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MEMORANDUM

TO: David Manning
FROM: Chace Anderson
DATE: 9/30/08
RE: Outline of Solid Waste Scenarios for Guam

The Receiver evaluated three solid waste management scenarios with which the Guam Solid Waste Management Division (SWMD) can meet the expectations of the Consent Decree. The scenarios analyzed include:

1. Basic Services, including a cart system for trash collection and staffed and strategically located convenience and recycling centers;

2. Curbside Recycling added to the Basic Services Scenario described above; and

3. Mixed Waste Recycling which includes the Basic Services Scenario plus a Mixed Waste Processing facility to recover recyclable material.

These three scenarios have many core programs that are common to each. They differ, however, in both the cost and percent diverted away from burial to reduce, reuse, and recycle. Table 1.1 summarizes the similarities and differences between these scenarios. It illustrates the fact that the majority of activities in each scenario are the same. This memorandum will discuss the first scenario at length, describing each activity. When describing the following two scenarios, the focus will be on those activities that are different from the other two scenarios.

Table 1.1 - Summary of Scenarios

Activities	Scenario 1	Scenario 2	Scenario 3
Curbside Trash Collection	Yes	Yes	Yes
Trash Carts to Customers	Yes	Yes	Yes
One Transfer Station[1]	Yes	Yes	Yes
Three Convenience Centers with Recycling Service	Yes	Yes	Yes
One Household Hazardous Waste (HHW) Facility	Yes	Yes	Yes
Closing Ordot Dump	Yes	Yes	Yes
Tire Recycling at Convenience Center	Yes	Yes	Yes
Vehicle Recycling	Yes	Yes	Yes
Education Program to Support Activities	Yes	Yes	Yes
White Goods and Bulky Waste Curbside Collection by appointment	Yes	Yes	Yes
Development of Sub-Title D Landfill at Layon site	Yes	Yes	Yes
Curbside Recycling with Carts & Materials Recovery Facility	No	Yes	No
Mixed Waste Processing	No	No	Yes
Large Composting Facility	No	No	Yes
Projected Diversion (including Vehicles & Tires)	32%	34%	71%
Estimated Annual Number of SWMD Employees	91.5	108.6	183.5
Estimated Annual Gross Expense (2008 $)	$13,137,220	$14,461,512	$19,534,424

Scenario One: Basic Services

The goal of this scenario was to build a sustainable solid waste system that would both meet the requirements of the Consent Decree and provide a strong foundation from which to grow into more advanced programs should the Government of Guam desire to pursue them.

[1] The terms "transfer station" and "convenience center" are different in Guam than on the mainland. The SWMD operates facilities in Agat, Malojloj, and Dededo that it calls "transfer stations." The waste industry refers to these as "convenience centers." This memorandum uses these terms as they are used within the waste industry.

Table 1.2 - Basic Services

Activity	Description
Curbside Trash Collection	The SWMD will continue to collect the residential trash. New trucks have been, and additional ones will be, purchased; truck maintenance has been and will continue to be contracted out; and employees will continue to be trained on best procedures for collecting trash once a week from households. Semi-automated trucks will be used, reducing the potential for worker injuries.
Carts	The SWMD will procure 96 gallon carts and provide them to residences for trash. Only trash in the cart will be collected and residents will be charged on a per cart basis. This will lower the risk of vector problems, and eliminate the unsightly cages that residents currently place their trash cans in. When the carts are delivered to the household, these households will be registered so as to update the billing system.
One Transfer Station	Transfer Stations are facilities that consolidate trash and/or recyclables from garbage trucks into tractor-trailers so that a greater number of tons can be moved by one vehicle thereby lowering the number of trucks making trips to the landfill or processor. This transfer station would take material from SWMD trucks, commercial haulers, and self haulers. The facility and its operation, including transport of material to the Layon Landfill, are recommended to be contracted to a private operator. The recommended location for the transfer station is at the current SWMD's yard or as close to this site as is reasonable. This location is central to the population density of the island, the commercial district, and has a separate ingress and egress from the rest of DPW.
Three Convenience/ Recycling Centers	What the SWMD calls 'transfer stations' are called convenience centers because they are convenient locations for residents to dispose of trash and recyclables. The recommendation is to specifically keep Malojloj and Agat convenience centers open and to have a convenience center at the transfer station. These convenience centers would take recycled paper, aluminum and metal cans, tires, and possible other recyclables when an outlet for them becomes available. Material would be placed in roll off containers, collected by SWMD, and shipped off to markets. Each of these locations would have a limited Household Hazardous Waste drop off for items such as motor oil, anti-freeze, brake fluid, and batteries. These sites would remain under the operations of the SWMD.
Household Hazardous Waste Facility	A permanent site opened six days a week and staffed by SWMD employees will be constructed with adequate room to bulk hazardous waste and store for shipping. A contractor would be procured for the transport and disposal of the hazardous materials. A reuse center would provide material to the public at no cost that could reasonably and safely be reused. A trained HHW manger would be hired for this activity and a truck will be procured for the collection of limited HHW material from the convenience centers and transport to the permanent site.

Activity	Description
Closing Ordot Dump	Once the new landfill is open to accept waste, the Receiver will begin to implement its plan to close the Ordot Dump in a manner meeting applicable regulations.
Tire Recycling	On average, there is one tire a year discarded per person, which means that approximately 173,000 tires a year are generated and have the potential to be recycled. Currently, there is no permitted tire processor on the island that can handle that flow of material because of space and permit limitations. The recommendation is to procure a partnership between the Government of Guam and a tire processor whereby the Government of Guam provides a location for the processing of tires in exchange for reduced processing cost. Citizens will be able to drop off their tires at SWMD convenience centers and at the processor's location instead of storing them where they may become a habitat for mosquitoes. The recommended location is the Coral Pit in Dededo. This would put the facility below grade and out of sight. There is ample room, good ingress and egress, and adding these operations would not interfere with on-going operations.
Vehicle Recycling	The Government of Guam implemented a Recycling Revolving Fund to handle the collection and disposal of derelict and abandoned vehicles, tires, and other recyclables. Currently there is no program active in the recycling of such vehicles. The recommendation is to establish a program for the collection and recycling of such vehicles and have the fund cover the total cost of the program. By implementing a consistent program, the problem of abandoned and derelict vehicles should diminish.
Education Program to Support Activities	Education through public information is important to the success of all programs. The recommendation is to fund a position for a public information officer/educational coordinator and monies to do focused research to create a coordinated effort to support all the activities mentioned in the scenarios.
White Goods and Bulky Waste Curbside Collection by Appointment	White goods are metallic items such as washing machines and hot water heater tanks. Bulky wastes are items such as sofas, chairs, and other furniture. The recommendation is to have a curbside collection system by appointment for these items. Residents would call in to the customer call center, be assigned a day that the material would have to be out at the curb, and the truck and driver would come by and collect the large waste items. The island would be divided into three zones: North, Central, and South. Requests from each of these zones would be clustered together on the same day so the driver doesn't spend most of his/her time driving among zones. This service would be fee based, with the collection made by a SWMD employee or contractor using a knuckle-boom grapple-hook vehicle. These pieces of equipment would be advantageous for Guam to have given the island's historical need to also handle storm debris. The knuckle-boom grapple-hook acts as a hydraulic metal hand with the dexterity to grab and lift small to large items and place them in a trailer for transportation.
Development of Sub-Title D Landfill	A landfill in Layon will be constructed to meet or exceed all regulations for a Sub-Title D Landfill.

Activity	Description
Curbside Recycling Pilot Program	After the activities in this Basic Scenario are implemented, a curbside recycling pilot program will be initiated for approximately 1,000 homes. Two separate and distinct routes will be chosen for this pilot. The goal of the program is to collect data on the number of times households set out their recyclables, the total weight of the recyclables, and percentage of contaminants found with the recyclables. From these data, the Receiver can determine the relative activity a full curbside recycling program would achieve.

Scenario Two: Curbside Recycling

A second scenario was created using the activities in Scenario One with the addition of weekly curbside collection of recyclables. This means the addition of collection vehicles and carts as well as a Materials Recovery Facility (MRF) to process these recyclables. One may expect the recycling percentage to be much higher than in Scenario One until; however, the SWMD only collects from some, not all, of the homes in Guam and it is assumed, for modeling purposes, these households will divert 25 percent of their recyclable items into the recycling cart. This amounts to 5,200 tons of recyclables collected at the curb in this scenario.

Table 1.3 - Scenario Two: Curbside Recycling

Activity	Description
Curbside Recycling	Carts are provided to residents whereby paper, cans, and plastic are mixed together in, what is called, a single- stream process. SWMD employees and trucks would run the same routes as the trash trucks and collect the recycling cart the same day as the trash cart is collected.
Materials Recover Facility (MRF)	The trucks with single-stream recyclables will go to a MRF. The contents of the truck are emptied, placed on a conveyer and a combination of human and machinery efforts will separate the material into categories of commodities. These commodities will be sold in the recycling market through a broker of such material.

Scenario Three: Mixed Waste Processing

This scenario was created with the purpose to extend the life of the landfill through maximum diversion. At the heart of this scenario is a simple concept: all trash to be land-filled must first go through a materials recovery facility where both human and mechanical labor separates out recyclables and organic waste from the material that eventually is land-filled. The recyclables are sold through a broker and the organics are composted in a separate area at the landfill and used as soil amendment on-site and sold to the public.

Table 1.4 - Scenario Three: Mixed Waste Processing

Activity	Description
Mixed Waste Processing	All trash would be deposited at the MWP, placed onto conveyers and sorted out by both machines and employees, with 25 tons an hour going through the system. While vendors of these new systems boast a diversion rate of up to 40 percent recyclables and another 40 percent organics, for purposes of this scenario, a more conservative 30 percent diversion was chosen for each. This amounted to a total diversion of 71 percent of the total trash with a little over 28,000 tons composted a year and another 28,000 tons sent to the recycling market. This process is very labor intensive (approximately 89 employees), and the capital cost of the equipment and 60,000 square foot- building drives the cost up as well.
Compost Yard	The compost yard would be a simple windrow system, using a Gortex blanket to protect the material from rain. The compost material would be turned and screened into a finished product that can be used around the landfill and provided to the public.

Financial Comparisons of Scenarios

Costs are shown for each Scenario in Tables 1.5 - 1.7. These costs are conservative and include contingency factors that are estimated to reflect Guam location costs. Detailed costs will need to be developed from detailed engineering and cost analyses, or preferably from actual procurement processes. An implementation timeline will also be needed to show the development tasks and approximate schedule for each project in the selected scenario. Table 1.8 shows the acreage and building space required for the various activities.

The following key assumptions were used:

1. Based on existing residential population and tonnages from 1-4 unit dwellings currently served by DPW;

2. No land costs, DPW will provide land;

3. Labor fringe benefits factor of 34%;

4. Labor costs are based on 2009 SWMD labor wages and production wages for workers as found in the U.S. Department of Labor, Bureau of Labor Statistics, Guam Data;

5. Operations and maintenance costs are based on actual costs on Guam or other locations with similar solid waste activities;

6. Number of laborers and capital cost estimates for mixed waste processing are from manufacturer;

7. Fixed equipment depreciated over 30 years;

8. Mobile equipment depreciated over 5 to 10 years, depending on type of equipment;

9. Separate funding for junk cars and tire processing;

10. Windrow process used for composting;

11. Carbon Emissions Credits include net emissions from convenience center, curbside, and/or mixed waste processing recycling materials and transporting materials within the island using Chicago stock exchange value; and

12. Carbon Emissions Credits are speculative and not included in the total revenue.

In general, recycling processes can result in environmental benefits and, specifically, a reduction in greenhouse gas emissions. Projects seeking greenhouse gas emission credits are subject to evaluation by the International Panel on Climate Change and there are many requirements to present a project for evaluation. In addition, the current as well as long-term markets for carbon credits are speculative at best.

Table 1.5 - Costs for Scenario 1 – Basic Services (2008 $)

Cost	Administration (1)	Disposal/ Processing (2)	Junk Cars & Tire Processing (3)	Collection (4)	Total
Salaries/Wages	$799,922	$1,404,510	$0	$1,749,182	$3,953,613
Vehicle Expenses	$50,200	$1,168,600	$0	$916,518	$2,135,318
Other Non-Capital Direct Expense	$316,610	$1,187,211	$1,527,500	$271,868	$3,303,188
TOTAL DIRECT COSTS	$1,166,732	$3,760,320	$1,527,500	$2,937,567	$9,392,120
Capital Depreciation Expense	$28,627	$2,930,428	$0	$786,045	$3,745,100
TOTAL COSTS	$1,195,359	$6,690,749	$1,527,500	$3,723,612	$13,137,220

(1) Includes: Administration, Education/Outreach, shop and Call Center.
(2) Includes: LF scale house and landfill operations, and Transfer Stations
(3) Includes: Junk cars and tire processing.
(4) Includes: HHW, Convenience and Recycling Centers, Residential Trash Collection, white goods and bulky collections.

Table 1.6 - Costs for Scenario 2 – Curbside Recycling (2008 $)

Cost	Administration (1)	Disposal/ Processing (2)	Junk Cars & Tire Processing (3)	Collection (4)	Total
Salaries/Wages	$799,922	$1,626,834	$0	$2,086,606	$4,513,362
Vehicle Expenses	$50,200	$1,213,180	$0	$1,210,870	$2,474,250
Other Non-Capital Direct Expense	$316,610	$1,258,386	$1,527,500	$286,566	$3,389,062
TOTAL DIRECT COSTS	$1,166,732	$4,098,400	$1,527,500	$3,584,042	$10,376,674
Capital Depreciation Expense	$28,627	$3,043,100	$0	$1,012,785	$4,084,512
TOTAL COSTS	$28,627	$3,043,100	$0	$1,012,785	$14,461,186

(1) Includes: Administration, Education/Outreach, shop and Call Center.
(2) Includes: LF scale house and landfill operations, MRF and Transfer Stations
(3) Includes: Junk cars and tire processing.
(4) Includes: HHW, Convenience and Recycling Centers, Residential Trash Collection, Curbside Recycling, white goods and bulky collections.

Table 1.7 - Costs for Scenario 3 – Mixed Waste Processing (2008 $)

Cost	Administration (1)	Disposal/ Processing (2)	Junk Cars & Tire Processing (3)	Collection (4)	Total
Salaries/Wages	$799,922	$3,751,769	$0	$1,749,182	$6,300,872
Vehicle Expenses	$50,200	$2,439,980	$0	$916,518	$3,406,698
Other Non-Capital Direct Expense	$316,610	$2,343,157	$1,527,500	$271,868	$4,459,135
TOTAL DIRECT COSTS	$1,166,732	$8,534,906	$1,527,500	$2,937,567	$14,166,705
Capital Depreciation Expense	$28,627	$4,553,047	$0	$786,045	$5,367,719
TOTAL COSTS	$28,627	$4,553,047	$0	$786,045	$19,534,424

(1) Includes: Administration, Education/Outreach, shop and Call Center.
(2) Includes: LF scale house and landfill operations, Mixed Waste Processing, Compost Yard and Transfer Stations
(3) Includes: Junk cars and tire processing.
(4) Includes: HHW, Convenience and Recycling Centers, Residential Trash Collection, Curbside Recycling, white goods and bulky collections.

Table 1.8 - Solid Waste Activity Acreage and Building Space Requirements

Facility	Space in Acres	Building Space (SF)
Transfer Station	4	18,300
Household Hazardous Waste	0.5	3,300
Convenience Center		
Landfill Scale-house		150
Landfill		
MRF	2	5,000
Mixed Waste Processing	15	60,000

Recommendation

The criteria used to recommend programs to implement include low costs, environmental health, and diversion. While Scenario 3 provides the highest diversion, it is also the most expensive due to high labor requirements and capital costs. Scenario 1 is the lowest cost to implement and provides only 2% less diversion than Curbside Recycling. Implementing Scenario 1 also allows Guam to initiate other programs as needed and on a pilot basis. Because Scenario 2 is only slightly more expensive to implement and provides slightly more diversion, it is recommended that a pilot curbside collection program be implemented in one of the villages to collect further information and refine cost data. In short, Scenario 1 provides the basic level of service to comply with the Consent Decree without precluding future solid waste programs, such as those in Scenarios 2 and 3, from being initiated.