as evidenced by the staging of junk cars at the Malojloj, Agat, and Dededo transfer stations. Hundreds of cars were staged in these locations but were never processed and removed from the island. Based on statements from DPW, towing companies were charging DPW up to $200 for each vehicle that they removed under the AVF program. The program stopped but the collection of the funds continued. The spending of the AVF was never resolved.

In 2005, DPW implemented a pilot project for the collection, transport, recycling, and disposal of abandoned and junk vehicles. In the 2005 pilot project, DPW's contractor removed 1,189 vehicles just from the villages of Yona and Dededo. In addition to processing these individual vehicles, a total of 180 automobile batteries, 726 engine components, 706 transmissions, 68 auto air conditioners, and 1,417 tires were collected and properly disposed of. In 2006, DPW was

expanding this program to serve the entire island and to include the collection of white goods.

Public Law 23-64 requires the Director of Public Works to advertise and contract for the collection of abandoned metal implements over which DPW has jurisdiction and the right to dispose. DPW cannot charge the owner a fee for the scrap metal. However, abandonment of vehicles and other metallic waste on government land or rights of way is illegal. It can result in litter citations or prosecution for misdemeanor crimes for failure to abate a public nuisance under 10 GCA Chapter 20.

In order to address the abandoned vehicle problems, amendments to Public Law 27-38 (as amended by PL 27-148 and PL 28-07) were being considered by the Guam Legislature. Bill 232 would require annual recycling fees paid at vehicle registration to be administered by the Guam EPA and used to subsidize the collection, processing, recycling, and disposal of all recyclable materials in the priority of junk vehicles, tires, batteries, and white goods.

In late 2005, eleven recycling companies were actively collecting or accepting all types of metallic wastes. But because there is a requirement for the removal of engine oil, differential oil, freon and fuel from junk vehicles, recycling companies have been reluctant to deal with junk cars. Only one permitted recycling company was accepting junk cars in 2005. A continuous collection system will depend on a government subsidy program.

7.3.4 Waste Reduction Opportunities

It is unquestionable that reduction of the amount of waste generated at the source is one of the keys to effective solid waste management. Waste reduction can be achieved through the elimination of excess packaging, production of more durable goods, reuse of product packaging, and promotion of responsible consumer packaging. Potential source reduction options that involve regulating the production of packaging cannot be effectively implemented on Guam. However, with regards to the use of packaging, it is important that, to the extent practical, the "Three Rs" be followed as part of Guam's overall waste management strategy as follows:

1. Reduce use of containers
2. Reuse containers
3. Recycle containers.

Successful implementation of programs which address container and packaging use reduction and reuse could result in a significant reduction in Guam's (per capita) solid waste generation rate and, in turn, a significant reduction in recycling processing and required landfill capacity. The study of the feasibility and subsequent implementation where applicable of the following source reduction policies must be seriously considered by the government in cooperation and consultation with applicable private sector industries as public awareness of solid waste management issues increases:

Policy	Description
• Taxation	A tax on one-way containers that is high enough to make refillable or reusable beverage containers an attractive alternative to consumers.
• Ban	Ban the sale of one-way containers.
• Quotas	Require beverage manufacturers to package a certain percentage of their products in refillable containers.
• Deposit	Require a deposit on one-way containers to create an environment in which refillable containers can effectively compete.
• Differential Deposits	Require deposits on one-way and refillable containers, but only a fraction of the deposit is refunded on one-ways to increase the competitive advantage for refillables.
• Deposit/Refund	Consumers pay a deposit (say, 10 cents) on each beverage container purchased. A refund (say, 5 cents) is given for each container returned. The remainder of the deposit is used to fund collection, recycling, and education programs. This can only be effective in conjunction with a one-way container ban, taxation, or quota system.
• Mandatory Recycling Rates	Set mandatory recycling goals for one-way container types (beer, soft drink, wine, liquor, etc.) or for material types (glass, steel, plastic, aluminum). Require deposits if goals are not met.

Unfortunately, in a free market society such as ours, to reduce material consumption is viewed as economic meddling. To implement source reduction policies requires a radical change in current consumer attitudes, strong political will, and, in the final analysis, cooperation with the private sector.

We emphasize that the feasibility of implementing any or a combination of the above policies must be preceded by a thorough feasibility study and analysis that takes into consideration the impacts on consumer practices and acceptance, Guam beverage manufacturing and distribution industries, and achievable waste reduction gains.

7.3.5 Illegal Dumping

Illegal dumping activities are still an ongoing problem on Guam. According to Guam EPA data, there appears to be an increase in the illegal dumping activities around the island. The dumping appears mostly on isolated government properties, especially in the northern part of the island where the population is denser and more government (local and federal) properties are located. Illegal dumping is difficult to detect. The most that can be done is to minimize the conditions that contribute to the public's participation in this illegal act. These conditions are likely to be the following:

- Mistaken belief that dumping is legal and harmless: Illegal dumping is a crime punishable under both the Solid Waste and Litter Control Act, 10 GCA Chapter 51, Articles I and II, and the Public Health and Sanitation Law, 10 GCA Chapter 20, for failure to remove the material which creates a public nuisance.

- Dissatisfaction with MSW collection service: This can only be addressed by providing consistent collection service. Implementation of privatized residential collection may go a long way in achieving this end.

- Ignorance of the negative impacts associated with illegal dumping: Public education efforts to relay the negative impacts, as well as to encourage reporting of illegal dumping activities, should be undertaken as part of the SWM Plan's public education strategy.

- Perceived inconvenience of hauling waste to a transfer or disposal facility: For those who dump illegally because it is easier than proper disposal, only a fundamental shift in disposal attitudes will adequately address this problem. Public education and increased enforcement may be two solutions applicable to this problem. In order to facilitate enforcement and ensure reasonable penalties that can actually be assessed and collected, implementing a system of penalties that vary based on the severity of the violation may be appropriate. When combined with public education efforts, such a measure can effectively reduce illegal dumping.

- Resistance to pay costs of disposal: Charges from private operators for white goods and metallic waste disposal in the past have discouraged the public from properly disposing these wastes.

CHAPTER EIGHT: PUBLIC EDUCATION STRATEGY

The development of a comprehensive public awareness and involvement program is central to the success of integrated solid waste management (ISWM). While incorporating elements from successful programs elsewhere, considerable effort has been made in this Plan to examine Guam's unique population and environment in order to meet the needs of the entire community.

8.1 Purpose and Objectives of this Strategy

8.1.1 Purpose of this Strategy

Five target audiences on Guam have been identified, and each will benefit from specific public education and information programs tailored to its situation. They are:

- Schools,
- Commercial and tourist businesses,
- Government of Guam agencies and institutions,
- General public,
- Military installations.

The purpose of this public education and information strategy is to outline the needs of these groups with regard to their public awareness and understanding of SWM, to suggest ways in which their participation in an ISWM public information and education program can be encouraged and secured, and to recommend some general activities to be promoted for, by, and among these groups.

8.1.2 Objectives of the Public Information and Education Strategy

Public information and education programs are expensive but essential for public acceptance of and participation in Guam's ISWM. Because the various target audiences require different approaches, a professional, consistent, and well-funded effort should be established with the following objectives:

- The Guam Environmental Protection Agency (Guam EPA), through its Solid Waste Management Program and Information Services Branch (Guam EPA), will oversee the development and distribution of ISWM information to the general public, consistent with the Solid Waste Reduction Act, PL 24-304.

- Upon full staffing and operation of its public information program, the Solid Waste Management Division of DPW (Solid Waste Management Division) will take on a more active role in public education activities under this Plan, and Guam EPA will propose to transfer some of its public education responsibilities under current law.

- Guam EPA will coordinate with the Solid Waste Management Division to enlist the participation of solid waste collectors to assist in disseminating SWM information and education materials, noting the different needs of small and large businesses. Guam EPA will provide educational materials to solid waste collectors as necessary.

- The Solid Waste Management Division of DPW and Guam EPA will encourage and coordinate with the federal agencies on Guam to implement SWM information and education programs and will assist federal agencies, wherever possible, to carry out those programs.

8.2 Public Education Activities

Public education activities will focus on "the big picture" of the solid waste challenges facing Guam, an understanding of each facet of ISWM, and how the various facets work together. The Guam EPA and the Solid Waste Management Division will be the community's primary resources for information on solid waste reduction and recycling issues. While a large part of these responsibilities will be to develop and implement "Reduce, Reuse, Recycle" educational programs throughout the Guam community, public presentations, the development of print materials, and producing media articles will necessitate a broad knowledge of ISWM practices. To facilitate the development of a comprehensive and effective educational program, Guam EPA is developing a "Waste Reduction Education Strategy" to cover, in detail, the activities included in this chapter.

8.2.1 Coordination with Commercial Haulers, Educators, Federal Agencies, and Utilities

Guam EPA will work closely with the Government of Guam Recycling Compliance Officers (RCOs) as designated in Executive Order 2003-17, commercial haulers, and educators, as well as other civilian and military entities in collaboration and coordination to ensure that each target audience receives the information it needs. One avenue for disseminating such information is through monthly billings by the Government of Guam utilities. Bills for power and water are currently distributed to more than thirty thousand residences and businesses every month. Guam EPA can capitalize on this distribution by including "Reduce, Reuse, Recycle" messages and other relevant public information, as well as encouraging the use of recycled paper for these bills.

8.2.2 Source of Reference Materials

Guam EPA will also serve as a repository and resource library on solid waste references, with an emphasis on recycling and source reduction. Current SWM industry periodicals, ISWM plans from other jurisdictions, sample brochures and flyers, and educational curriculum will be compiled.

8.2.3 Recycling Web Site

Guam EPA will also oversee a community recycling section on the Guam EPA Web site. As ISWM programs become operational, many questions from the public are likely to arise. New SWM procedures are more difficult to understand for some individuals and entities than for others, and problems occur in any newly established public program. A comprehensive Web site will serve to enhance public knowledge and confidence in the educational programs run by Guam EPA and the operational programs of the Solid Waste Management Division by providing answers from an informed source. Information should also be available in hard copy format and by telephone from the Guam EPA front office staff.

8.2.4 Arrange Community Events

Guam already has been actively participating in Earth Week in April of each year with displays and other events. Further, several business groups, clubs, and organizations presently provide litter pick-up several times a year. Guam EPA can build on this awareness and enthusiasm to include similar activities throughout the year, such as recycling and composting fairs, as well as other events that will be instructional, educational, and fun.

8.3 School Community

The most effective strategy for achieving long-term change to Guam-wide apathy about recycling is through education of Guam's school children. Consequently, school curriculum development and implementation at the elementary, middle, and secondary levels is one of the most important objectives in ISWM public education. It is through these school children that families can become informed and encouraged to participate in "Reduce, Reuse, Recycle" programs. Additionally, through such school programs, the children are inculcated with an environmental ethic that will become a habit for the rest of their lives, and this represents a long-range benefit.

8.3.1 Curriculum Development, Pre-K through 12

Attitudinal and behavioral changes to recycling will only occur through early intervention in the educational process. To that end, the Guam Public School System (GPSS), which currently teaches approximately thirty-two thousand school children, becomes a major role player in achieving Guam's SWM objectives.

GPSS already addresses SWM and recycling issues collaterally through its science curriculum, which includes a component on ecology. The summary of Content and Performance Standards for Ecology now establishes the following standards for student learning:

- Know that changes in ecosystems can be caused by natural and human activities, which may affect all members of the system.

- Understand how organisms are linked to one another and their surroundings by the exchange of energy and matter.

- Describe the responsibilities human beings have as the stewards of the environment.

Guam EPA shall coordinate assistance to GPSS in expanding its curriculum content and performance standards so as to address Guam SWM and recycling issues. While the majority of subject content will be addressed within the department's "Content Standards for Science," recycling issues can also surface in other subject areas, such as mathematics (e.g., exercises for converting tons of solid waste collected into volumes of compacted solid waste being disposed) and language arts (e.g., writing letters to elected officials and articles about SWM issues). Model curricula are already available through the U.S. EPA as well as several states, including Hawaii. This expanded content about recycling within the GPSS curriculum content and performance standards should meet the department's current standard of compliance with the National Science Teachers Association. Additionally, inasmuch as thirty percent of GPSS students speak English as a second language, course work must be prepared in the five secondary languages being used by GPSS. The costs for curriculum development and teaching materials can be funded in part through the budgets for public information and education of the Solid Waste Management Division of DPW and Guam EPA.

Guam EPA shall also coordinate assistance to Guam's private, parochial, and Department of Defense school systems in a manner similar to that employed with GPSS in order to reach all non-government of Guam school children with the same educational information about Guam's SWM and recycling issues.

Until such time as SWM and recycling become a permanent part of the GPSS curriculum, it is recommended that Guam EPA and GPSS organize a peer mentoring initiative to introduce recycling concepts at each Government of Guam public school.

8.3.2 Teacher Training

In order to introduce SWM and recycling issues at all levels of the Guam educational system, teacher training must be conducted. This can be accomplished through a new series of methodology courses within both the Pre-Service and In-Service programs at the College of Education, University of Guam. Within the Pre-Service program at the College of Education, new courses that specifically address environmental and recycling issues on Guam can be added to the current series of teaching methodology courses. This material can range from such topics as the need for and benefits of recycling to programs and strategies for achieving Guam's MSW recycling objectives. The UOG Media Lab could assist in developing support materials for this course work. At the In-Service level, a fifteen-credit methodology course, similar in subject matter to that developed about recycling in the College's Pre-Service Program, can be

developed for GPSS's Continuing Education Program. This would bring teaching methodology about recycling to current GPSS teaching staff.

The estimated budget for undertaking a new recycling methodology course within the College of Education's Pre-Service program can likely be limited to only the cost of teaching materials. At the In-Service level, however, the budget would be approximately $100.00 per credit hour per teacher, or about $1,500.00 per teacher.

8.3.3 Assembly Presentations

Presentations by the Guam EPA and other government and solid waste management specialists, business leaders, and organizations at various schools is another important way to gain participation in source reduction and recycling and to influence public opinion. Most children take note when government and business representatives take time to meet them at their level. Promotional items (made from recycled materials) can be distributed at such presentations. Colorful displays and drama skits will also gain the attention of students. A reasonable objective is for every school on Guam to be visited within the calendar year. Planning, coordination, and collaboration are the keys to success for school assembly presentations.

8.3.4 School Recycling Centers

Each elementary school could function as a local collection point for certain recyclable materials. Newspaper, mixed paper, and aluminum cans are particularly suitable for campus collection programs. The students should be encouraged to be involved in the design and maintenance of their school recycling center. This involvement will teach the importance of recycling, source reduction, and litter control. It will give the students another reason to take pride in their school and their stewardship of the environment. Schools could also receive money for the materials collected for recycling, and such funds could be applied to field trips, school supplies, etc. Since 2005, Guam EPA has been spearheading a public/private partnership to establish aluminum can collection sites at all Guam public schools, and this effort could be expanded to private schools and to cover additional materials.

8.3.5 Environmental Clubs

Every school should be encouraged to form an environmental club. Such clubs will engender groups of informed student leaders who will be instrumental in making their school recycling center a success. The clubs will also serve to build pride and awareness in the respective schools, thereby helping to reduce litter and graffiti. These clubs could be modeled after the 'WAVE' clubs in public high schools. The Environmental Education Committee and the Island Pride Campaign are forming 'Island Pride' clubs in public middle schools.

8.4 The Commercial and Tourism Business Community

Guam's commercial, tourism, and business communities continue to grow, contributing significantly to Guam's SWM challenges. Because commercial haulers are currently responsible for the collection of Guam's commercial waste and their role is likely to expand with more privatization of the island's SWM operations, it is important that they take a major role in assisting with the public information and education responsibilities. This will contribute to their business advantage, as well as to the advantage of the overall ISWM program. The haulers' involvement in the education of their customers will, first of all, improve their image and good will. Secondly, it may make the haulers' job easier, since new SWM programs will introduce more modern and efficient collection methods. Thirdly, active involvement will help to empower commercial haulers to shape the success of their respective commercial accounts.

8.4.1 Educational Materials and Events for the Commercial Sector

Guam EPA will work closely with the Guam Solid Waste Authority and the private haulers to provide the most up-to-date, successful educational materials and ideas available to meet the needs of the business community. Collaboration and/or review of applicable informational materials will also be provided, and Guam EPA may offer presentations and workshops for commercial haulers.

Meeting the needs of the various language groups related to our tourist businesses should be viewed as a responsibility of the individual businesses, the Guam Hotel and Restaurant Association, and the Guam Visitors Bureau. Presently, hotels on Guam are communicating in different "tourist" languages about Guam's need for water conservation; recycling and source reduction can use the same approach. Information about recycling and source reduction can also be added to the language-specific packets distributed by the Guam Visitors Bureau. However, because many visitors to Guam are already familiar with and participate in recycling activities in their home countries, the need to educate this group will be limited. Instead, providing opportunities to recycle (recycling bins in hotel common areas and public places, for example) may be a more effective way of engaging the visitor community.

8.4.2 Awards Program

Acknowledgment of efforts to make a significant impact on the environment through wise solid waste practices is important to encourage greater participation and creativity. An expansion of Guam EPA's annual awards ceremony during Earth Week will help spur the commercial sector to greater participation.

8.4.3 Recycling Bins for Public Events and Places

For special events such as fiestas, conferences, and other large gatherings, specialized containers for recyclable materials should be provided with the recycling logo and business name of sponsors and designed to accommodate a

thirty-gallon (or larger) trash bag liner. Such containers are inexpensive and appropriate for use in areas that remain sheltered from rain. Recycling containers should also be permanently placed (and maintained by the Department of Parks, Recreation, and Historic Preservation) at public parks.

8.5 The Government of Guam Agency and Institutional Community

8.5.1 Setting the Example

Guam EPA and the Solid Waste Management Division can continue to assist all the agencies of the Government of Guam, Guam's largest employer, to meet the requirements of Executive Order (EO) 2003-17 on government-wide recycling by encouraging agencies to participate in environmentally-friendly purchasing procedures, source reduction, office paper recycling, and solid waste collection. Guam EPA will be the primary entity responsible for the dissemination of information to various Government of Guam agencies and the implementation of responsible practices government-wide. These duties and responsibilities are generally described in the "The Solid Waste Reduction Act" (PL 24-304). The general public will be encouraged to participate in new activities and develop an improved environmental ethic when it sees the example set by the Government of Guam agencies and institutions. Guam EPA has been leading the government recycling initiative under EO 2003-17, having established a 'pilot' group of ten agencies in 2005 and expanding to a government-wide program in early 2006.

8.5.2 In-house Communication

Flyers, newsletters, in-house presentations, and incentives for participation are some of the ways to communicate the problem and the solutions to Government of Guam employees. Guam EPA will be responsible for the development and production of these items.

Guam EPA can assist in designing, developing, and/or utilizing present communication methods to assure that every employee, student, and client is informed about government recycling initiatives. Guam EPA can also make presentations and hold workshops for the various agencies as needed and/or requested.

8.5.3 Training Government of Guam RCOs in the "Reduce, Reuse, Recycle" Philosophy

Guam EPA will have to rely on assistance from other agency RCOs in assuring that the Government is successful in setting the example for the private sector on Guam for reducing, reusing, and recycling wastes. Those RCOs (and other select agency staff) must be both trained and then periodically retrained in undertaking MSW public information and education programs within their respective agencies. Guam EPA should organize such training at regular intervals.

8.6 The General Public

Guam EPA and the Solid Waste Management Division will serve as the primary source of "Reduce, Reuse, Recycle" and related programs for the residents and visitors on Guam. As such, it will be responsible for designing, developing, and implementing, among other activities, an advertising campaign to enhance existing knowledge and influence prevailing attitudes regarding solid waste management for the general public. A successful campaign will necessitate the help of an advertising agency, billboards, public service announcements, paid advertising in print and electronic media, printed materials, and promotional items. Guam EPA, working with the Chamorro Language Commission, will also identify and communicate the values of the Chamorro culture and show how source reduction, recycling, and new SWM projects are consistent with the traditional values and practices. Guam EPA should also seek to address the specific cultural needs of other ethnic groups on Guam, including the Filipino community and former residents of Palau and the Federated States of Micronesia.

Each and every hands-on activity in which the public can participate in aspects of a "Reduce, Reuse, Recycle" program becomes an educational opportunity. Variety in the activities, especially those that touch every part of the residents' lives (school, business and home), will instill in the public mind the importance and far-reaching impact of their behavior in dealing with waste. Recycling, source reduction, composting, new collection methods, and material recovery facilities all have the potential for influencing public opinion and behavior.

8.6.1 Logo and Theme

A logo and theme or slogans must be developed in the earliest stages of implementing a public information and education program. By employing a local professional advertising agency, these promotional items will be of high artistic quality, easily reproducible, and attentive to Guam's unique culture. Slogans expressing the "Reduce, Reuse, Recycle" ethic must be communicated over a prolonged period of time, to be diminished only after significant reduction in solid waste is realized. Guam EPA will be responsible for directing the development and implementation of this Guam-wide campaign, which can build upon the "Don't waste Guam's future" campaign launched in 2005.

8.6.2 Coordination and Collaboration

A task force made up of representatives from various sectors of the community who have a sincere interest in the environment and public education can prove to be very helpful to Guam EPA and the Solid Waste Management Division in moving a program along. The existing "Friends United through the Understanding of Recycling Efforts" (FUTURE) committee should develop a public outreach and education subcommittee to advise Guam EPA on ISWM education issues. Representatives on the committee come from Government, the tourist industry, commercial haulers, the environmental community, the school community, and residents-at-large. Bringing these diverse groups together

serves to build understanding of their respective SWM problems and provides an idea pool for greater program success.

The Environmental Education Committee, an inter-agency group made up of representatives from several local and federal agencies, NGOs, and the community, must also continue to be actively involved in planning public education campaigns and events. The Government's coordinated environmental education activities, through events such as Earth Week and the Island Pride Campaign events, attest to the value of an integrated, coordinated approach, and Guam EPA should continue to actively involve the Committee in recycling and waste reduction education activities and plans.

8.6.3 Community Events

The general public can also be accessed through community events, such as the Earth Week Island Pride Festival, village fiestas, the annual Liberation Day Carnival, GVB summer and winter festivals, and similar public gatherings.

8.6.4 Media

The media on Guam represents a major player in achieving public awareness about Guam's SWM issues. Specifically, the media can provide opportunities for feature articles, advertisements and public service announcements, as well as encourage general access by the public to discuss ISWM concerns. Guam EPA and the Solid Waste Management Division should aggressively engage the media through their Public Information Officers by regularly preparing press releases and fact sheets on ISWM-related topics, communicating with and educating journalists and media personalities on ISWM issues, appearing on radio and television talk shows, and actively responding to current ISWM issues in the media.

8.7 Federal Agencies on Guam

Although the Air Force and Navy installations and other federal agencies on Guam are undertaking their own public information and education programs with regard to reducing, reusing, and recycling military-generated solid waste, it is important that Guam EPA and the Solid Waste Management Division stay abreast of such work and participate wherever possible. The opportunities for jointly-sponsored events and sharing public information and education resources are beneficial to achieving objectives for both the military and the civilian side of Guam's SWM programs.

8.8 Funding

Currently there is no dedicated funding source to support the Solid Waste Management Program, including public education responsibilities within Guam EPA. In addition, Government of Guam agencies must rely on General Fund monies to support their solid waste management and their recycling

responsibilities under Executive Order 2003-17. The funding strategy is outlined below.

8.8.1 Fees

A portion of the tipping fee shall be deposited in the Solid Waste Management Fund for use by Guam EPA for public information and education programs. In order to accomplish this, legislation must be introduced to restructure the fee. Any recycling fees created by legislation or otherwise should also include a percentage earmarked for public information and education programs.

8.8.2 Grants

Grants, especially for start-up programs, are offered by federal agencies and certain foundations.

8.8.3 Initial Government Subsidy

The Government of Guam should commit to bearing the expense of the start-up program's information and education efforts. A minimum of two dollars ($2.00) per resident has been the standard budget in stateside communities. Guam needs additional money for an effective start-up program. The start-up funding should be $3.00 per resident, or $480,000, for 160,000 people for fiscal year 2007. This initial subsidy start-up money shall be deposited into the Solid Waste Management Fund.

8.9 Future Planning and Development

The overall public information and education program will benefit from an annual critique by various stakeholders, including the FUTURE Committee, the Environmental Education Committee, and the management of Guam EPA and the Solid Waste Management Division. Such an assessment may suggest that a phased approach to educating the public about SWM issues may be more cost effective and compatible with Guam's transition into a society which fully accepts a "Reduce, Reuse, Recycle" philosophy.

8.10 Recommended Actions

This Section will set out essential public information and education activities, already mentioned in the above text, which need to be implemented if Guam is to meet its MSW reduction goals. The effort demands participation by every resident, visitor, and business. It is not enough that only a few individuals, agencies, or businesses participate; everyone must also do whatever possible to educate and inform others, through both word and example.

1. Develop activities, curricula, and incentives to reach the audiences in the educational community.

2. Develop activities, incentives, and print and electronic materials to reach the commercial and tourist industry.

3. Implement government-wide source reduction, procurement, and recycling policies throughout Government of Guam agencies and institutions in accordance with Executive Order 2003-17.

4. Develop a long-range publicity and awareness campaign to meet the needs of the general public, including logo and slogans.

5. Develop, implement, and encourage source reduction activities in all sectors.

6. Commit to the need for funding of the program through earmarking a portion of the Solid Waste Management Division revenues.

7. Establish an education and outreach subcommittee of the FUTURE Committee to assist Guam EPA and the Solid Waste Management Division with ideas and meeting the community's information and education needs.

8. Commit to enforcement of all laws and regulations regarding Integrated Solid Waste Management.

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APPENDIX A

GUAM SOLID WASTE LAWS (SUBJECT TO REVISION)

September 2006

APPENDIX A

SOLID WASTE LAWS September 13, 2006

Public Law No.	Date	Short title	Brief Description	Status
28-92	12/12/05	Recycling Enterprise Zone	Directs Port Commission to establish size and location at JD Leon Guerrero for recycling enterprise zone and only lease to companies which satisfy Qualifying Certificates under PL 25-127.	Port Decision due 2/10/06
28-70	10/14/05	No ADF regulations	Disapproves Advance Disposal Fee regulations and the renumbering of SW regulations.	Bill 232 would replace ADF with recycling fee.
28-58	6/30/05	ADF rule making authority	Amended §51505 to make GEPA promulgate rules. GEPA to request economic impact assessment from Bureau of Statistics and Plans. Authorized again DPW to enter into contracts with recycling companies.	Rule authority Article I of Ch. 51. Bill 232 would delete economic impact and specific rule authority
28-56	6/30/05	PUC Tipping /User Fee Law	Amended Tipping and User fee §51118(e) and (f) to allow for PUC rate making charges to part of fees and paid from the Solid Waste Operations Fund., and repealing any DPW power to establish fees outside of PUC procedures.	PUC made rate in October, 2005, effective Nov 1, 2005.
28-11	3/9/05	No Combustibles in Hardfills	Defined Combustible materials per federal hazardous transportation regulation at 49 CFR and deleted "undecayed wooden materials attached to construction debris" from SW regulations as permissible in hardfills.	GEPA to incorporate in hardfill permits.
28-07	3/3/05	Advanced disposal fees amendments	Postpone the effective date of Advanced Disposal Fees (ADF) until the regulations become effective.	PL 28-70 disapproved regulations. Bill 232 would replace ADF with recycling fee.
27-148	12/30/04	Guam's Recycling Act Amendments	Revises the ADF for vehicles imported for resale to be collected at the point of sale.	PL 28-07

27-74	2/10/04	Regulations for Recycler Qualifying Certificate	Approves GEDCA rules for qualified companies engaging in recycling and transshipment	1 company has certificate
27-38	11/13/03	Guam's recycling law (Advanced Disposal Fees)	Assess fees on items imported for resale, collected by Customs, established Revolving funds for GEPA to administer for recycling projects. Repealed abandon vehicle fee portion of 16 GCA § 7161 Abandoned Vehicle and Street Light Fund..	Revision made with PL 27-148.
27-37	11/14/03	Municipal Recycling Law	Municipal Recycling program; DPW to set up recycling programs at the village level.	Mayor's Council of Guam to implement
27-07	2/28/03	Feb 2003 Appropriation Act	Sections V.3 and V.4 made the Abandoned Vehicle and Street Light fee $25; and after April 1, 2004, $45.	Abandoned vehicle fee provision repealed by PL 27-38
26-153	10/31/02	Ordot Fire appropriation	$250,000 for Dept. of Civil Defense to respond to fire of October 25, 2002.	Done
26-132	9/17/02	DPW SW Hazardous Pay	Hazardous pay for DPW Dump workers if emergency (e.g. fire, typhoon)	Ongoing
26-99	6/3/02	DPW Privatize Collections	DPW to Contract out collections for 2/3 island within 90 days.	PUC Audit Report recommends by January 2007
26-76	3/12/02	CCU Act	Created the CCU to oversee GWA and GPA disbanded the boards of each.	DPW's solid waste duties should be moved to Solid Waste Authority
26-35	9/30/01	Mayor tipping fee exemption and Ordot Fire appropriation	Add subsection (m) to § 51118, Exempts Mayors from paying tipping fee for solid waste from village streets, public buildings, parks or facilities. $214,681 to Civil Defense for its response to Ordot fire on May 14, 2001.	Some Mayors are inappropriately providing trucks as dumpsters and residential customers are avoiding the fees.

26-17	5/20/01	Prorate residential tipping fee backbilling	Required DPW to give credit for payments made but not billed, to prorate balances due for February 2000 to March 2001. Limits backbilling to seven months before July 2001, and four months thereafter.	Prorating done, rest is ongoing
25-175	12/12/00	ISWMP Amendment	Approves the ISWMP submitted by GEPA, eliminated the Solid Waste Management Authority, and eliminated waste reduction by incineration.	Updated September 2006 by GEPA
25-173	10/20/00	Administrative Adjudication law Amendments	Any rule or regulation for fees that has a cost to public of over $500,000 requires an economic impact statement.	Ongoing
25-170	10/19/00	Litter Fines on Guam	Litter fine reduced from $500 to $100 to encourage officers to encourage officers to issue more fines by Mayor's council, GPD, GEPA and certain peace officials in Superior Court.	Lt Gov. Litter Task Force to encourage litter citation issuance by Mayors, GPD, etc.
25-127	5/22/00	Tax Benefits For Recycling and Shipping Companies	Tax benefits for recycling companies; 100% Corp. income tax rebate for 40,000 lbs. The earned interest from rebate goes to GEPA. Gives 10 yr Waiver of docking and stevedoring fees if shipping company has permit from GEPA and CPA certifies type and volume of recyclable materials.	PL 27-74, ongoing
25-119	3/24/00	Litter fines for village beautification	Creates litter fine under Mayors power to issue. Deputizing powers to GEPA and other agencies if people are trained at GCC. Creates Municipal Litter and Defacement Fund.	Most Mayors do not get trained or levy fines
25-93	12/29/99	SW Tipping Fee Amendments	Mandates DPW to develop lifeline rates. Creates exemptions for Mayors (1 yr), force majeure, good citizen if permitted, and terminate service if 60 days in arrears.	DPW did not develop rates, so PUC will do so under PL 28-56.
24-313	12/24/98	DPW Solid Waste Collection Rules and Regulations	Approved DPW regulations. Residents shall segregate waste and recyclables, but no provision for "disposal" of recyclables. Standards for cans and placement. Commercial and govt. construction must design space for collecting and loading recyclable materials and solid waste. Collection contracts 5 yrs or less.	No enforcement by DPW. No collection contracts.

24-309	12/18/98	Solid and Hazardous Waste Federal Approval Law	Added financial assurance, performance bonds, inspection authority and warrant authority to 10 GCA Chapter 51	SW Program published on 10/5/99 approved 6/6/00
24-304	12/18/98	An Act mandating the Government of Guam to Reduce waste	Requires Guam EPA SW program to: monitor and enforce PL 21-22, implement recycling efforts and coordinate with DPW Recycling office. Mandates GovGuam and schools to make every effort to decrease waste purchase recycled and biodegradable goods, and compost. Also created GEPA SW Management and Hazardous Waste Programs and positions.	Similar EO 2003-17 signed by Gov. Camacho. Ongoing
24-272	10/8/98	The Revised Ordot dump closure and SW management alternative act	Same law as 24-139 except it deleted: privatization of SW collection and transportation, DPW employee transfer, GEDCA bonding, mandated Ordot closure and open MSWLF for April 1999, and added to definition of hazardous waste, and that DPW, in cooperation with Parks and Recreation to convert Ordot to Park, and that Guam EPA shall monitor Ordot for compliance with Act and "take proper measures to mitigate environmental damage to protect health and welfare of resident and people of Guam."	DPW did not privatize and did not create recycling office. Law invalidated by Supreme court in Pangelinan and Wesley v. Gutierrez (2004 Guam 16).
24-246	8/18/98	Recycled Paper Collection Contract Law	DPW, after advertising for proposals, to enter into 2-year contract with company to collect recyclable paper from the public and implement a plan to prevent paper form entering into the waste stream. Award to highest bidder pre pound to pay public for recyclable paper. The contract to be granted $150,000 per year from the SW Operations Fund. Article 4 of Chapter 51.	DPW has not Implemented.
24-181	4/17/98	SW Health Monitoring and Compensation Act	Requires 1% of a all tipping fees deposited into the solid waste management facility medical monitoring fund. The Director of DPHSS shall distribute the funds quarterly - 25% to village(s) with landfill for community health care needs and programs; 25% to village(s) with other solid waste management facilities; and 50% for DPHSS for health monitoring of people and animal around landfills and other designated solid waste facilities as specified by Guam EPA Administrator or DPHSS Director.	Unknown

24-166	4/11/98	Priorities for Private Activity Bonds	Places restriction on private bonding section of PL 24-139 and requires legislative approval of any contracts related to bonding. Prevents Governor transfer of the $4 million dollars for Ordot.	Partially repealed with PL 24-272.
24-139	3/11/98	The Ordot Dump Closure and Solid Waste Management Alternatives Act	Changed DPW role from doing SW operations to contracting SW operations and promoting recycling; established tipping fees; requires dump to close by July 1998 and open new landfill in 6 months, $ 4million for Ordot, authority to GEDCA private bonds, 180 days to execute privatization of operations, ISWMP and sets details, Governor transfers DPW SW employees, Land Management Report on Ordot on private land, and notify DOI of law so to release funds for Ordot.	Repealed by 24-242:1
24-57	6/30/97	Prohibited government funds for GRRP Agreement	Section 6 prohibited the commitment of any funds resources, assets or debt by any government entity for payment of the GRRP Agreement including the waste to energy facility and the landfill design and construction.	Invalidated by court decision.
24-06	3/20/97	Privatization of the MSWMF	Requires funding, design, construction and operation of the new landfill. Required Qualifications and insurance from bidders.	Not implemented, and then partially eclipsed by Consent Decree
23-95	5/8/96	Landfill Site Law	Stated Guatali as the preferred site and Malaa as the secondary site. Required budget within 90 days and annual reports for 3 years.	Nullified in San Miguel et al. v. DPW, et al. Sup. Ct No.CV0892- 04, (April 22, 2005)
23-64	12/5/95	Solid Waste Management and Litter Control Act	Repealed and reenacted 10 GCA Chapter 51. Requires the ISWMP, required financial assurance for SW facilities and public notices for recycling, disposal and incineration, specified permit fees, inspection rights, prohibit activities, citizen suits, yearly scrap metal removals, littering fines between $500-$1000.	The Comprehensive solid waste law with the voidance of PL 24-272. By Supreme Ct.

22-115	4/25/94	Close Ordot Act	Mandated closure of Ordot by April 25, 1997. Directed Governor to identify new site and submit budget for moving disposal to new site. Required DPW and Guam EPA to assess environmental impacts of Ordot and estimate clean up costs, Directed Guam EPA to develop an integrated solid waste management program including recycling of glass, metals, composting, and submit in 90 days. Directed DPW to within 180 days to develop commercial fees by regulation and created solid waste processing fund.	Major components not implemented. Subsequent Public Laws
21-73	1/24/92	Aluminum Can recycling Act	Mandated Agency directors to have monthly collection of Aluminum beverage cans, to sell the cans and to maintain records.	Repealed/replaced by 24-304 12/18/98
21-22	5/17/91	Buy recyclable and biodegradable	An Act mandating GSA to purchase biodegradable products.	Partially implemented, ongoing
17-87	1/18/85	Solid Waste Management and Litter Control Act	Specifies Guam EPA and DPW powers and duties. Includes DPW authority to contract out collection and disposal, provided employees adversely affected are given first preference for other GovGuam jobs for which they qualify.	Repealed and reenacted by PL 23-64
17-26:46	10/11/83	Supplemental Appropriations Act for FY84	Section 46 repealed and reenacted the street light fund law to make the fund the Abandoned Vehicle and Street Light Fund. It mandated that 90% of funds to GPA to be used for street lights and 10% for removal of abandoned vehicles.	Abandoned Vehicle provision repealed by PL 27-38.

APPENDIX B

BEFORE THE GUAM PUBLIC UTILTIES COMMISSION

FOCUSED AUDIT REPORT AND RECOMMENDATIONS (WITHOUT ATTACHMENTS[1])

August 18, 2006

[1] Attachments available for viewing and copy request at the Guam EPA Administrative Building.

GUAM ENVIRONMENTAL PROTECTION AGENCY

AHENSIAN PRUTEKSION LINA'LA GUAHAN

P.O. Box 22439 GMF • BARRIGADA, GUAM 96921 • TEL: 475-1658/9 • FAX: 477-9402

GUAM 2006 INTEGRATED SOLID WASTE MANAGEMENT PLAN

PLAN ADOPTED: (Guam EPA Board)	DECEMBER 15, 1999
APPROVED AND AMENDED: (25th Guam Legislature)	DECEMBER 12, 2000
UPDATED PLAN ADOPTED: (Guam EPA Board)	JANUARY 26, 2006
UPDATED AMENDED PLAN ADOPTED: (Guam EPA Board)	SEPTEMBER 26, 2006

Office of the S...
...POR...
Date: 10/2/06
Time: 8:00
Rec'd by:
Print Name:

ALFRED K.Y. LAM
GUAM EPA BOARD VICE-CHAIRMAN

ATTESTED:
for Margaret P. Gorham
SABRINA CRUZ-SABLAN
BOARD SECRETARY

9-27-06
DATE

"ALL LIVING THINGS OF THE EARTH ARE ONE"

Guam 2006 Integrated Solid Waste Management Plan

TABLE OF CONTENTS

VI. Written Comments

a. Copy of Written Testimony Re the Proposed Integrated Solid Waste Management Plan, from Jose S. N. & Lolita B. Chargualaf, Concerned Resident of Inarajan dated 26 September 2006 and received by Guam EPA on September 26, 2006.

b. Copy of letter from Alicia Diego received by Guam EPA on September 26, 2006.

c. Copy of letter from Paul S. Tobiason, Member: Recycling Association of Guam, dated 26 Sept. 2006 and received by Guam EPA on September 26, 2006.

d. Copy of transmittal cover sheet from Albert H. Tsutsui, A.I.A. with attached letter from Yusuke Kurumi, President & CEO, Ocean Development Co., Inc. (Group) with attached document, CD and DVD, received by Guam EPA on September 26, 2006.

VII. Public Hearing

a. Board of Directors Meeting, Minutes of September 26, 2006

b. Copy of Presentation of the Guam 2006 ISWMP Board Meeting, September 26, 2006

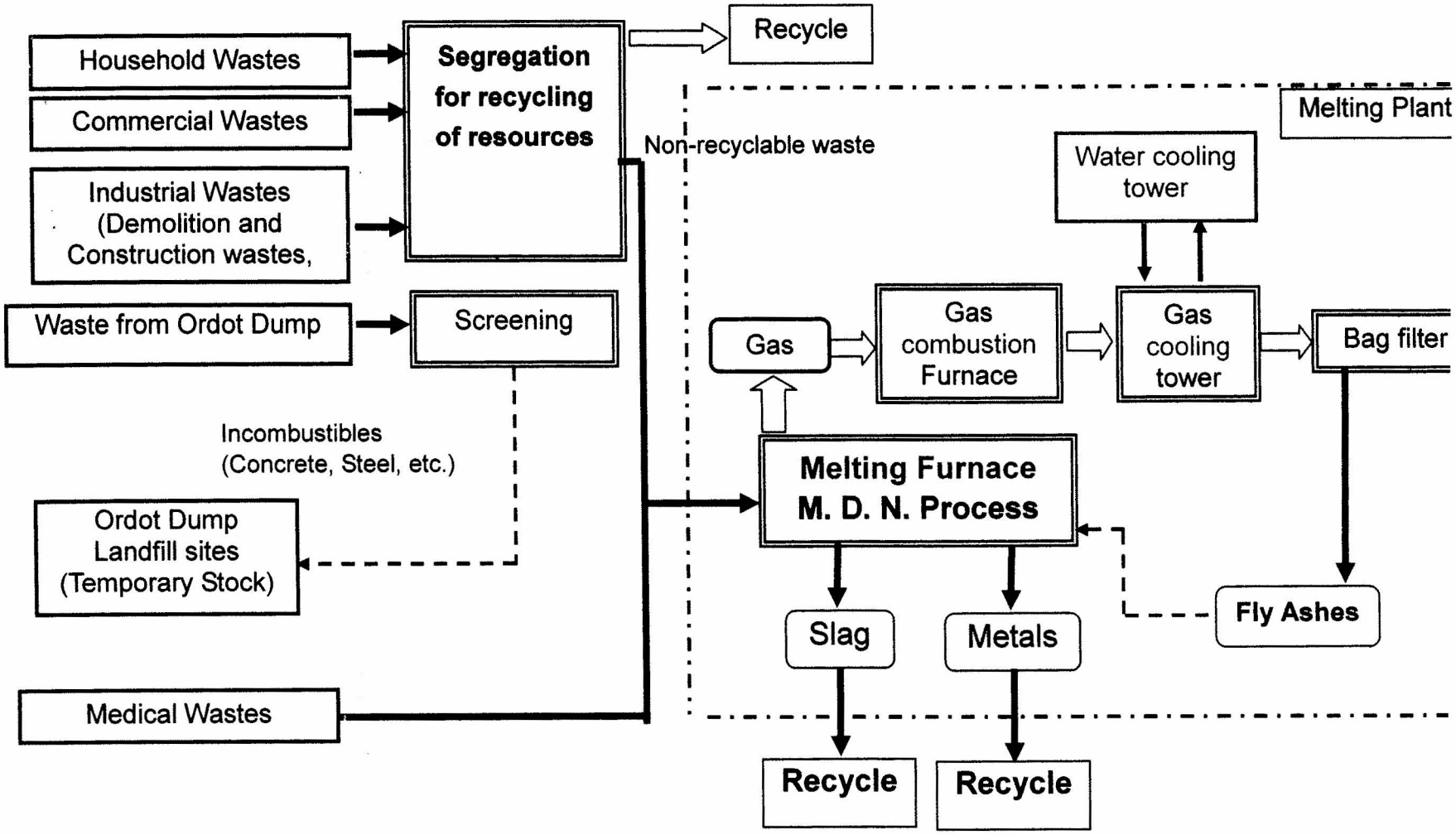
c. Board Meeting, September 26, 2006 Board Members sing in sheet and Agenda

d. Guam EPA Meeting Attendance Record, September 26, 2006 Board Meeting

VIII. Copy of Summary of Comments and Response with Attachment 1: Testimony By Representatives of the General Public

Process Flow Diagram for Solid Waste Treatment

AAT □ 1



OPERATION COST

ATT-3 (1/2)

□FACILITIES COST□

Waste processing plant facilities		200	t/day Capacities	Ordot Landfill site		
Amount of waste processing		60,000	t/year			
Cost	Plant Construct'n Cost	8,393,000	Thousand JP. yen	Skeleton rock bucket M/C	5,000	Thousand JP. yen
	Vehicles *Note 1.	26,000	Thousand JP. yen	1No.		
	Office Equipments	10,000	Thousand JP. yen			
	Contract elect. power	0	kW	Shovel loader x 4Nos	60,000	Thousand JP. yen
	Elect basic charge		1000JP.yen/kW.Month	Dump truck 4ton x 2Nos	16,000	Thousand JP. yen
	Operation Cost	185,144	Thousand JP. yen	Fuel charge for above	Excluded	Thousand JP. yen
	Labor cost	6,000	1000JP.yen/p.year	Maintenance fee for above	Excluded	1000JP.yen/year
	.Plant 24p.Driver 5p.	29	Persons			
	Maintenance Cost	See Table	1000JP.yen/year			
Income	Waste Treatment Fees	0.000	1000JP.yen/ton	Labor cost(Day time 8hrs. work)	6,000	1000JP.yen/p.year
	Annual SELL Elect.Power	0.0	kWh/year	.Driver 6p.Worker 4p.	10	Persons
	SELL Elect.Power Charge	----	JP. yen/kWh			

*Note 1□ Vehicles for plant — Thousand JP. yen

...Fork lift.2Nos.1ton.2ton.	10,000
...Flatdeck truck.2Nos(2ton.4ton.	8,000
...Dump truck 1No..4ton.	8,000
TOTAL	26,000

Condition .For cooling tower, Under ground water will be used. (depend on the site condition) To be checked possibility of City Water supply.
.Electric power for plant operation is supplied by emergency generator and steam turbine generator.

□RUNNING COST□

Elapsed years		1st. Year	2nd. Year	3rd. Year	4th. Year	5th. Year	6th. Year	7th. Year	8th. Year	9th. Year	10th. Year
Plant Cost (Unit:1000JP .Yen)	const. cost repayment	0	0	0	0	0	0	0	0	0	0
	Elect basic charge	0	0	0	0	0	0	0	0	0	0
	Operation Cost	185,144	185,144	185,144	185,144	185,144	185,144	185,144	185,144	185,144	185,144
	Labor cost	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000
	Maintenance Cost	32,743	39,416	35,143	89,806	32,743	41,816	32,743	89,806	35,143	39,416
	TOTAL	391,887	398,560	394,287	448,950	391,887	400,960	391,887	448,950	394,287	398,560
	Cost Accumulation	391,887	790,447	1,184,734	1,633,684	2,025,571	2,426,531	2,818,418	3,267,368	3,661,655	4,060,215
Ordot Cost (Unit:1000JP .Yen)	Equipment & Vehicles	0	0	0	0	0	0	0	0	0	0
	Labor cost	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	TOTAL	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Cost Accumulation	60,000	120,000	180,000	240,000	300,000	360,000	420,000	480,000	540,000	600,000
Income (Unit:1000JP .Yen)	Waste Treatment Fees	0	0	0	0	0	0	0	0	0	0
	SELL Elect.Power Charge	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0
Waste process cost 1000 JP.yen/ton		7.5	7.6	7.6	8.5	7.5	7.7	7.5	8.5	7.6	7.6

Elapsed years		11th. Year	12th. Year	13th. Year	14th. Year	15th. Year	16th. Year	17th. Year	18th. Year	19th. Year	20th. Year
Plant Cost (Unit:1000JP .Yen)	const. cost repayment	0	0	0	0	0	0	0	0	0	0
	Elect basic charge	0	0	0	0	0	0	0	0	0	0
	Operation Cost	185,144	185,144	185,144	185,144	185,144	185,144	185,144	185,144	185,144	185,144
	Labor cost	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000	174,000
	Maintenance Cost	32,743	92,207	32,743	39,416	35,143	89,806	32,743	41,816	32,743	89,806
	TOTAL	391,887	451,351	391,887	398,560	394,287	448,950	391,887	400,960	391,887	448,950
	Cost Accumulation	4,452,102	4,903,453	5,295,340	5,693,900	6,088,187	6,537,137	6,929,024	7,329,984	7,721,871	8,170,821
Ordot Cost	Equipment & Vehicles	81,000	0	0	0	0	0	0	0	0	0

(Unit:1000JP .Yen)	Labor cost	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	TOTAL	141,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Cost Accumulation	741,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Income (Unit:1000JP .Yen)	Waste Treatment Fees	0	0	0	0	0	0	0	0	0	0
	SELL Elect.Power Charge	0	0	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0	0	0
Waste process cost 1000 JP.yen/ton		8.9	8.5	7.5	7.6	7.6	8.5	7.5	7.7	7.5	8.5

Proposal for
Prevention of Environmental Pollution
at the Ordot Dump in Guam

Sep. 25, 2006

OCEAN DEVELOPMENT Co., INC. Group

[redacted]

[redacted]

led to you the high temperature melting system that we think is the
solve the environmental problem at the Ordot Dump.
ome measures to eliminate the existing heaped garbage in Ordot.
troduce you, as our engineering proposal, the method of reducing
f Bacteria and Zeolite with water (ATT-2) that has been developed
solutions to improve the environmental pollution caused by the
Ordot Dump for your consideration.

lem of Existing Waste Treatment

g environmental problems will not be solved until the new melting
burnt up the existing heaped garbage at the dump.

rbage. Increase of untreated garbage
Ordot. Generation of bad odor and toxic gas,
Misgivings about the fire occurrence,
Pollution expansion
. It is harmful to humans.

ed ATT-1

vement of environmental pollution

e mixture of Bacteria and Zeolite with water in order to improve the
ntal problems until the new melting system is in operation.

ic gases and decomposition of toxic gases such as Hydrogen Sulfide,

ump
dy after the construction

heaped garbage
to level the top of the existing heap and spraying the mixture of
ith water to prevent the generation of bad odor and toxic gases. The
quired according to the quantity of the gas.
te investigation at the Ordot Dump is necessary before starting the
e of the possibility of dangerous objects in the heap.
newly generated garbage
the mixture of Bacteria and Zeolite with water to the garbage wastes
ion of bad odor and toxic gas when dumping at the landfill until the
service.
es
nominated from both sides of the Owner and the Contractor and carry
iled inspection method and numerical data will be informed later.