



CNMI Department of Public Works Solid Waste Management Feasibility Study

Final Report
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1 Executive Summary

The CNMI Office of Grants Management – Office of the Governor (OGM-OG) and the Department of Public Works (DPW) Solid Waste Division contracted GHD, Inc., and subcontractor GBB, Inc., (“The GHD team”), to undertake a feasibility study, including a waste sort; to assess the potential of a government-run waste collection service; and, suggest improvements to the Lower Base Transfer Station (LBTS) Facility.

In accordance with the prescribed scope, the GHD team evaluated the existing solid waste infrastructure on Saipan, primarily the current operations and design of the Marpi Landfill and the Lower Base Transfer Station (LBTS) Facility.

Marpi Municipal Solid Waste Landfill Life Expectancy Analysis: When evaluating the Marpi Landfill, the GHD team used historical data, including post-2013 surveys from the DPW, to compare the true generation of solid waste to the estimated disposal in order to evaluate the useful life of the six (6) cells included in the original development plan. The team also estimated the current existing capacity of the Marpi landfill. Through the evaluation of these reports, the GHD Team estimated that approximately 27.8% of the 2.58M cubic yards (718,549 cubic yards) of airspace have been exhausted as of February 2019. Additionally, there is approximately 422,403 cubic yards of existing capacity remaining in Cell #1 and Cell #2 given the current configuration of the lined area. Utilizing current scale data, a reasonable estimate of the remaining service life of Cell #1 and Cell #2 and the life of the entire proposed lined area of the site can be projected. Based on this rate the estimated remaining airspace capacity of 422,403 cubic yards will last approximately 6.7 years.

Since the Marpi landfill is integral to the solid waste disposal capacity of the island, the projected remaining airspace capacity and disposal rate are significant and pressing concerns. Saipan should consider beginning the process to develop future disposal capacity. Saipan also should consider strategies to divert recoverable waste from the landfill recommended in **Section 6**. The full analysis of the landfill is provided in **Section 4.2.2**.

Lower Base Transfer Station Assessment and Recommendations: The Lower Base Transfer Station (LBTS) was built as a transfer station but is currently being used more like a convenience center, due to the proximity to the landfill. Most full-size commercial trucks go directly to the landfill. Homeowners or haulers and businesses with small trucks are more frequent users of the transfer station. For this reason, creating more space or rearranging the facility to accommodate passenger vehicles, recyclables, and possibly additional diversion opportunities for residents would be a worthwhile effort. It is useful, however, to have the transfer station’s commercial vehicle facilities available as a redundancy for the landfill. Furthermore, in the future, the transfer station could be more fully implemented as intended to reduce truck traffic to Marpi Landfill. For these reasons, the transfer station features should be maintained. The full analysis is provided in **Section 4.3**.

Saipan Waste Sort: As part of the analysis of the existing solid waste management system, the GHD team conducted a waste composition study to evaluate MSW and recyclables delivered to Marpi Landfill. The Saipan waste sort took place the week of April 8-13, 2019 (Monday through Saturday). The overall results of the waste composition study are shown in the figure below. The largest component, by weight, is fiber (33%), followed by glass (24%), and plastics (also 16%). These three materials, usually considered traditional recyclables, comprise nearly three-quarters of the waste stream by weight. There is also considerable opportunity for diversion in organics, which like plastics also represent 16% of the material, by weight.

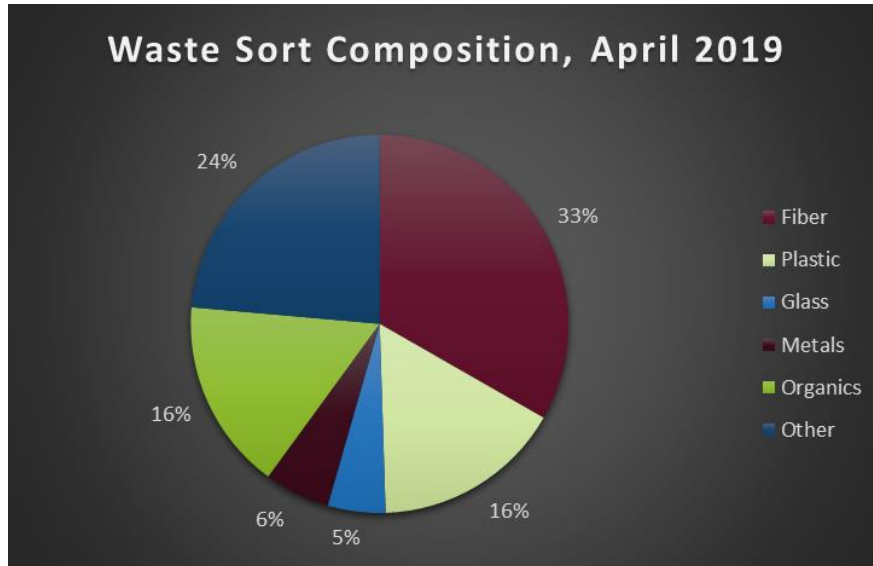


Figure 4: Percentage of Category Groups from the MSW Sort Results

As expected, since it was the largest group, OCC and Other Fibers are the top two materials by weight, followed closely by Other Organics, which was mostly food waste. Bulky or Composite items (which includes diapers), Bags and Film, and the Dirt and Fines materials (items less than 2" square) were quite even at just over 8% of the total waste stream for each of them. The top 10 is rounded out with Glass and Ceramics; Textiles, Leather, and Rubber items; Mixed Plastics; and, Ferrous Metals. The top 10 items equal approximately 90% of the total waste stream.

Of the highly recyclable materials, OCC stands out as a high proportion of the waste stream compared to mainland locations, where OCC is more likely to be approximately 3 percent of the overall waste stream. The remaining recyclables numbers are more similar to mainland sort data. The full analysis is provided in **Section 4.5**.

Assessment of Current System and Alternatives: Based on the analysis herein, the GHD team identified deficiencies concerning the solid waste management system and provides the following recommendations to consider when evaluating the possibility of a government-run waste collection service and potential improvements to the LBTS Facility. It is important to note that, from our first-hand observations, the individuals, agencies, businesses, and residents in the Saipan solid waste system make all available effort to protect their soil, air, water, and people. The full analysis and complete list of recommendations are provided in **Section 5 and Section 6**.

1. Policy and Programs

Deficiency: The tipping fees at the MSWLF have been stagnant for more than fifteen years, chronically underfunding the facility operational and capital budgets as well as reserve funds. This means there is not a sufficient supply of funding, or "up-front money," for making changes or improvements that would benefit the customers or the environment, or both. Additionally, there is somewhat of a financial disincentive to recycle or divert additional recoverable materials, such as cardboard or food waste, from the landfill because the system is set up so that the operator is paid per ton to dispose of waste, not to manage it.

Recommendations: Saipan should assess the feasibility of implementing a solid waste authority that aims to provide service resources and diverse facilities for residents and businesses and guides the flow of wastes through and out of the jurisdiction. The creation of an authority will allow Saipan to have a governing body that is insulated from the politics and financial issues of the general government, allowing it to approach solid waste management from a more entrepreneurial standpoint. Additionally, Saipan should consider establishing the goal of preserving landfill capacity as the primary objective of the island's solid waste management program. Like Prince William County, as described in the examples in **Section 6**, Saipan can make decisions regarding all other programs, including waste reduction, reuse, recycling, and pollution control, that come from this guiding principal.

2. Rate Structures

Deficiency: A fee-for-service system is considered by many to be an equitable way to fund a universal system of solid waste collection and disposal—i.e., people pay just for what they use. This works in locations where the minimum threshold of a tax base population can support such a system. However, in a community that has small tax base and large portions of the population earning poverty or subsistence wages, self-hauling to the landfill, where costs are low and have been frozen for years, or dumping illegally are perceived as more affordable. In reality, the costs are simply moving around from paying rates to paying in other ways (e.g., costs for waste cleanup of illegal dumps). Regrettably, this is not usually apparent to the customer.

Recommendations: Saipan should assess the feasibility of an approach for setting and enacting rate structures similar to that of Orange County, NC, as described in **Section 6**. In Orange County, everyone—i.e., every resident and every business—pays a fee and everyone gets one or more services. Funding is distributed among the rate-payer base so that no one fee is particularly burdensome, and the fees are directly connected to the receipt of service.

3. Transfer Station

Deficiency: If the recycling area at Lower Base TS could be re-designed and some of the space re-purposed, it could be more convenient for users, attracting more people to use it. Furthermore, additional materials might be able to be collected for recycling, reuse, or pollution prevention.

Recommendations: First, Saipan should assess the feasibility of having an expanded list of materials that can be donated, reused, or recycled at its drop sites and drop off facility (for the Lower Base Transfer Station) like in Emmet County, MI, as described in **Section 6**. Second, the island should consider creating one or more convenience centers like on Guam, where the facility is slightly more than a garbage or recycling drop off center and offers the opportunity for residents to properly manage some of the most common and most problematic materials, such as household hazardous waste. Third, with the high proportion of inert and debris material being brought to Marpi Landfill, it is recommended to consider opening a new cell as Class III and start putting debris in there, conserving the current cell for Class I waste.

4. Collection Service

Deficiency: The patchwork system of waste collection, and the proportion of addresses which do not have any collection service, makes the use of administrative tools such as planning and reporting difficult. Collection routes with large gaps between customers are inherently inefficient, making the services that are in use more costly than necessary.

Recommendations: Saipan should assess the feasibility of implementing a universal fee for all customers which funds universal collection of one or more waste streams. There are many different ways to assess a fee, as discussed in **Section 6.2**. Some possible costs to implement universal collection, regardless of the fee structure (or lack thereof), are discussed in **Section 7**. The second concept, which goes hand-in-hand with universal collection—and, in fact, requires it—is to ban cardboard from disposal in the landfill, as in North Carolina.

5. Waste Diversion Programs

Deficiency: Saipan welcomes over half a million visitors each year, and that number is expected to grow by tens of thousands annually. Tourist populations are known to be hard-to-reach, especially about local issues they may not perceive as affecting them. Furthermore, most of the tourists to Saipan are from South Korea, Japan, China, and increasingly Russia, making language access an issue to be considered. The tourists and visitors are, however, a significant source of waste generation, especially when compared to the local population of about 52,000.

Recommendations: Saipan should assess the feasibility of creating a “speakers bureau” of subject matter experts who can visit in the community—scheduled, spontaneously, or by request—and inform residents and businesses about their opportunities regarding waste and why their choices matter. Another recommended program for feasibility study is a “Too Good to Waste Place,” as in Prince William County, VA. This is closely related to the idea of the drop sites with a multitude of materials collected.

2 Introduction

The CNMI Office of Grants Management – Office of the Governor (OGM-OG) and the Department of Public Works (DPW) Solid Waste Division solicited a feasibility study of the solid waste program in Saipan to evaluate the potential for an island-wide, government-run waste collection service and improvements to the Lower Base Transfer Station (LBTS) Facility. The project specifically entails performing activities to include the following:

- a. Evaluating existing solid waste infrastructure for the island of Saipan. Review documents/data for waste entering the Lower Base Transfer Station and Marpi Landfill.
- b. Performing waste sorting activities at the Lower Base Transfer Station and Marpi Landfill for characterization of waste type.
- c. Assessing the general requirements to accommodate a government-run solid waste collection service.
- d. Assessing economic, market, technical, financial, and management feasibilities as it relates to solid waste management for the CNMI.
- e. Providing a draft and final report.

The analysis began by gathering information on the existing solid waste system on Saipan. This included a document review and a week-long waste sort and analysis of material disposed at Marpi Solid Waste Landfill (MSWLF). Discussion in this report of options that might be good for Saipan was derived from an academic and literary review of solid waste management concepts; a review of best practices for solid waste management systems across the U.S.; and, recommendations for changes Saipan could make as a starting point for moving towards its own best system generated from existing conditions assessment.

The content of this report is organized similarly to the work described above. Section 3 describes how the project team assembled information about Saipan. Section 4 reports the information found, including descriptions of operations at the MSWLF and the LBTS and of the waste sort activity. Section 4 discusses opportunities identified by the team. The RFP called for a discussion (Section 5 of the report) of “deficiencies,” which means lack, faults, shortcomings, and failures. Our team is aware, from our first-hand observations, that the individuals, agencies, businesses, and residents in the Saipan solid waste system make all available effort to protect their soil, air, water, and people. They do as much as they can within the system constraints as it exists. There are, however, opportunities to do more to preserve the environment and guard human health. The recommendations given and analyzed in this project were framed as ways to bring those opportunities to Saipan. Section 5 also provides a discussion of how solid waste systems are influenced by government, private companies, and both in conjunction with one another. Section 6 provides examples of best practices from across the country, and makes recommendations for Saipan. Section 7 reviews the feasibility of the endorsed recommendations, and Section 8 describes how a future solid waste management system built on these recommendations might look.

3 Kickoff and Project Approach

The Project Kickoff Meeting was held on March 19, 2019, at GHD's Saipan Office conference room. The attendees for the meeting included representatives from the Bureau of Environmental and Coastal Quality (BECG), DPW's Solid Waste Division, OGM-OG, and the GHD Project Team including representatives from GBB participating via teleconference.

The purpose of the meeting was to provide BECG, DPW, and OGM-OG a better understanding of the plan for the study and to solicit input on project execution and feedback on the planned approach to the project. The following items were considered to be significant in the development of this report:

1. Evaluate the existing fleet of private trash haulers.
2. The main agencies to coordinate with are the DPW Solid Waste Division, Bureau of Environmental and Coastal Quality, and the Office of Grants Management.
3. This study has to consider, generally, the possible impacts stemming from the future operations of two (2) new transfer station facilities at the As Gonno and Kagman villages currently under design.
4. A waste sorting activity to understand the waste profile entering the solid waste facilities.

The meeting discussions combined with the proposal outline framed the project work and outputs.

4 Report on Existing Solid Waste System

4.1 Description of Data Provided

One of the challenges with this analysis, especially the cost accounting exercise, was assembling detailed information. As mentioned below in Section 4.2, a system of planning and reporting can be described as a “self-fulfilling prophecy” of solid waste programs, providing data for decision-making and motivation for keeping, halting, right-sizing, or adding programs.

4.2 Marpi Landfill

4.2.1 History

The MSWLF began accepting waste in 2003. At that time the garment industry was still in full operation. From Operational Year (OY) 2003 through OY07 (OY07 being approximately when the garment factory closures impacted generation and disposal), the MSWLF received between 96 and 112 tons per day. As the garment industry receded, the tonnage delivered mirrored the general economic decline. During the period between OY08 through OY14, the delivered tonnage ranged from 60 tons per day to 68 tons per day.

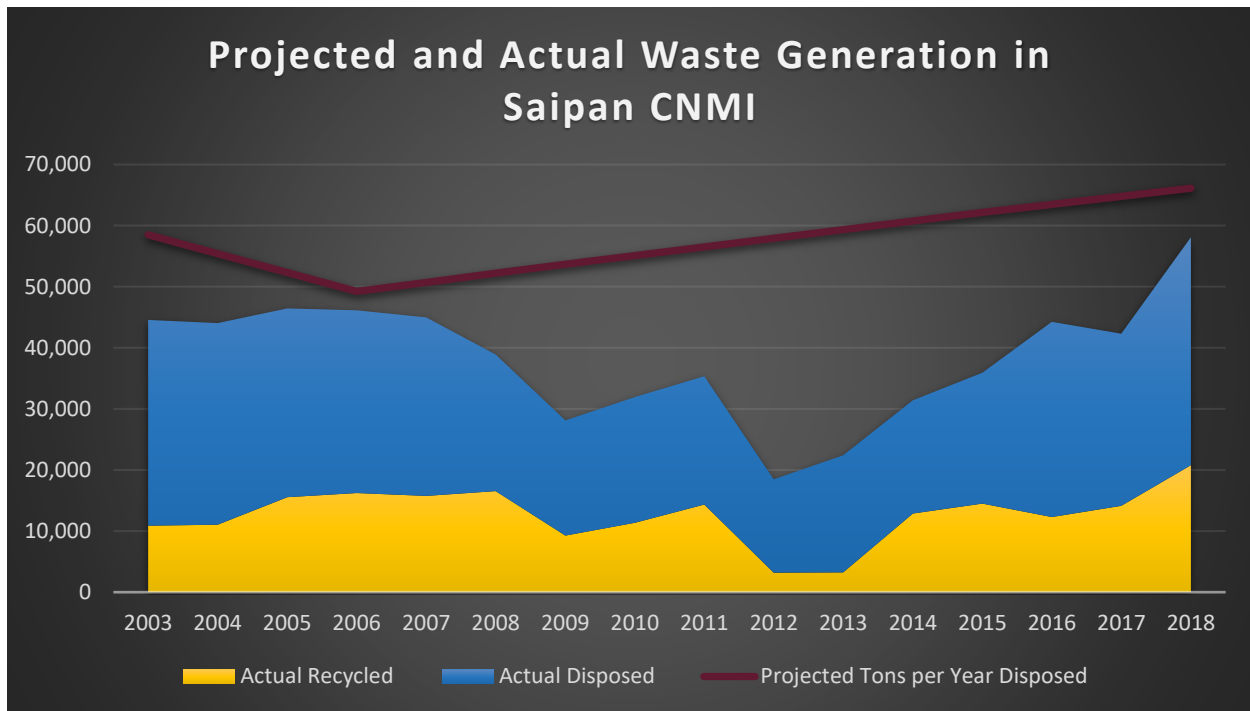


Figure 1 – Actual Tons per Year Recycled and Disposed in Saipan CNMI Compared to 20-year-old Projected Tons per Year¹

Waste disposal tonnage has been trending upwards since 2012. There was a significant increase in tonnage from OY16, OY17, and OY18, trending toward the OY03 to OY07 levels, when the garment

¹ Projections with Base Year 1999 going out to 2020 sourced from Final Implementation Plan Integrated Waste Management System Saipan, MP, Prepared for U.S. Commonwealth of the Northern Mariana Islands, Office of the Secretary of Public Works, Division of Solid Waste Management, Saipan, MP 96950; Harding Project No. 49530; Harding ESE, May 2019; Actual tons from tonnage reports sources from MSWLF scale data.

factories were most active. Typhoon Soudelor struck Saipan in late 2015, lending extra tons to the island's disposal in 2016; and in late 2018, Super Typhoon Yutu struck and is continuing to impact waste disposal into early 2019. It is unclear to what extent the upward trend is amplified by the typhoon debris and to what extent the disposal might have been increasing in the absence of these storms. Unfortunately, these types of events are not isolated. For this reason, although the debris tons "cloud" the MSW disposal figures, the solid waste management system must also be designed to respond to and accommodate cyclic debris-generating events, making this data valuable in its own right.

4.2.2 Landfill Life

There are two dependent issues related to this level of disposal: how the true generation compares to estimated disposal to determine the useful life of the six (6) cells included in the original development plan, and how to estimate the remaining lined capacity.

The original plan provided for six (6) cells and approximately 2.58M cubic yards of airspace. In the Government estimates of generation by Harding Environmental Science and Engineering from the 2002 Closure Plan (Harding ESE 2002, or "Harding02"), it was indicated that the 2.58M cubic yards would provide disposal capacity for sixteen (16) years and closure and post closure care costs to respond to RCRA² Financial Assurance requirements in 40 CFR §258.71 and 40 CFR §258.72 would be approximately \$9,000,000.

One of the issues DPW faces in relation to Permit requirements is based on the estimate in Harding02. This assumed that the full twenty-six (26) acre site would reach capacity within sixteen (16) years. This required the annual reserve fund set aside (closure and post closure) for Financial Assurance. The initial plan and Major Siting Permit called for development of approximately twenty-six (26) acres divided into six (6) cells. Cell #1 and Cell #2 were constructed and comprise approximately 1.14M cubic yards of airspace.

This impacts compliance with 40 CFR §258.71 and 40 CFR §258.72 because the annual reserve is based on an estimated life for all twenty-six (26) acres of sixteen (16) years and true disposal and management indicates that this estimate, although valid at the time, no longer reflects actual airspace utilization and needs to be updated.

An updated approximation of available airspace capacity would result in a reassessment of annual and total cost projections for closure and post closure reserves as well as support an updated projection of available airspace capacity remaining based on accurate historical data and present disposal rates. DPW's current operations contractor began operations at the MSWLF in 2013 and immediately took steps to maximize the available airspace capacity in the existing waste footprint. DPW has evaluated scale records and estimates that approximately 343,654 tons requiring management within the lined portion of the MSWLF were delivered from OY03 through OY16. Harding02 estimated that there would have been 790,566 tons delivered during the same period from OY03 through OY16.

To convert the 343,654 tons to an estimated density, (pounds per cubic yard of airspace volume consumed) airspace volumes generated from topographic surveys show that the current operations contractor achieves a density of 1,100 pounds per yard compacted (or an Airspace Utilization Factor, AUF, of 1,100/2000 or 0.55). During operations since OY13 regular surveys have been conducted to evaluate compaction efficiency and therefore airspace utilization efficiency. These surveys have shown that DPW's

² Subtitle D of the Resource Conservation and Recovery Act, related to Non-hazardous Waste.

operations contractor is realizing 1,100 pounds per yard of compacted waste. This leads to arriving at an estimate of 624,825 cubic yards of solid waste in the active, lined portion of the MSWLF. It should be noted that a much greater density can be realized with proper compactive effort on the waste and therefore more efficient use of airspace resulting in a better return on the value invested in the landfill.

Traditionally, landfills utilize significant quantities of soil to cover solid waste on a daily basis. In most instances, approximately 25% of the available airspace is taken up by this cover material. The landfill operator, Tang's Corporation, has utilized an Alternative Daily Cover (ADC) to maximize the efficient utilization of airspace.

As of February 2019, approximately 718,549 cubic yards of the approximately 2.58M cubic yards have been exhausted or approximately 27.8%. Additionally, there is approximately 422,403 cubic yards of existing capacity remaining in Cell #1 and Cell #2 given the current configuration of the lined area. Utilizing current scale data, a reasonable estimate of the remaining service life of Cells 1 and 2 and the life of the entire proposed lined area of the site can be projected.

The most current scale data indicates that, on average, 2,707.95 tons per month required disposal in the landfill in years OY16, OY17, and OY18. This equates to approximately, 4,923.54 cubic yards (using an average density of 1,100 pounds/cubic yard or an Airspace Utilization Factor of 0.55), of airspace used on a monthly basis. When the utilization of cover is considered, the total average monthly usage of air space is 5,254 cubic yards (the AUF drops to 0.51). Based on this rate the estimated remaining airspace capacity of 422,403 will last approximately 6.7 years. This disposal rate presents a significant and pressing concern requiring the beginning of the process to develop future disposal capacity.

When evaluating the projected landfill life of the remaining 26-acre site, it is appropriate to use the current disposal rate without any escalating multiplier to reflect the fragile nature of Saipan's economic recovery. In order to meet the requirements of 40 CFR §258.71 and 40 CFR §258.72 a reasonable estimate of the remaining landfill life is 1,861,451 cubic yards at an estimated rate of 5,254 cubic yards per month or approximately twenty-nine (29) years.

4.2.3 Tonnage

Tonnage data we have for the facility will be discussed in two ways. The first will be an evaluation of the most recently concluded operating year's tonnages. This will allow us to take a short-term look at disposal habits and make any minor adjustments needed. Secondly will be a comparative discussion of the combined tonnages from the last three operating years: OY16, OY17, and OY18. This will allow a longer-term evaluation to occur and provide data to estimate future need in both capital and operational program development.

Delivered Tonnage; Operating Year 2018 (OY18; February 1, 2018 through January 31, 2019)

The largest component of delivered material is Municipal Solid Waste (MSW) from a variety of sources. In OY2018 there was a total of 37,313.05 tons of MSW delivered and disposed of in the MSWLF. Aggressive site management and creative utilization of recoverable material led to a significant increase in material classified as "Backfill." Backfill is primarily dirt, rock, construction & demolition debris (C&D), or other inert and reusable material. Previously, backfill was placed into the lined portion of the landfill, displacing airspace and creating operational difficulties. Operations now directs this material to an unlined section of the MSWLF and it is utilized as needed. 5,754.75 tons or 9.9% of the total delivered waste, was classified as Backfill and was diverted during this reporting period. Some of the material is later used as ADC, as

described elsewhere. A more detailed description of the recovered/recycled waste stream is contained in a succeeding section.

DPW scale records have a rudimentary delineation of component parts of the waste stream, as illustrated in Figure 2. The MSWLF received a total of 58,105.51 tons of material during OY18. Of this total 20,792.46 tons were diverted to an alternative use through recycling or re-use and are not charged at the gate. Of the remaining 37,313.05 tons of material disposed, 29,866.73, or 80.04%, is classified as Municipal Solid Waste (MSW) and is charged at the gate rate. 734.27 tons, or 1.96%, is classified as Construction and Demolition debris (C&D) and is charged the gate rate. 69.87 tons, or 0.19%, is classified as Green-waste Mixed and is charged the gate rate. 803.51 tons, or 2.15%, is classified as Government Free loads and is not charged. And, 627.63 tons, or 1.68%, were classified as Government C&D and not charged.³

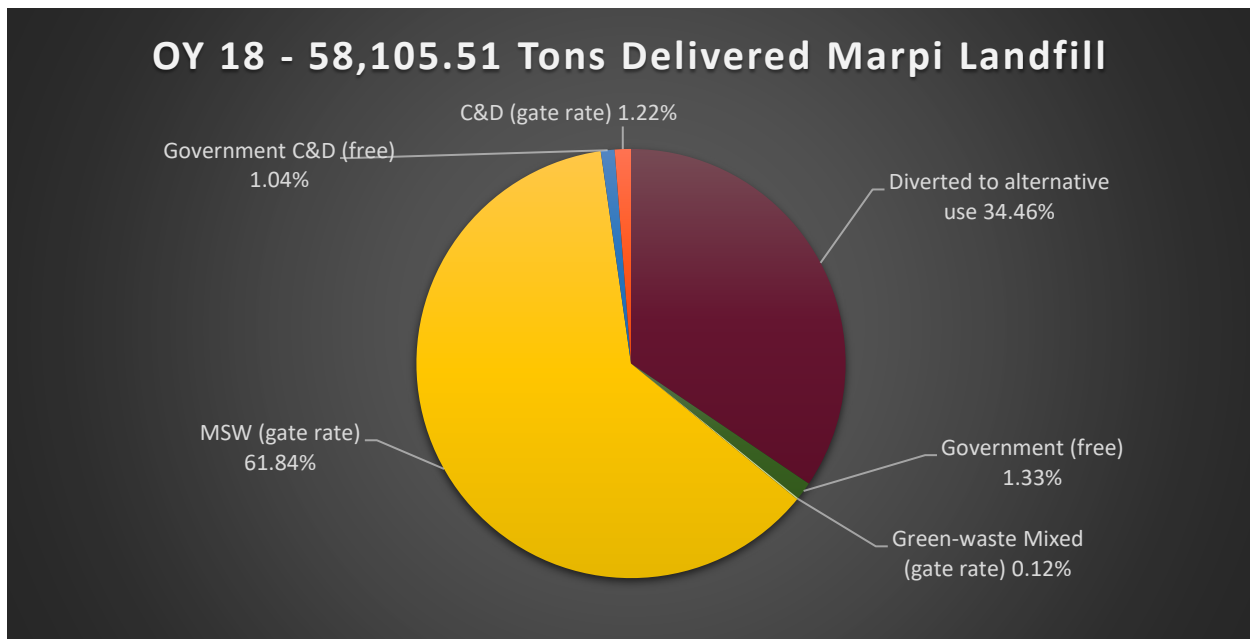


Figure 2 – Tonnage Delivered to Marpi Landfill by Type, Operating Year 2018

The 20,783.44 tons diverted to alternative reuse or recycling were primarily clean green waste at 13,346.98 tons (64.19% of the recovered stream) and backfill at 5,754.75 tons (20.67% of the recovered stream). There is 456.97 tons of sewage sludge beneficially reused (1.64% of the recovered stream). The remaining are recyclables including metal, 524.09 tons (1.89% of the recovered stream); tires, 294.59 tons (1.06% of the recovered stream); white goods, 192.27 tons (0.69% of the recovered stream); cardboard, 137.44 tons (0.49% of the recovered stream); mixed recycling, 50.28 tons (0.18% of the recovered stream); office paper, 22.93 tons (0.08% of the recovered stream); newspaper, 4.41 tons (0.02% of the recovered stream); glass, 4.87 tons (0.02% of the recovered stream); and, plastic bottles, 2.86 tons (0.01% of the recovered stream). Figure 3 illustrates these figures and their relationship to each other.

³ There were no residential free loads of MSW delivered during OY18, although there are in some other reporting years.

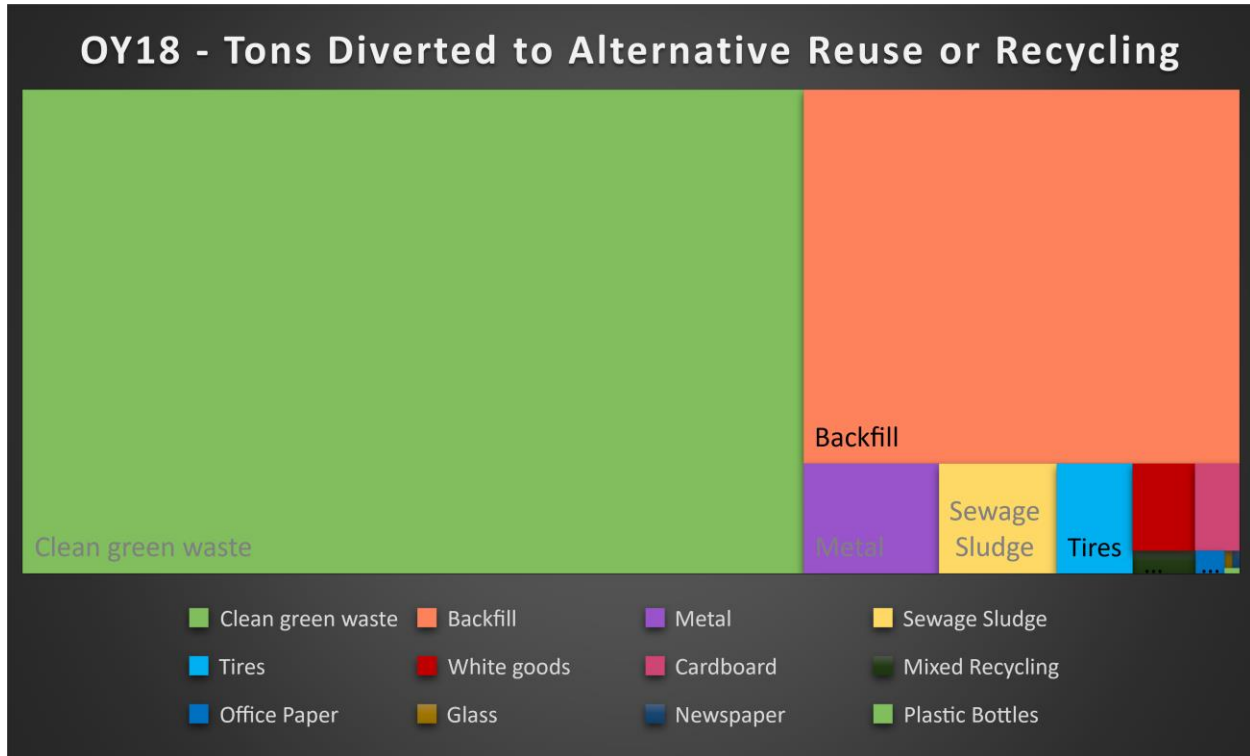


Figure 3 – Tons Delivered to Marpi Landfill and Diverted to Alternative Reuse or Recycling, OY18

The clean green waste and the backfill—almost 92 percent of all the Alternative Reuse materials—are 100 percent re-purposed and utilized within the footprint of MSWLF. 100 percent of the sewage sludge is mixed with cover soil and used as daily cover or intermediate cover material for the MSWLF working face. The remaining tons of recovered material is managed through a contract with a private firm. This firm is provided with space at the LBRTS for acceptance, processing and shipping the material. They are additionally provided with a cardboard baler, skid-steer loader, office space, a small sorting line with conveyor, tire baler, glass crusher, and power and water. The only residual waste stream is that sometimes fluff from the white goods is disposed at the landfill.

Delivered Tonnage; Operating Years 2016–2018 (February 1, 2016 through January 31, 2019)

When evaluating tonnage records from OY16, OY17, and OY18, it is critical to be mindful that Saipan felt the effects of two super typhoons; Super Typhoon Soudelor in August 2015 and Super Typhoon Yutu in October 2018. This may skew data higher and inflate disposal rates; however, for planning purposes it seems reasonable to use this data as a conservative baseline for disposal. This would allow DPW to provide allowance for debris management impacts along with ensuring that appropriate programs and policies are put into place to more adequately address integrated solid waste management practices.

During this period from OY16 through OY18 the DPW received 144,700.87 tons. Of this material, 47,214.56 tons were diverted to an alternative use through recycling or re-use (32.63%). The remaining 97,486.31 tons were disposed of in the MSWLF. Similar to the OY18 discussion, this disposed waste is categorized as follows: 73,186.63 tons, 75.09%, is classified as MSW and is charged at the gate rate. 14,138.79 tons, 14.5%, is classified as C&D and is charged the gate rate. 4,403.50 tons is classified as Green-waste Mixed,

4.52%, and is charged the gate rate. 4,036.07 tons, 4.14%, is classified as Government Free loads and is not charged. These figures are illustrated in Figure 4.

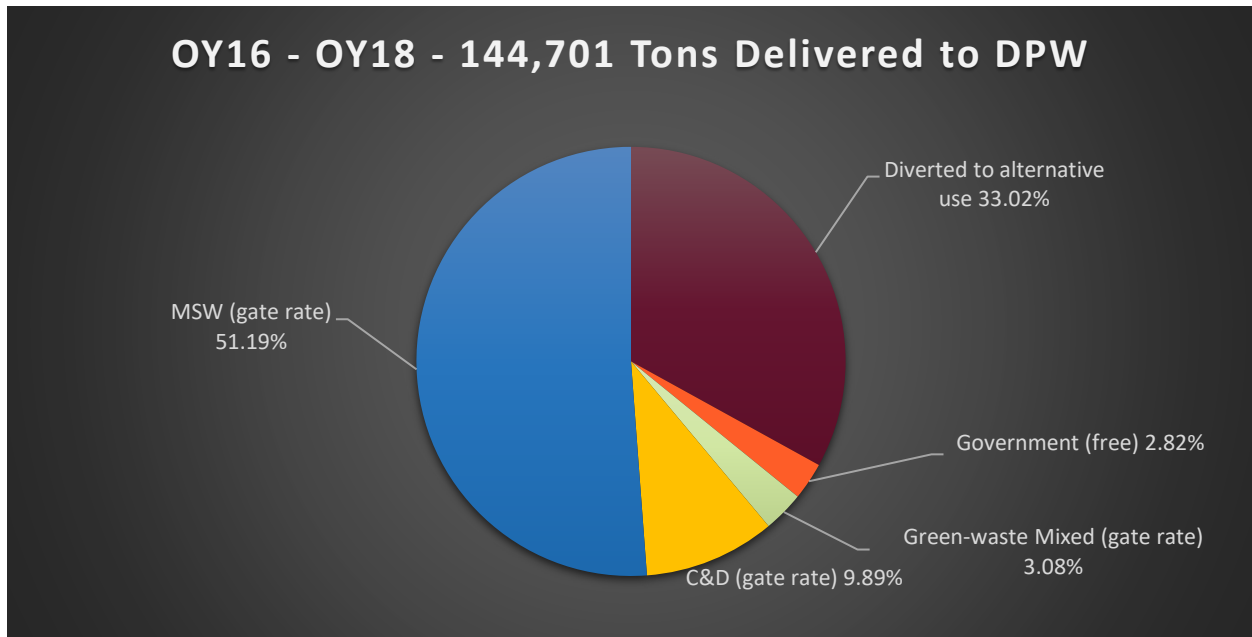


Figure 4 – Tonnage Delivered to Marpi Landfill by Type, Operating Years 2016 through 2018

The 47,214.56 tons diverted to alternative reuse or recycling were primarily clean green waste at 27,589.83 tons (58.54% of the recovered stream) and backfill at 14,515.47 tons (30.74% of the recovered stream). The remaining 5,109.26 tons in the recovered material stream include; sewage sludge 1,437.05 tons (3.04% of the recovered), metal 1,437.05 tons (3.04% of the recovered stream), tires 871.94 tons (1.85% of the recovered stream), white goods 375.99 tons (1.14% of the recovered stream), 497.71 tons of cardboard (1.05% of the recovered stream), office paper 151.75 tons (0.32% of the recovered stream), mixed recycling 129.81 tons (0.27% of the recovered stream), glass 18.82 tons (0.04% of the recovered stream), newspaper 17.79 tons (0.04% of the recovered stream), and plastic bottles 8.55 tons (0.02% of the recovered stream). These figures are illustrated in Figure 5.

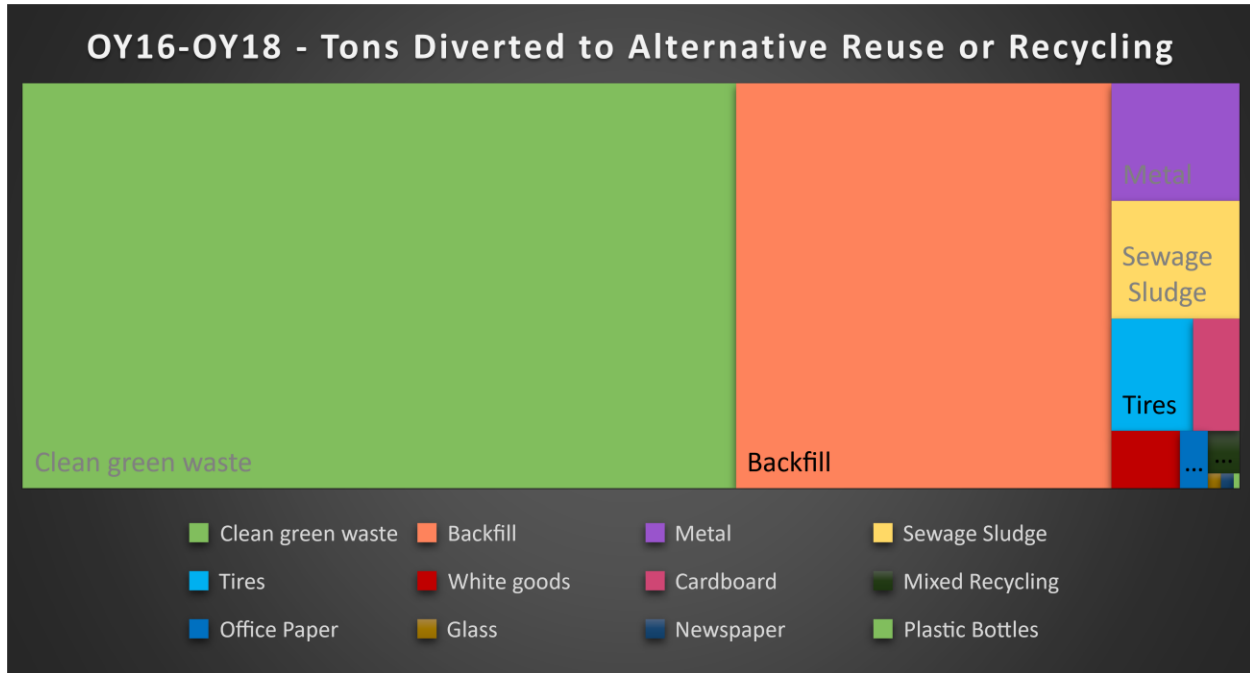


Figure 5 – Tons Delivered to Marpi Landfill and Diverted to Alternative Reuse or Recycling, Operating Years 2016 - 2018

The clean green waste and backfill are re-purposed and utilized within the footprint of the Marpi Solid Waste Facility (MSWLF).⁴ The sewage sludge is mixed with cover soil and used as cover material for the MSWLF working face. The recovered material not repurposed at the MSWLF is managed through a contract with a private firm. This firm is provided with space at the LBRTS for acceptance, processing and shipping accepted, recovered material. They are additionally provided with a cardboard baler, skid-steer loader, office space, a small sorting line with conveyor, tire baler, glass crusher, and power and water.

4.3 Lower Base Transfer Station

4.3.1 History and Detail

The Lower Base Refuse Transfer Station (LBRTS) is on the west side of the island of Saipan in an industrial area known as Lower Base. The facility is open Monday through Saturday from 7:30 a.m. to 4:30 p.m. It consists of an office/material recycling facility building, recycling container storage area, green waste storage area, transfer building with tipping floor, hand unload, and automatic unload areas, inbound and outbound scales, public and employee parking, access roads, and a transfer truck loading area.

The entrance to the transfer station is on the north side of the site. This entrance is be open to the public during operating hours and is the entrance for all traffic, including transfer trucks, into the transfer station. The scale house and electronic vehicle scales are just inside the main entrance. All transfer station patrons are required to stop on the 40-foot inbound and outbound scales and communicate with the scale house

⁴ Historically, un-processed green waste was arranged into a shape similar to a windrow and allowed to passively decompose. After Typhoon Soudelor, DiamondZ 1250 tub-grinder was used to process both vegetative debris and clean wood from construction and demolition debris. This material was also placed into windrows that were being turned and watered in a basic technique to encourage break-down. When Typhoon Yutu hit, the windrows had to be pushed and covered to allow for acceptance of debris.

attendant for load accounting, determining waste disposal charges, recording waste quantities, and receiving disposal instructions. Transfer trucks are allowed to bypass the scales unimpeded to the roll-off loading area. Transfer trucks are weighed at the landfill. The scale house contains office space, an employee restroom, and an automated vehicular weighing and information system manufactured by Mettler Toledo.

There are three main parts of the LBRTS. They are:

Transfer Station Office/MRF: The office area provides a public reception area and a manager's office. The transfer station office building provides office space for Department of Solid Waste Management (DSWM) personnel. The MRF is a separate area under the combined building and is operated by a contractor.

Stockpile Areas (2): There is a fenced area where metals and white goods are received and processed for shipment to off-island markets. A separate stockpile area is designated to accept and process used tires.

Transfer Facility Drop-off Areas: The transfer facility is a steel-framed building that covers both the entire tipping floor and the container loading areas, and two sides of the building are closed in to limit the wind from moving waste outside the building. The facility has three bays to accommodate 48-cubic-yard roll-off containers. After customers place waste onto the tipping floor, the refuse is inspected for hazardous and non-compatible wastes, then broken up and compacted by equipment before being pushed directly into roll-off containers. Three open-top bays are built under the tipping floor to accommodate the 48-cubic-yard roll-off containers. All the manufacturer's operations and maintenance manuals for the buildings and supplied equipment are kept in the transfer station office for reference.

The transfer station accepts the following waste streams:

- Residential municipal solid waste
- Household hazardous wastes
- Recyclable materials
- White metal goods

The following waste streams are not accepted at the transfer station:

- Commercial municipal solid waste
- Special wastes, except white metal goods
- Commercial hazardous waste

The scale house operator questions the transporter about whether any hazardous waste or special wastes are contained in the load being delivered. It is not the intent to sample every load of waste entering the transfer station; however, random loads of waste are checked for acceptability for disposal. The transfer station manager has personnel dedicated to inspecting vehicles and identifying loads that should be inspected. If the transporter's load is suspicious, then the scale house operator contacts the transfer station manager to have the load inspected.

Any unusual or questionable waste is rejected unless a determination of acceptability can be made by transfer station personnel. If such a determination cannot be made, the hauler will be informed that the waste cannot be accepted by the transfer station. Refused loads and any regulated hazardous/PCB waste discovered in the transfer station are reported to the Director of the Division of Environmental Quality (DEQ) in the quarterly and annual reports. If any of these materials are found on the tipping floor after

the customer is gone, then the transfer station has to consider the material to be a hazardous waste cleanup situation and handle it accordingly.

Commercial regulated hazardous wastes and polychlorinated biphenyl (PCB) waste are not accepted at the transfer station. They are defined as follows:

- Regulated Hazardous Waste ⁵ Refers to a solid waste that is a hazardous waste, as defined in Title 40, Code of Federal Regulations, Part 261.3 (40 CFR 261.3), that is not excluded from regulation as a hazardous waste under 40 CFR 261.4(b) or was not generated by a conditionally exempt small quantity generator as defined in 40 CFR 261.5.⁵
- Polychlorinated Biphenyl Waste (PCB) – as defined under 40 CFR 761⁶

The scale facility and transfer station are operated by DPW, and the MRF is operated by a contractor. The transfer station manager is responsible for the overall coordinated operation of the transfer station. The transfer station manager ensures that waste handling and screening practices and personnel attitudes are geared toward satisfying the requirements of planning, design, operational, and environmental regulatory requirements. In the event of noncompliance, the transfer station manager will implement corrective actions as necessary to protect the health and safety of the public and operations personnel. The contact names, phone numbers, and addresses of the transfer station manager and/or responsible individuals will be displayed conspicuously at the transfer station office.

Personnel and equipment listed below do not include the MRF, which is operated by a contract operator, which provides its own personnel and equipment.

Operation of the transfer station typically uses the following equipment:

- Five roll-off type transfer trucks
- Eight 48-cubic-yard roll-off containers
- Two 20-cubic-yard roll-off containers
- Front-end loader
- Track loader

Typical personnel requirements include the following:

- Transfer station manager
- Two administrative/bookkeepers
- Two equipment operators
- Two laborers/mechanics
- Three to five transfer truck drivers

The transfer station manager ensures that all personnel receive adequate training to perform the duties assigned. In addition to specific duties, all employees are familiarized with identifying regulated hazardous, PCB, and other special wastes.

⁵ <http://www.gpo.gov/nara/cfr/index.html>

⁶ <http://www.gpo.gov/nara/cfr/index.html>

4.3.2 Best Practices for Transfer Stations (“Convenience Centers”)

Transfer stations need to be correctly functioning Solid Waste Management facilities with trackable data for regulatory compliance and planning. To fulfill reporting commitments required by state and federal governments, transfer stations in the United States usually evaluate tons received and managed in a facility on a monthly, quarterly, or annual basis. According to the "Waste Transfer Stations: A Manual for Decision-Making," guidance provided by the Environmental Protection Agency, facilities are often required to report the number of materials (by weight tons or loads) collected by and delivered from the location. Additionally, Transfer Stations are required to monitor and report unacceptable or hazardous materials brought to their facilities and responses to customer complaints. To track materials obtained by a facility, facilities sometimes use scales to weigh incoming trash collected from residential and commercial users. Facilities can also follow the amount of trash exported by reviewing hauler bills. Some facilities track their exported waste by requiring processors to send a tonnage report documenting the type, and the number of materials (in tons or load) received from that Drop off Facility. Transfer Stations and convenience centers can also use data tracking to support facility management by using this data to identify operational needs (e.g., the amount and size of containers needed to collect materials). Also, monitoring the number of unacceptable items received can help facilities assess whether additional educational outreach is required to help customers understand the proper materials collected by the facility. Additionally, data tracking of recyclables collection can help the government create programs and policies or make necessary waste infrastructural investments based on the materials most commonly collected.⁷

In conjunction with data tracking, convenience centers and Transfer Stations should consider the utility and safety of their facility by evaluating its design. According to the Illinois recycling manual, governments can structure convenience centers and transfer stations with hassle-free traffic flows by providing drop off areas and access lanes for passenger vehicles and heavy truck traffic. Also, governments should consider the security of the location by finding ways to limit illegal activities near a facility. Some convenience centers use gated fences, and using 24-hours lighting will limit after hours to deter scavenging and illegal dumping on the premises.

4.3.3 Assessment

The facility was built as a transfer station but is currently being used more like a convenience center, due to the proximity of the landfill. Most full-size commercial trucks go directly to the landfill. Homeowners or haulers and businesses with small trucks are more frequent users of the transfer station. For this reason, creating more space or rearranging the facility to accommodate passenger vehicles, recyclables, and possibly additional diversion opportunities for residents would be a worthwhile effort. It is useful, however, to have the transfer station’s commercial vehicle facilities available as a redundancy for the landfill. Furthermore, in the future, the transfer station could be more fully implemented as intended to reduce truck traffic to Marpi Landfill. For these reasons, the transfer station features should be maintained.

4.4 Report on Solid Waste Collection System

There are ten waste collection companies that deliver to the landfill:

- Artman Environment Corporation
- Cruz Sanitation Services
- Great Pacific Refuse and Recycling
- Joeten Enterprises
- JHJ Corporation
- Marianas Solid Waste Collection, LLC (MSWC)

⁷ <https://www.epa.gov/sites/production/files/2016-03/documents/r02002.pdf>

- Superior Sanitation
- TC Trash
- A.Y.D.
- Services (SSS)
- Trash King

Very little information is available formally about customers visiting the landfill. During the period the waste sort was conducted (see Section 4.5), a record was kept of all the commercial haulers (companies, not individuals) and account customers that came to the landfill gate. They are shown in Table 1.

Table 1 – Haulers Delivering to Marpi Landfill in a Week (Waste Sort Week April 8-13, 2019)

Customer	# of Loads	Type	Tons for the Week
Commercial Haulers			
Green Trucks MSWC (Joeten)		MSW SC	12.52
		Total	12.52
Rear-Load Trucks			
AYD	45	MSW SC	108.22
JHJC	30	MSW SC	87.23
Art Man	44 ⁸	MSW SC	137.28
GPRR (White Truck)	6	MSW SC	4.87
Manns	3	MSW SC	3.78
		Total	341.38
Other Drop-Off			
Park and Rec	16	MSW SC	4.04
Mayor		MSW SC	25.5
DLNR	1		0.7
DOC	3		1.22
DPS	1		0.45
DPW			2.39
Gov Office	1	MSW SC	0.07
Legis. B		MSW SC	0.99
GPPC			0.36
Residential		MSW SC	6.02
		Total	41.74
Unknown			
DSWM	15	TipMSW	44.3
DPW		Mix MSW	138.7
Mayor		Mix MSW	2.4
		Total	185.4

⁸ The record is incomplete for this hauler. During the waste sort period, Art Man delivered 48 trucks. Some were backfill, green waste, C&D, or metal, plus MSW SC. Most of the trucks and 78 percent of the tons were MSW SC.

4.5 Report on the Waste Sort

In order to fully understand the nature of the waste disposed on Saipan, a waste composition study was included as part of the system-wide analysis. A waste composition study, often also called a waste sort, is necessary to understand the actual amounts of individual types of materials contained in the incoming waste. Without physically sampling and sorting the material, any decisions going forward regarding diversion, recycling or other aspects will be based on guesses or derived from data in other localities—for an island, this can be a problem as it may not be representative. While not very glamorous, waste sorts provide a treasure trove of information on which to base analyses and decisions for years in the future. It is recommended to do such a waste analysis prior to major changes in policy and system functionality, and again after the changes have occurred to check the effectiveness of these changes.

The Saipan waste sort took place the week of April 8-13, 2019 (Monday through Saturday). The landfill is open for disposal from 8:00 AM to 4:00 PM on the weekdays and 8:00 AM to 4:30 PM on Saturdays. A GBB representative was on-site for the entire set-up and sorting process. The sort took place at the Marpi Landfill. A tent was set up near the citizen drop-off area to provide cover, with two 4'x8' tables built specifically to sort this waste. Approximately sixteen 32- or 33-gallon totes were utilized as both receptacles for the sorted category materials and as collection buckets to gather samples from the tipped waste material. Certain categories that seldom had much material utilized 5-gallon buckets to collect the material in that category. A group of APEC employees were staffed as the sorters, with the GBB employee identifying sample loads, quality controlling the sorted materials, and recording the weigh-out data. The sampling took place during the operating hours of the landfill from Monday through Saturday, with a total of 50 samples being sorted over the length of the study.

4.5.1 Methodology

Generally, the material chosen for sorting was waste destined for disposal in the Marpi MSW landfill. One exception was mixed C&D waste, which is waste from construction and demolition sites, including both private and Government C&D. Another exception was any material deemed dangerous or difficult to sort utilizing the hand sort methodology (such as medical waste). Normally trucks are chosen for sampling based on the “nth truck” method, where every 3rd or 4th truck, depending on the total number of trucks expected, are selected for sampling. As there were so few trucks, and the timing was quite random of their arrival throughout the day, samples were collected depending on the type of hauler and the availability of a location to store the sample prior to sorting. The goal was to get at least two samples each from all of the trucks that showed up to tip at the landfill. This helped ensure a broad spectrum of pick-up locations and adequate representation among all the haulers. While individual trucks were not recorded (some haulers on the island have multiple trucks) the numbers were not so great that it wasn't difficult to remember the trucks and make sure multiple samples were taken from them throughout the week.

The hauler of each sampled truck was recorded as was a copy of the scale tare sheet for all trucks sorted. The haulers were divided into four categories, to better understand the incoming waste from all sources, and the weights of the final results based on the weekly tonnage to the landfill from the different haulers. The incoming haulers were divided into the following categories:

1. Commercial Trucks – These were usually the green trucks utilized by Joeten Groceries and Ace Hardware stores.
2. Private Direct Haul – These were either private citizens or other haulers such as Parks and Rec and a group from the mayor’s office that brought collected waste in small trailers or pick-ups to the landfill, generally tipped in the citizen drop-off area next to the waste sort tent location.
3. Private Collection Haulers – This was material collected in small, private compactor trucks from residential and commercial locations throughout the island.
4. Transfer Station – This was the transfer boxes from the Lower Base transfer station.

This constitutes nearly all of the volume of material that comes to the landfill, with the exception of C&D materials, inert rock, and green waste residue from the clean-up associated with Super Typhoon Yutu, which were identified and not sampled.

The logistics to collect samples took a few iterations to work out, but the best method was deemed to identify the truck needed for sampling and have it tip normally at the landfill working face. Then, the landfill’s wheeled loader was utilized to collect a 5-cubic-yard bucket sample from the load. The loader operator was instructed to vary the location within the pile that the scoop was taken from, although this was somewhat limited due to other tipped piles and the frequent small size of the tipped piles. From the scoop sample, eight totes were loaded with material for sorting. Sometimes this constituted nearly the entire scoop and other times it would be much less. This worked out to be approximately 200 pounds per sample. If the totes were full or a sort was already happening, the scoop sample was piled near the sampling tent as a queue for the next sort. There was room for up to four scoop samples, and care was taken to make sure each scoop sample matched the data sheet and the truck it was taken from. Once the sample was collected, the loader was used to clean up any remaining materials from the pile.

Samples from the private direct haulers were sometimes tipped directly near the sorting tent or on the ground at the citizen drop-off for the loader to collect a sample prior to disposing the rest.

The bins containing the waste for the sorting were tipped onto the sorting tables and the materials were divided, by hand, into the categories shown in Table 2. The definition of each of these categories is included in Appendix A.

Table 2 – Waste Sort Categories

Category	Material
Fiber	Old Corrugated Cardboard (OCC)
	Other Fiber Materials
Plastic	PET (#1)
	HDPE (#2)
	Mixed Plastic
	Bags and Film
Glass	Glass and Ceramics
Metals	Ferrous Metals
	Non-Ferrous Metals
Organics	Yard Waste
	Other Organics
Other	C&D
	Textiles, Leather and Rubber
	Dirt and other Fines
	Other Bulky or Composite Items

Once the materials from each sample were sorted into their respective categories, all categories that had material were weighed and the contents dumped into the loader bucket for disposal. Care was taken to ensure all material from each sample was weighed with that sample. In cases of multiple bins being needed to contain all of the materials from a certain sample, it was properly noted on the data collection sheet so that the appropriate amount of tare weight was removed from the final sample weights.

This process was repeated throughout the day, depending on the number of trucks and the timing. The landfill closed at 4:00 PM so the team tried to be done with the sorting and cleaned up by around that time. In total over the six days of the sort, 50 samples were taken, sorted and weighed resulting in statistically valid results.

4.5.2 Sort Results

The total number of trucks was not always directly proportional to the total tonnage brought to the landfill, as many of the commercial and self-hauls had much less in terms of tons even though the volume was sometimes similar, both in terms vehicle numbers and the space needed for the hauling and disposal. This is because these haulers had no compaction of the material and the materials were frequently light but voluminous such as cardboard or Styrofoam containers. As these results are based on weight and not volume, the resulting composition percentages need to be weighted to adjust the results to reflect the total amount of MSW that is brought to the landfill. The incoming tonnage data for the week of the waste sort was used to tabulate the total tonnage for the week from all four types of incoming hauls.

There was nearly 440 tons of MSW brought to the Marpi landfill the week of the waste sort study, with more than three-quarters of the material from the private collection haulers. The percentage of each hauler type is shown in

Table 3.

Table 3 – Percentage of incoming MSW tonnages by hauler type for weighting of results

Hauler Type	Weekly Tons	%	# of Samples
Private Direct Haul	12.52	2.8%	8
Private Collection Hauler	341.38	77.6%	27
Commercial Hauler (Joeten)	41.74	9.5%	6
Transfer Station	44.3	10.1%	9
Weekly Total	439.94		50

What this essentially indicates is that while the Joeten/Commercial haulers had a very high percentage of cardboard, that result only counts about 3% to the total result, while any cardboard in the rear-load private collection haulers would count over 77% to the result. This is why most of the samples were taken from Private Collection Hauler as that data was the most influential in the overall results.

Once the sort weights were entered into the excel database and the weighting solved, the results were calculated and tabulated. The error range was also calculated for the overall results based on a confidence level of 90 percent, which essentially means that 9 out of 10 times this sort is performed, the average (mean) will land within the statistical error range. This is another way of saying that there is a good chance⁹ the actual population average (mean) of all the MSW waste generated on the island is somewhere between the error range calculated for this study. The error range is indicated by the “whisker” bars in the charts and shown as a \pm in the tables like Figure 7 and Figure 8.

The overall results of the waste composition study are shown in

⁹ Surprisingly, this chance isn't necessarily 90% that the mean will be between the error range. This error has to do with the results of the sampling and not necessarily for the population mean. However, this is the method most commonly used to calculate error and makes the most sense for this study as well.

Table 4. The results subdivided by type of hauler are included in the expanded table in Appendix B.

Table 4 – Overall results of Waste Composition Study

Group	Category	Weighted Mean - All	Error Plus/Minus
Fiber	<i>Old Corrugated Cardboard (OCC)</i>	16.2%	2.9%
	<i>Other Fiber Materials</i>	17.1%	2.8%
Plastic	<i>PET (#1)</i>	3.2%	0.5%
	<i>HDPE (#2)</i>	1.1%	0.2%
	<i>Mixed Plastic</i>	3.5%	0.6%
	<i>Bags and Film</i>	8.4%	0.7%
Glass	<i>Glass and Ceramics</i>	4.9%	0.8%
Metals	<i>Ferrous Metals</i>	3.2%	0.5%
	<i>Non-Ferrous Metals</i>	2.4%	0.5%
Organics	<i>Yard Waste</i>	1.4%	0.5%
	<i>Other Organics</i>	14.9%	2.2%
Other	<i>C&D</i>	2.1%	1.7%
	<i>Textiles, Leather and Rubber</i>	4.8%	1.4%
	<i>Dirt and other Fines</i>	8.1%	1.4%
	<i>Other Bulky or Composite Items</i>	8.6%	2.2%

While the results are interesting, it is frequently much easier to interpret the results visually to understand. For instance, the top group from the above categories in terms of weight (and likely volume) was from the Fiber group, which includes cardboard and all other fiber items. The next largest group was the Other category, mostly consisting of Fines and Bulky items. Figure 6 shows the percentages of each category group from this study.

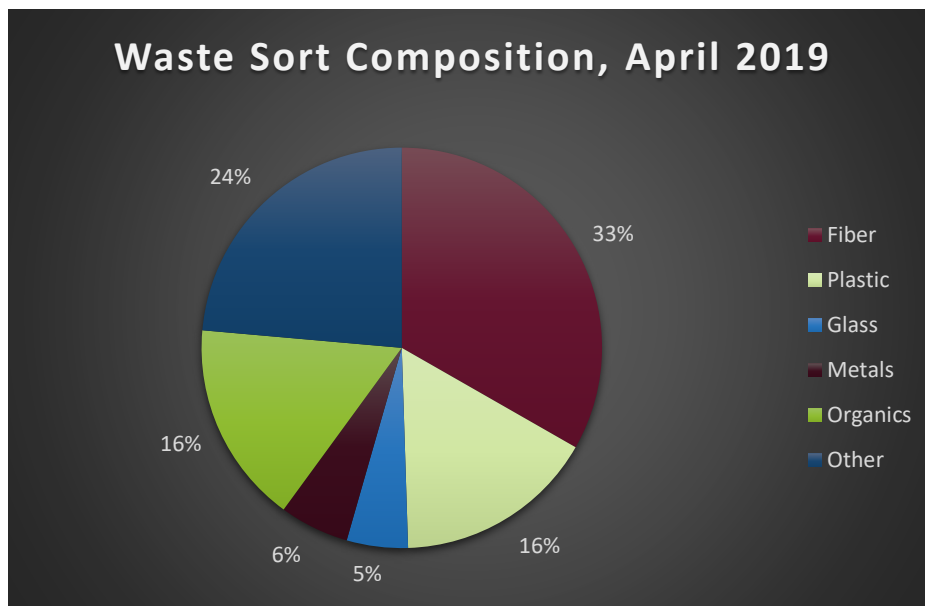


Figure 6 – Percentage of Category Groups from the MSW Sort Results

These results indicate that plastic and fiber make up almost half of all the MSW disposed on the island.

To help show how the larger components of the waste sort categories relate to the other, the results were sorted into the top 10 materials by weight, with the results shown in Figure 7.

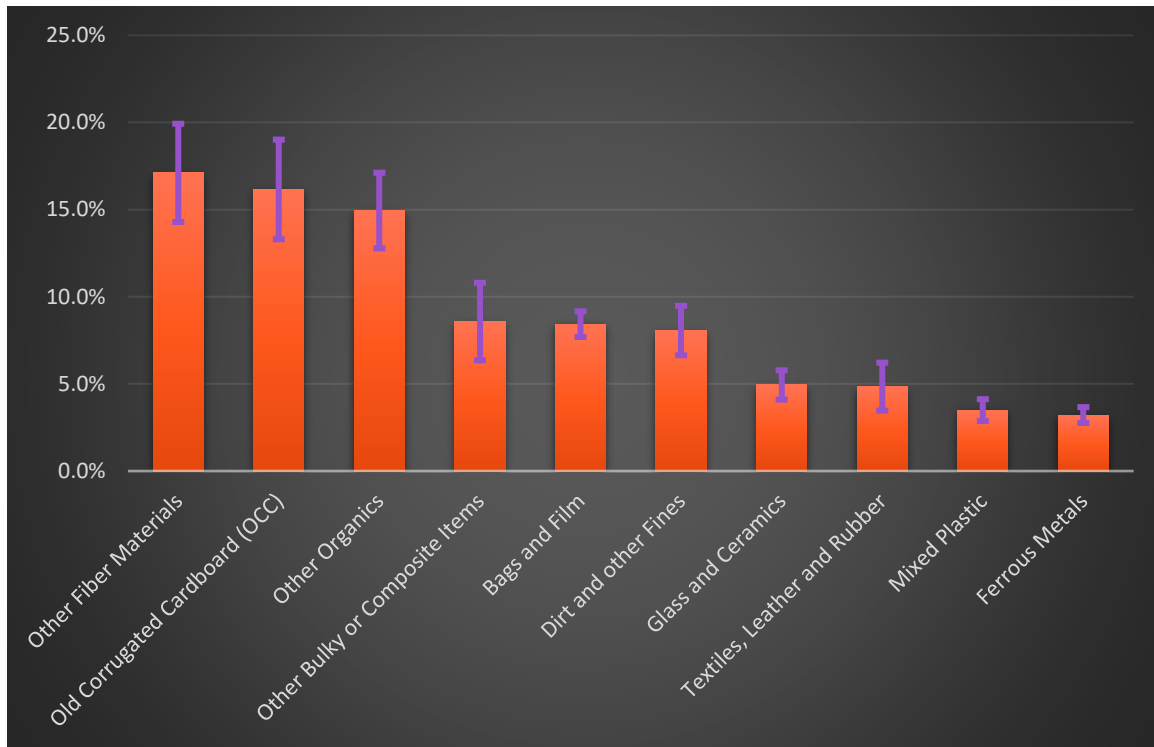


Figure 7 – Top 10 materials by Weighted Average (Mean)

As expected, since it was the largest group, OCC and Other Fibers are the top two materials by weight, followed closely by Other Organics, which was mostly food waste. Bulky or Composite items (which includes diapers), Bags and Film, and the Dirt and Fines materials (items less than 2" square) were quite even at just over 8% of the total waste stream for each of them. The top 10 is rounded out with Glass and Ceramics; Textiles, Leather and Rubber items; Mixed Plastics; and, Ferrous Metals. The top 10 items equal approximately 90% of the total waste stream.

Of the highly recyclable materials, OCC stands out as a high proportion of the waste stream compared to mainland locations, where OCC is more likely to be approximately 3 percent of the overall waste stream. The remaining recyclables numbers are more similar to mainland sort data. The recyclable categories of interest are compared in

Table 5.

Table 5 – Highly Recyclable Materials Results

Recyclable Category	Weighted Mean - All	Error Plus/ Minus
Old Corrugated Cardboard (OCC)	16.2%	2.9%
PET (#1)	3.2%	0.5%
HDPE (#2)	1.1%	0.2%
Ferrous Metals	3.2%	0.5%
Non-Ferrous Metals	2.4%	0.5%

Of interest also are the types of materials dropped off from each type of hauler. Figure 8 shows the results when comparing the source for the overall top 10 materials.

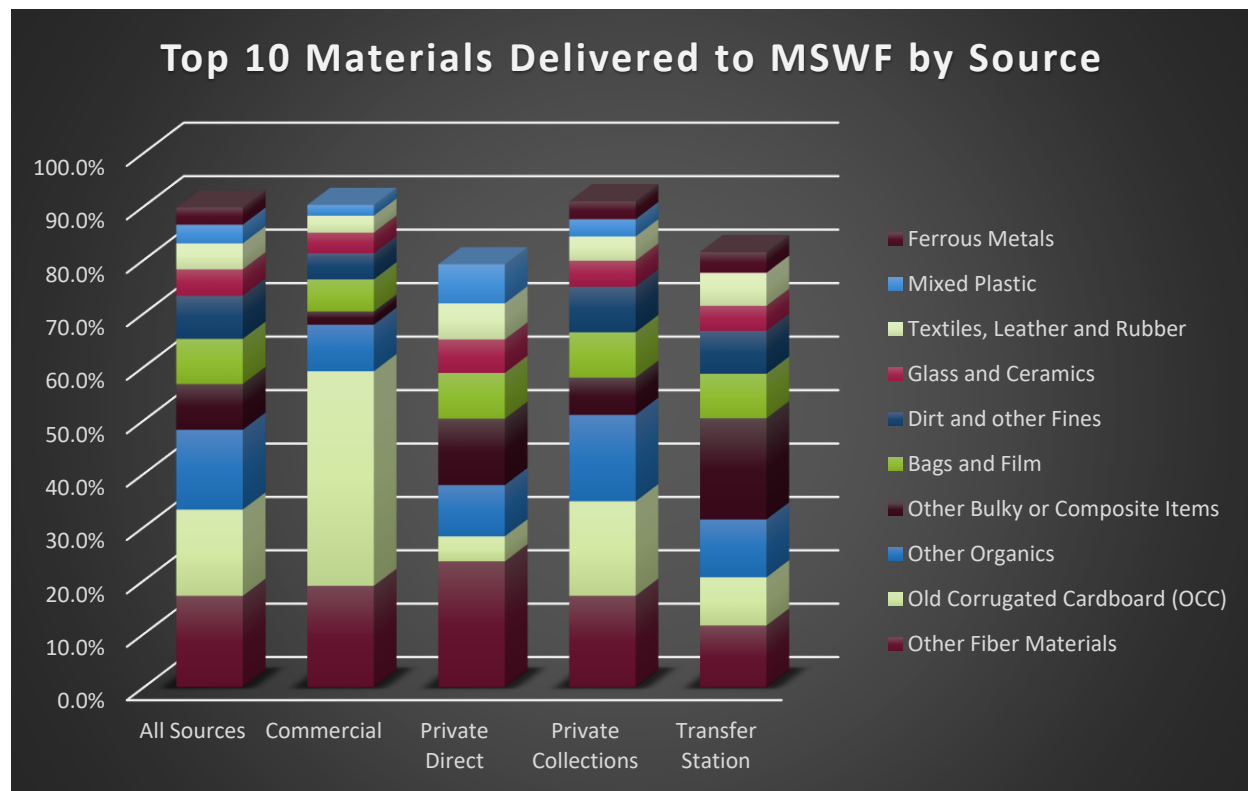


Figure 8 – Top 10 Materials by Source

It’s important to note when viewing Figure 8 that the percentages for a given material are the proportion of the tons delivered from that source, not the proportion the entire stream. So, for example, nearly 40% of the material in the incoming commercial loads was cardboard, but most of the cardboard brought to the landfill actually came from Private Collections. Because the weighting percentage from commercial loads was so small, it actually didn’t affect the overall OCC composition much. Relatedly, Figure 8 shows that most of what comes from the Transfer Station is bulky material; coincidentally most of the bulky material brought to the landfill comes from the Transfer Station. The third point of note is that most of the food waste/other organics came from the private collection haulers.

4.6 Description of the Organization: Current Staffing Structure of the CNMI Solid Waste Management Division

As currently organized, the Solid Waste Management Division (SWMD) is a line agency of the Department of Public Works (DPW). It is led by the Director of Solid Waste and is divided into three (3) sections related to tasks. The sections are: (1) the Lower Base Transfer Station Operations Section (LBTSO), (2) the Marpi Refuse Transfer Station Operations Section (MRTSO), and (3) the Administrative Support/Collections Section (ASCS). Figure 9 (next page) shows the organization.

Both the LBTSO and MRTSO are under the supervision of the Manager of the Solid Waste Branch and are primarily staffed for three distinct sub-tasks; receiving/inspecting incoming waste loads, pushing delivered waste into transfer containers, and transporting waste loads to the Marpi Solid Waste Facility (MSWF) for disposal. While these are separate sections, the SWMD has the personnel resources to allow the flexibility of those staff members assigned to perform all task functions at the two (2) waste receiving locations. The LBTSO Sections includes the following positions:

1. One (1) Equipment Operator IV;
2. Two (2) Equipment Operator Is; and,
3. Two (2) Trades Helpers.

The Equipment Operators are assigned to operate the skid steer loader at the Lower Base Transfer Station (LBRTS) and/or the transfer roll-off truck used to deliver waste to the MSWF. The Trades Helpers are primarily used as spotters to identify prohibited waste from being introduced into the disposal stream and general site maintenance activities at the LBRTS.

The MRTSO Section consists of the following positions:

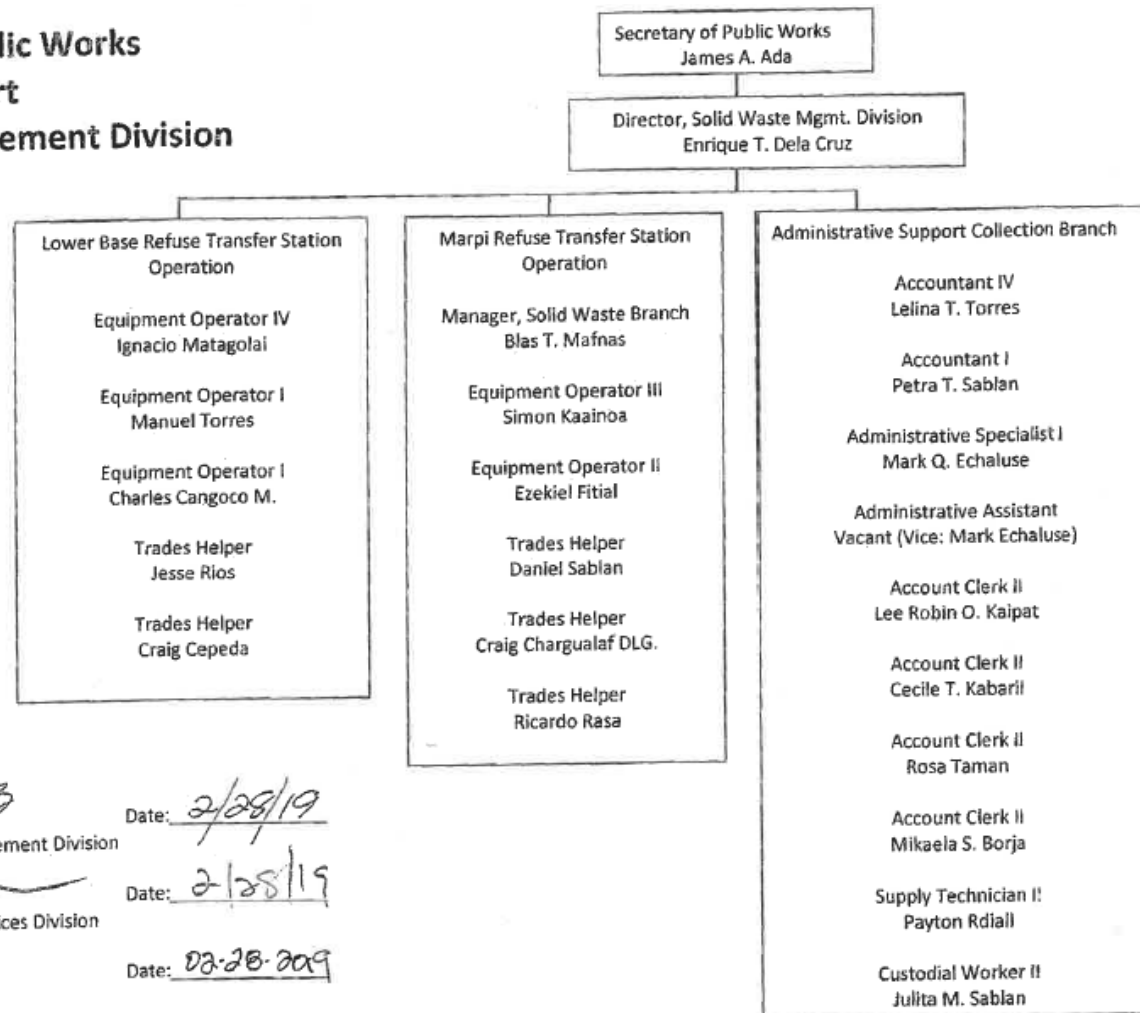
1. One (1) Equipment Operator III;
2. One (1) Equipment Operator II; and,
3. Three (3) Trades Helpers.

The Equipment Operators are assigned to the roll-off truck designated to move waste from the residential drop-off location to the working face. The Trades Helpers are primarily assigned to conduct incoming load inspections to ensure that prohibited waste is not introduced into the disposal stream.

The ACSC performs the function of operating the scale houses and ensuring that all charges are properly assessed at the time of waste delivery, that all charge accounts are properly managed, and that billed revenues are collected from those haulers with charge accounts. This Section also provides administrative support in purchasing, basic accounting, and custodial services. The ACSC Section consists of the following positions:

1. One (1) Accountant I;
2. One (1) Accountant I;
3. One (1) Administrative Specialist I;
4. One (1) Administrative Assistant;
5. Four (4) Account Clerk IIs;
6. One (1) Supply Technician II; and,
7. One (1) Custodial Worker II.

**Department of Public Works
Organizational Chart
Solid Waste Management Division**



Prepared By: Enrique T. Dela Cruz
Director, Solid Waste Management Division

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Approved By: James A. Ada
Secretary of Public Works

Date: 2/29/19

Date: 2/28/19

Date: 02-28-2019

Figure 9 – DPW and SWMD Organizational Chart

5 Assessment of Current System and Alternatives

Waste management on islands is always challenging, but in the wake of the worldwide changes to the recyclables market, it has not become any simpler. Infrastructure investment requires an extra level of redundancy due to the remoteness and exposure to the destructive forces of typhoons, earthquakes and volcanoes. Islands are surrounded by potential sources of energy (sun, wind, and sea), so generating expensive electricity through waste processing is not economically attractive. Conversely, they possess finite land resources, making the impacts of giving up acreage for landfilling critical. How can islands conserve their landfills, preserve their local economies, and empower their residents to protect their neighborhoods and environments? And how can this be done without burdensome user fees or straining public budgets?

Having reviewed the existing solid waste management system on Saipan and conducted the waste sort, a set of challenges appeared. These challenges currently prevent the residents and businesses of Saipan from having a best-practices system that protects soil, air, water, and people. They do not have access to the ability to divert as much as they desire from disposal. In Section 5.1, some of the issues are presented. Section 5.2 discusses why these issues matter, and how their improvement helps everyone who resides and comes to visit in Saipan.

5.1 Deficiencies

5.1.1 Management and technical deficiencies

- Saipan welcomes over half a million visitors each year, and that number is expected to grow by tens of thousands annually.¹⁰ Tourist populations are known to be hard-to-reach, especially about local issues they may not perceive as affecting them. Furthermore, most of the tourists to Saipan are from South Korea, Japan, China, and increasingly Russia, making language access an issue to be considered. The tourists and visitors are, however, a significant source of waste generation, especially when compared to the local population of about 52,000.
- Trying to fit a typical urban or suburban waste collection and recycling program onto an island with a strong traditional culture and a relatively isolated location is a challenge. The simple fact that the logistics behind trucks and their maintenance are much more complicated than in mainland communities is just the beginning. This is compounded by difficult accessing markets for scrap and recycling. Other factors include predominance of very small businesses, which have a harder time adapting to changes and regulatory burdens than do larger companies, and local infrastructure with a rural character (isolation, secondary roads, mixed-use properties).
- The small volume of the waste stream simply can't fully benefit from many of the economies of scale which are typically realized via techniques such as computerized vehicle routing, GPS technologies, consolidation of services, maximization of container sizes, reduction in collection frequency, etc. If the Saipan Municipality were a city in the mainland U.S., it would rank about 575th, similar to Pocatello, ID; Ames, IA; or Biloxi, MS.

¹⁰ Presentation by Marianas Chamber, August 2017, <http://www.saipan-chamber.com/resources/files/PPT%20MVA%202017%20Saipan%20Chamber%20of%20Comme%20FINAL.pdf>

The Republic of Palau

The Republic of Palau is an example of an island nation that has experienced increased waste generation related to the evolution of its tourism industry. The country has a GDP per Capita that exceeded US\$16,000 with tourism as the primary economic sector. Due to the tourism industry and the island's culture of consumerism, the Republic of Palau has witnessed a 63% increase in waste generation from 2005 to 2014, with residents and visitors discarding 0.9 pounds per day in 2014 compared to the 0.55 pounds of solid waste discarded per day in 2003. In 2015, Palau received 12,500 visitors per month; most of the visitors to the island were tourists coming to view the island's most attractive diving sites.

When considering practical steps of addressing waste from the tourism industry, island nations frequently use regulations and taxation to help curb solid waste generated by the industry and to fund island-wide waste diversion programs. On the island of Maldives, the national government enacted a solid waste reduction plan for the tourism industry, Maldives 4th Tourism Masterplan, which focused heavily on solid waste diversion. The island also amended a Tourism Act to include a Green Tax on tourists that requires every tourist to pay \$6 per day that they spend on the island. Additionally, the government established the Maldives Green Fund Company, an entity dedicated to raising funds necessary to conduct long-term projects, particularly for solid waste management. The government established the Maldives Green Fund to manage capital raised for national environment programs. Through the support of the World Bank and Asian Development Bank, the fund collected more than \$130 million within the year of its inception in 2013.

Additionally, island nations have formed Public-Private Partnership with entities within the tourism industry to make programs based on the industry's waste stream. The Republic of Palau worked with the island's tourism industry to create a beverage container redemption program that diverts bottles, recoverable waste materials that were most frequently discarded by the industry, from landfills. Since the inception of the program in 2011, the nation was able to recover 87percent of the bottles imported into the country while raising \$3 million in donations for the island's federal recycling fund.

For more information about Palau, see Section 6.5.4.

5.1.2 Economic and financial deficiencies

- The changes to the international recyclables marketplace—i.e., China closing to scrap—have only exacerbated the challenges associated with marketing the relatively small volumes of available recyclables on Saipan. Even with extremely high levels of participation and rates of diversion, the volumes would be economically inefficient to export directly.
- In addition to the economic challenges to recycling, there is somewhat of a financial disincentive to recycle or divert additional recoverable materials, such as cardboard or food waste, from the

landfill because the system is set up so that the operator is paid per ton to dispose of waste, not to *manage* it.

- A fee-for-service system is considered by many to be an equitable way to fund a universal system of solid waste collection and disposal—i.e., people pay just for what they use. This works in locations where the minimum threshold of a tax base population can support such a system. However, in a community that has small tax base and large portions of the population earning poverty or subsistence wages, self-hauling to the landfill, where costs are low and have been frozen for years, or dumping illegally are more perceived as more affordable. In reality, the costs are simply moving around from paying rates to paying in other ways (i.e. costs for waste cleanup of illegal dumps). Regrettably, this is not usually apparent to the customer.
- The tipping fees at the MSWLF have been stagnant for more than fifteen years, chronically underfunding the facility operational and capital budgets as well as reserve funds. This means there is not a sufficient supply of funding, or “up-front money,” for making changes or improvements that would benefit the customers or the environment, or both.

5.1.3 Institutional and capacity deficiencies

The current organizational structure of SWMD is designed to provide the basic services required but does not provide a centralized planning and management function. It is targeted at performing those basic, day-to-day tasks associated with waste acceptance. At this point, it is not currently equipped technically or organizationally to conduct the short-term and long-term planning that would be advantageous to the CNMI in developing and implementing projects and programs that address evolving solid waste management needs.

As currently organized, the overall long-term planning necessary is somewhat diluted by not having the SWMD with direct control and responsibility for an integrated approach. It is also not well-situated to engage in collection service, beyond that currently offered, from both a technical and financial perspective. While funding is similar to an enterprise fund, the attendant management is more closely aligned with other, similar general fund, line level activities that do not have the same revenue generation ability. Consideration of developing an independent structure for integrated solid waste management should be seriously investigated.

This lack of centralized control and responsibility is particularly problematic in developing effective responses to the dynamic nature of the recovered material market. It is targeted at disposal of solid waste and is not well situated to address management of waste prior to disposal. By transitioning to a more responsive management model the CNMI could position itself to address long term diversion of targeted waste streams and develop management options designed to minimize the need for lined landfill capacity and extend the life of the MSWF.

Beyond the SWMD organization, the following aspects of the overall solid waste management system merit review, analysis, or attention:

- If the recycling area at Lower Base TS could be re-designed and some of the space re-purposed, it could be more convenient for users, attracting more people to use it. Furthermore, additional materials might be able to be collected for recycling, reuse, or pollution prevention.
- Although there is little to nothing that can be done to prevent it, the system disruptions resulting from events like typhoons are problematic. Including disaster planning for solid waste is key.

- The patchwork system of waste collection, and the proportion of addresses which do not have any collection service, makes the use of administrative tools such as planning and reporting difficult. Collection routes with large gaps between customers are inherently inefficient, making the services that are in use more costly than necessary.
- The government currently does not have a function for generating and collecting a bill for a service like waste collection. Part of any program to collect a universal fee or a fee-for-service would also require the collection of such a billing system in order to ensure the revenue therefrom is stable.

5.2 Alternative Scenarios

As part of the analysis in this report, a discussion of approaches to regulation of the solid waste system and markets is provided in this section. In the United States, regulation of solid waste occurs at all three levels of government—Federal, State, and local. Federal regulation is primarily related to facilities with regard to safety and environmental protection, and constitutional matters regarding solid waste businesses. State regulations get into more detail about policy, priorities, permitting landfills, reporting, environmental protection, and state laws regarding operation of solid waste businesses. Local laws set priorities, goals, collection requirements (including what must be collected and from whom) and regulate solid waste businesses. Local governments also often are involved in the solid waste management marketplace as service providers. Collection, transfer, processing, and disposal are all activities that a local government likely regulates and in which they may be operationally involved. Many factors influence whether the public or private sector operates a service or facility; generally, they are tradition, culture, market, and risk, as shown in Figure 10.



Figure 10 – Influences on Solid Waste Management Systems

For disposal, local ownership and operation of MSW landfills was the traditional model. At present, many local governments that still operate landfills use policy and regulation to conserve them for use only by

their residents, or even avoid using their landfills as the primary local disposal option. Instead, they allow or encourage waste to be deposited in regional or “mega” landfills elsewhere, reserving their landfills for some future need or emergency. Local governments that do use their landfills as their primary disposal destination can operate them using government employees or have a private company operate them via a lease or a contract. Privately-owned and -operated MSW landfills tend to be large and connected to transportation networks, so that waste can be recruited from a wide variety of sources both near and far.

Some localities choose to exercise influence over the solid waste marketplace by franchising or licensing collection, contracting out service for one or more areas, or directly providing service to some or all customers. The intent of these actions is two-fold: to ensure a desired level of service and to control costs for customers. Others prefer to allow the open market to rise to the demand for collection. The motivations for this approach can be many, including a philosophical system of “small government” or “citizen choice.”

5.2.1 Private

In an open market system, private waste collectors or haulers are regulated simply as companies doing business in a locality. Due to the role of waste collection as a critical component of infrastructure, local governments nearly always enact laws requiring safe operations and setting conditions for haulers to operate within their borders. There are often restrictions on when collection can be conducted—within certain hours, for example, or even disallowing collection on Sundays. A license or permit may be required to operate lawfully. Sometimes, the operating licenses or the local laws require reporting of certain information. Examples of the types of information required include tonnages, operating areas, and recycling implementation. More comprehensive laws exist in communities that have prioritized waste reduction and recycling, whether it is a local aspiration or a higher-level mandate. Those laws may have requirements for haulers to provide recycling to all customers; to provide recycling at a particular level of service; to distribute educational information to customers; and, most always, to report to the locality any of these activities.

Privately-owned and -operated landfills are also regulated as businesses, with a high burden of planning, permitting, and reporting. Private landfills usually can recruit customers from wherever they like, and charge each open-market customer whatever rate can be negotiated. They might operate under a Host Community Agreement, or HCA. This is a binding agreement between the local government and the landfill owner, and is a condition of the local operating permit. The HCA includes benefits to the community, ostensibly in exchange for the risks associated with having a landfill in the locality, and for draws on services such as roads and fire protection. The benefits commonly include free or discounted disposal for tons delivered by the government and/or residents; cash payments calculated per ton, per dollar of tipping fees, or some other metric; and/or community benefits programs, for example a household hazardous waste collection event or take-back programs for hard-to-recycle items like oil, batteries, tires, mercury, or electronics.

There are other solid waste businesses that might make up a solid waste management system—namely, processing facilities. Due to the volatility of MSW recyclables processing, a private company would probably open such a facility only when there is a demand by the local government—i.e., private development of a “merchant” MRF would be an unlikely occurrence. Construction and demolition (C&D) recycling facilities are another matter, entirely. Recycling C&D material can be very profitable, which is why privately-owned C&D MRFs often are in operation even in communities where there is no governmental mandate to recycle the material. A green waste or organics processing facility can be

successful if there is sufficient marketplace demand—i.e., lots of landscaping and land clearing combined with an expensive disposal market—but having a local government requirement to recycle residential yard waste helps the economics to be even better.

5.2.2 Government

Direct provision of collection service by public employees, who deliver the material they collect to the community waste management facility (the old “dump” so many adults remember) is a traditional way to deliver solid waste services. The benefits are that the locality has direct control of the level of service, and customer prices should be contained due to the lack of a profit motivation by governments.

Even in an open-market system, where all the local collection services are contracted for directly by customers and all disposal is to private landfills or other facilities, government will be involved in solid waste management in one capacity or more, as described herein.

Regulations and requirements

Beyond regulation of waste haulers, there may be laws that apply to businesses or property managers regarding solid waste. These usually involve removal of waste in a manner that is sanitary and prevents pollution. There are also sometimes regulations that create a requirement to provide and/or participate in a recycling program. For example, a building owner might be required to provide service for tenants, and businesses might be required to divert certain materials from disposal or prohibited from disposing of certain items, such as cardboard. Laws also regulate behavior by individuals in residential programs. Examples of these types of laws are requirements to participate in recycling—i.e., to put all program materials in the recycling system—or bans on contaminating recyclables—i.e., penalties for putting unacceptable items in the recycling system.

Regulations of disposal or processing facilities occur at all levels of government, as described at the beginning of this Section. They relate largely to environmental protection and safety. Laws regarding operating hours, noise, dust, and other potential vectors or nuisances are in place to protect the public.

Data collection and utilization

The most powerful way to plan for and evaluate a solid waste management effort is the use of data. Records of tonnages and fees reflect activity level (i.e., collection, disposal, recycling), funding sufficiency, capacity needs, market growth or contraction, impacts of education efforts, and trends in waste generation, among other effects.

With more sophisticated data and analysis, forecasting can be used to help improve performance. Perhaps managers want to know why particular events occur, such as equipment break-downs, worker absenteeism, or dips and spikes in participation in household hazardous waste programs. Detailed data, properly managed, can have other seemingly unrelated data applied to it for analysis that can lead to improvements. Weather, schools, or even popular local events can affect conditions indirectly, and data management can be used to make decisions that considers those effects.

Planning and reporting

A system of planning and reporting can be described as a “self-fulfilling prophecy” of recycling programs. If a plan is required, and then reporting on the success of that plan follows, the general result will be recycling activity. Sometimes the hardest part of doing something is getting started, and planning addresses that. Afterwards, a requirement for reporting reinforces that the activity was important and valued. The contents of the reports then inform future planning for service provision and improvement.

Education and information

Comprehensive and strategic planning for outreach and education can make a considerable impact on participation in a solid waste system. The existence of a multi-year strategy and the ability to track success helps shield this “soft science” from financial reductions.

Part of a good outreach plan should include a brand. Branding is the use of a consistent “look and feel” across all the education efforts. This builds familiarity and helps reinforce all the messages whenever someone sees one.

Both comprehensive planning and sophisticated branding can be difficult or require the assistance of professional services. This makes planning and branding an opportunity for communities who can avail themselves of them to support others by sharing the results.

Although most programs now have content on the internet, they don’t always take full advantage of the media. Media is more than press releases. Where a web site is passive, requiring a user to find the page and look through it, media reaches people where they are: using Facebook or Twitter; watching the news or listening to the radio; and perusing sources that interest them, such as humor sites or “mommy blogs.” Reaching out to people on social media, writing releases that have interest for local TV or radio, and placing ads in nontraditional publications are all part of new media.

“You have to get to the kids,” is a common sentiment among professionals and residents, alike, seeking to build inroads about recycling. There are many isolated efforts in schools across the country that solid waste management organizations may not even know about. Identifying and supporting them is a good start for building on children’s activism without having to build an entire new program.

Many solid waste agencies provide personnel who work primarily in the field, with activities ranging from community organizing, to expert coaching and inspection. More intensive than education efforts like advertising or web sites, technical assistance and enforcement are usually associated with seeking compliance with regulations. The former is a “help me help you” approach, and the latter issues consequences. Use of field staff to perform these functions can be more expensive than outreach and education, in the sense of impressions per dollar spent; however, the results are more readily observed, adapted, and measured. Individuals engaged in technical assistance can increase their impact by building “champions” for the desired impacts when they work with organizations and individuals, so that their influence will be exponential. On-the-spot enforcement makes real the prospect of non-compliance with regulations, whether or not penalties are issued.

5.2.3 Government/Private Options

Market controls

Franchising or licensing limits who can sell service (typically collection) to customers in a particular area. Franchising is usually more comprehensive, and frequently includes negotiated pricing. It limits in how many haulers can participate in the franchise. Licensing is more general, as described above in *Regulations and Laws*, and may allow for an unlimited number of haulers to join the marketplace. Franchises and licenses can apply to collection from residential customers, commercial customers, or to both.

Another way governments exercise market control is flow control. As explained both succinctly and completely by the Rockland County, NY, web site:

"Flow control" is a general term that refers to the ability of municipalities and their agencies to mandate — through laws and regulations — that all locally-generated solid waste be delivered to designated solid waste management facilities. Until the United States Supreme Court's recent decision in *United Haulers Association, Inc. et al v. Oneida-Herkimer Solid Waste Management Authority, et al.* (127 S.Ct. 1786 [2007]), the prevailing view was that all flow control measures were unconstitutional because they imposed an impermissible burden on interstate commerce. That view had been endorsed by the Supreme Court in *C&A Carbone, Inc. v. Town of Clarkstown* (511 U.S. 383 [1994]). In *United Haulers*, the Supreme Court held that it is in fact legally permissible for a local government to require that solid waste generated within the jurisdiction of a municipality be processed at a designated publicly-owned solid waste management facility.¹¹

Governments are now free to direct waste to publicly-owned and -operated facilities; many also opine that a publicly-owned but privately-operated facility would also qualify.

Contracting out an activity to private vendors

Contracting out one or more collection areas is a procurement process by which the government has control of waste collection in the area and requests bids or proposals to provide a particular set of services to those customers. Prices are restricted by granting exclusive, long-term customers to the winning bidder or proposer. The locality uses contract compliance to ensure the desired services.

Many operations at publicly-owned facilities, such as at landfills or energy recovery facilities, are contracted out to the private sector. The contract or contracts could be segmented to different functions. Sometimes the local government might operate the scale at the front of the facility, and then one or more operations are conducted by a private company. These could include burying waste at the working face of a landfill, operating a waste-to-energy plant, grinding yard waste, combusting or converting landfill gas, shredding tires, and more.

Public/private partnerships: work with private sector organization to implement programs to increase recycling

A public/private partnership can mean different and specific things in different localities and different states or regions. In general, however, it means governmental entities working together with nonprofit organizations or businesses to achieve a common goal. Solid waste diversion is a natural fit for charities that accept donations of household goods, since they can work together to attract and filter materials as needed. Additionally, charities that serve to find work suited for adults with challenges or disabilities often find there are appropriate and rewarding jobs for their clients in the processing of items and materials bound for reuse or recycling.

¹¹ http://www.rocklandrecycles.com/vs-uploads/pdfs/1513199791_History-FlowControl.pdf

6 Examples of Best Practices and Recommendations

Section 1 provides examples of solid waste management programs across the U.S. where residents and businesses have access to equitable services, and where collection, processing, and disposal are available, reliable, and affordable. A variety of financing systems are used, ranging from system fees to utility bills to user fees to general taxes. While many of them may not initially seem comparable to Saipan, based on the existing conditions assessment, these are communities where, over time, local waste managers have developed systems that are efficient and sustainable, and where residents and businesses can access recycling in a way that is easy and effective.

6.1 Policy and programs

Collection of solid waste is most typically regulated at the local level by municipal or county government. Most often, the laws apply to service providers, although they may also apply to businesses, property managers, or even individuals. The following five localities are U.S. counties where the local government resolved to provide a comprehensive system of solid waste management for residents and businesses. Here in Section 6.1 are provided descriptions of the counties and their programmatic approaches to solid waste management. Their approaches to funding, regulations, collection, facilities, and other related programs are discussed in the subsequent sections 6.2, 6.4, and 6.5. In Section 6.3, because not all of these counties operate facilities, transfer stations on the U.S. Territory of Guam are discussed.

6.1.1 Stabilizing Program Funding in Orange County, NC¹²

Orange County is part of the Research Triangle region, anchored by the cities of Chapel Hill, Durham, and Raleigh, and the major universities in the area. The population is about 133,800, with roughly half concentrated in Chapel Hill. There are also nearly 30,000 undergraduate and graduate students at the University of North Carolina campus in Chapel Hill.

The Board of Orange County Commissioners along with its Town partners in the Solid Waste Advisory Group (SWAG) selected this financing mechanism for long term, sustainable, predictable provision of solid waste services. It was approved by all local governmental bodies in April 2015. All previous County fees were eliminated, including a so-called “basic fee,” convenience center fees, urban curbside fees, rural curbside fees, and a multifamily fee.¹³

The SWPF funds the following programs and operations:



- Direct and indirect costs of public recycling efforts in Orange County including curbside, multifamily, commercial recycling, drop-off sites, electronics recycling, hazardous waste collections, education and outreach, enforcement and environmental support;
- Recycling and processing services including mattress recycling, yard waste processing, clean wood waste processing, large appliance and scrap tire management, cardboard and scrap metal recycling; and,

¹² <http://orangecountync.gov/795/Solid-Waste-Management>

¹³ Orange County previously had a graduated set of fees for collection based on the type of customer. For example, there were approximately 6,800 rural households that did not previously receive curbside recycling, but now pay the SWPF. The SWPF funded expansion of curbside recycling to those households in July of 2016.

- Approximately 35% of the costs of operating Solid Waste Convenience Centers, with the remainder coming from the General Fund.

While participation in these programs is voluntary, the fee is assessed to all improved properties, including tax-exempt properties, whether the service is used or not.

6.1.2 Building a Comprehensive Waste Management System in Ramsey County and Washington County, Minnesota¹⁴

Ramsey County and Washington County are part of the Minneapolis-St. Paul metro area, with the city of St. Paul being in Ramsey County and Washington County located adjacent, away from the urban center. Ramsey County has a population of well over half a million and Washington County has a population of about 238,000; the entire 7-county metro area has a population of more than 3.87 million. Ramsey County has the distinction of being the most densely populated county in Minnesota and one of the most densely populated counties in the U.S., with more than 3,500 persons per square mile. Washington County is much less densely populated, with about 600 persons per square mile.



**RAMSEY/WASHINGTON
RECYCLING & ENERGY**
CONNECTING VALUE TO WASTE

The Ramsey/Washington Recycling & Energy Board (R&E Board) was formed over 30 years ago by Ramsey and Washington Counties as a joint powers board. The Joint Powers Authority (JPA) was revised in 2015 as part of a major reorganization and refocusing of the agency. The R&E Board is now responsible for administering joint solid waste resource recovery activities and other selected programs on behalf of the two counties.

The administrative structure outlined in the current JPA includes:

- A Joint Leadership Team (JLT) comprised of one member of the Washington County Department of Public Health and Environment, one member of the Saint Paul – Ramsey County Public Health, Environmental Health Division, and one member of the Ramsey County Finance Department. Authorization to the JLT to carry out project management activities is provided for in the Joint Powers Agreement and Bylaws adopted by the R&E Board.
- The R&E Board is authorized to employ staff, and six staff positions were approved by the R&E Board in 2015. Other staff support is provided by the Saint Paul – Ramsey County Public Health, Environmental Health Division, and the Washington County Department of Public Health and Environment.
- The R&E Board entered into a Fiscal Agent Agreement with Ramsey County for financial management, and a purchase of services agreement with Ramsey County for Human Resources Services.
- Legal representation for the R&E Board is provided by the Ramsey and Washington County Attorney's Offices. Special legal counsel may be retained upon the advice of those offices. Risk management services are provided through a consultant.

¹⁴ <http://morevaluelesstrash.com/about/>

The R&E Board is financed by Ramsey and Washington Counties in proportion to the estimated quantity of waste generated by each county as set forth in the Joint Powers Agreement that formed the agency.

6.1.3 Facilities and Flow Control in Rockland County, New York¹⁵

Prior to the inception of the Rockland County Solid Waste Management Authority (the Authority), a Solid Waste Management Committee existed as a sub-committee of the Rockland County Legislature. This Committee was charged by the New York State Department of Environmental Conservation (NYSDEC) to develop a Solid Waste Management Plan that would address the County's solid waste issues and opportunities. In 1992, the NYSDEC approved the Rockland County Final Integrated Solid Waste Management Plan and Generic Environmental Impact Statement. In 1994, the Rockland County Solid Waste Management Authority was created. The Authority consists of 17 members: 13 elected officials consisting of the five town supervisors (ex officio), eight legislative representatives (5 majority & 3 minority members), two Village Mayors and two representatives of the County Executive.



While the Authority originated as a local Rockland County facility and continues to serve the original county municipalities and customers (a population of over 310,000 people spread across 173.3 square miles), the Authority has evolved into a network of integrated waste management facilities accepting materials regionally, including:

- A Materials Recovery Center (MRF), taking in over 26,000 Tons of recyclable materials numbers 1-7 per year.
- Three regional garbage Transfer Stations that aggregate regional Municipal Solid Waste (MSW); handling over 228,000 Tons per year.
- A regional Co-composting Facility (CoCo) processing over 25,000 Tons of preprocessed biosolids, mixed with 5,000 Tons of yard waste and clean wood waste each year, creating a rich, top grade compost for local landscapers and civil engineering projects; and
- Three (3) Yard waste Facilities that process over 52,000 Tons of material per year.
- Additionally, The Authority operates one of the few permanent Household Hazardous Waste Facilities (HHW) in New York State's that is open 5 days a week, plus targeted weekend dates. The Household Hazardous Waste Facility (HHW) receives over 50,000 gallons of liquid HHW, and more than 800,000 pounds of other HHW materials annually, including a vast array of products not usually managed by ordinary HHW Facilities.

The goals of the Plan are to maximize waste reduction, reuse, and recycling. The Plan examines solid waste issues through the lens of sustainability and focuses on opportunities to support and protect the environment through the recovery and re-use of recyclable paper; glass; metal and plastic containers; compostable materials; sewage bio-solids; bulky wastes and construction and demolition debris; and household hazardous waste.

¹⁵ <http://www.rocklandrecycles.com/>

6.1.4 Preserving Landfill Space in Prince William County, Virginia¹⁶

Prince William County is an outer suburb of Washington, DC. With a population of about 455,000, it is the second-most populous county in Virginia, although about half of the land area remains rural in nature, with very large residential tracts, agricultural and forested land, and numerous small businesses.¹⁷ The areas classified as rural in nature also include several large parcels which are not subject to commercial development, including the Manassas National Battlefield Park (over 5,000 acres), Prince William Forest Park (more than 16,000 acres), and Marine Corps Base Quantico (over 55,000 acres).



Prince William County operates a landfill and an organics management facility, with related activities ongoing at those facilities. The landfill, which is the primary disposal facility for the County, is open daily for commercial disposal of in-county waste, only.

The organics management facility is a lynchpin of organics recycling for the surround region, and is currently being updated with advanced composting technology and other improvements. All collection is provided by the private sector on a subscription basis or via large contracts by homeowners associations (HOAs).

All businesses, offices and commercial facilities in Prince William County are required to recycle the one item making up the greatest portion of their trash on an annual basis. The County offers a list of business types and a suggested recyclable material—e.g., cardboard of commingled containers for a restaurant—and offers a detailed business recycling guide to help set up a program.

6.1.5 Building Regional Partnerships to Encourage Recycling in Emmet County

Emmet County is located at the northern tip of the Lower Peninsula of Michigan. It is primarily bordered by bodies of water—Lake Michigan to the west and the Straits of Mackinac to the north—with Cheboygan County to the east and Charlevoix County to the south. The population in 2010 was 32,694. There are two cities—Harbor Springs (about 1,200 people) and Petoskey (about 5,700 people)—both of which are considered “resort” communities. There are also three villages, each with fewer than 1,000 residents, but they are also tourist destinations and their occupancy increases during the summer months with visitors and temporary employees. These communities are part of one of the most popular tourist areas in Michigan. The Emmet County Department of Public Works and Recycling has six administrative and managerial staff, ten operational and facility staff, and various contract and temporary employees. The enterprise is governed by the seven-member DPW Board, which is composed of local officials.



Policy and Programs Recommendation

It is recommended to study the feasibility of two options for a program approach on Saipan. The first is a solid waste authority that aims to provide service resources and diverse facilities for residents and businesses, and guides the flow of wastes through and out of the jurisdiction. An authority is somewhat

¹⁶ <http://www.pwcgov.org/government/dept/publicworks/trash/Pages/Recycling-at-Work.aspx>

¹⁷ http://eservice.pwcgov.org/planning/documents/BuildOutAnalysis/2015_Publication.pdf

insulated from the politics and financial issues of the general government, allowing it to approach solid waste management from a more entrepreneurial standpoint. The second recommended program approach to study for feasibility on Saipan is the concept from Prince William County to make preserving landfill capacity the primary objective of the organization. Decisions regarding all other programs, including waste reduction, reuse, recycling, and pollution control, then come from this guiding principal.

6.2 Rate structures

6.2.1 Annual Programs Fee in Orange County, NC

Each improved property in Orange County is assessed an annual Solid Waste Programs Fee (SWPF) to fund recycling, waste management, and waste reduction services offered by the County. For FY 2017-18, the single annual fee is \$128. The fee is levied on each habitable residence, apartment, business or non-profit and funds all the County operated recycling programs for the next year as well as about one-third of convenience center costs. This fee is charged to all improved properties in all Orange County jurisdictions, including a part of the Town of Chapel Hill that lies within Durham County. The fee is for recycling only—Orange County does not provide garbage collection.

If a property has multiple units such as an apartment complex or shopping center, each individual unit, or each “front door,” is assessed a Solid Waste Programs Fee. Owners of the parcel of land on which there are single-wide mobile homes or leaseholds on which there are double-wide homes or other habitable structures, are assessed the SWPF for all units on their property eligible to receive service. The SWPF is assessed to the real property owner for each habitable unit on that property, and all public buildings such as schools, local government, state government, and utilities also pay the fee. There is a fund created by the Board of County Commissioners to assist people with limited income. Property owners who receive the Homestead exemption for seniors¹⁸ are eligible for relief from the SWPF.

6.2.2 Environmental Charges on Collection Fees in Ramsey County & Washington County, MN

In Ramsey County, all collection is open-market, provided by the private sector. Ramsey imposes a County Environmental Charge (CEC)¹⁹ on fees paid for collection service. The CEC is a percentage of the cost of service and must appear as a separate line item on a bill. Ramsey County’s CEC rate is 28% for residential customers and 53% for non-residential customers. It applies to trash collection and disposal service, fuel surcharges, account start-up or cancellation fees and any other administrative fees. It does not apply to construction and demolition waste, recyclables, medical and infectious waste, organic materials collected for composting and certain types of industrial waste. The CEC also does not apply to other taxes or government fees.²⁰ The collection company then remits the CEC to Ramsey County. A CEC Monthly Remittance Report is due from the collector to Ramsey County each month, along with a payment of the charges collected. The CEC funds the Recycling & Energy Center (R&E Center)—i.e., Ramsey County’s contribution to the R&E Board—and supports Ramsey County’s household hazardous waste, yard waste and organic waste collection programs.

¹⁸ Property owners meeting certain age, ability, income and residency requirements are entitled to reduced property taxes obligations.

¹⁹ Available at <https://www.ramseycounty.us/businesses/licenses-permits-inspections/licenses-inspections/waste-haulers/county-environmental> is an example of how the CEC is charged. Also available is a technical document for haulers on how to apply the CEC to their customers, and how to remit reports and payments.

²⁰ For example, the 9.75% Minnesota State Solid Waste Management Tax.

Similar to Ramsey County, Washington County also imposes a CEC on businesses and residences.²¹ Currently, the rate for all generator types is 35 percent on the total cost of waste management services. Washington County has collected this type of fee since the mid-1980s. Revenue from the CEC is used for solid and hazardous waste services such as a recycling drop-off center, household hazardous waste collections, recycling grants to cities and townships, environmental education programs, and operation of the Recycling and Energy Center in Newport—i.e., Washington County’s contribution to the R&E Board.

6.2.3 Matrix of *ad valorem* and per unit Charges in Rockland County, New York

Rockland County Solid Waste Management Authority uses six different charges to fund its comprehensive solid waste management system. Three are charged on all real property and three are charged only on residential dwelling units, on a per unit basis.

Area Benefit Charge

This charge is for capital or debt service costs for the Authority’s solid waste facilities, i.e. the sludge co-composting facility, the materials recovery facility, the yard waste composting facility, transfer station, and for general administration costs.

The Area Benefit Charge is assessed on all properties in the County on an *ad valorem* basis.

Green Waste Unit Charge - Per Parcel (PP)

This unit charge is for the operations and maintenance costs for the yard waste composting program for composting all of the leaves, grass, and brush collected in the County.

The Green Waste Unit Charge is imposed on a per parcel of real property unit basis.

Household Hazardous Waste Unit Charge - Per Unit (PU)

This unit charge is for the operation and maintenance costs for the household hazardous waste collection facility, which receives and processes household chemicals and electronics from all of the residential properties in the County and from conditionally exempt small quantity generators (CESQG’s).

The Household Hazardous Waste Unit Charge is imposed on a per dwelling unit basis.

Transfer Station Facility Unit Charge – Per Unit (PU)

This unit charge is for the operation and maintenance costs for the transfer station, which is available to receive municipal solid waste from all of the residential properties in the County.

The Transfer Station Facility Unit Charge is imposed on a per dwelling unit basis.

Materials Recovery Facility Unit Charge - Per Unit (PU)

This unit charge is for the operation and maintenance costs for the materials recovery facility which processes all of the commingled containers and commingled paper collected from the residential properties throughout the County as well as materials received from commercial and institutional facilities.

The Materials Recovery Facility Unit Charge is imposed on a per dwelling unit basis.

²¹ Residences also are assessed and pay an additional charge for curbside collection service.

Sludge Co-composting Unit Charge – Per Unit (PU); Water Usage (WU)

This unit charge is for the operation and maintenance costs for the co-composting facility, which composts municipal sewage sludge collected from the wastewater treatment plants in the County with clean wood waste.

The Co-composting Unit Charge is imposed on a per dwelling unit basis with additional units charged to non-residential properties based on actual water usage divided by the average water consumption per dwelling unit.

6.2.4 Advanced Disposal Fees in Prince William County, Virginia

To ensure the solid waste management system is adequately funded without the need to import waste from other jurisdictions to their landfill, the County utilizes a Solid Waste Fee. This system is advantageous for Prince William County because material is collected by County-permitted haulers and the fee is calculated based on a projected, or assumed, amount of waste generated by business type.

Haulers collecting from Prince William County residents and businesses charge their customers for collection service only, because waste delivered from these sources is not charged a tipping fee.²² The Solid Waste Fee “pre-pays” the disposal of the waste. All residents are assessed a fee for disposal based on the type of home, and businesses and non-profit organizations assessed based on a calculation of their waste generation. The amounts are projected using the type of activity (retail, hotel, etc.) and the square footage multiplied by the annually-approved rate. In 2017, the rate was \$70.

$$\frac{[(\text{Square Footage} \div 1,000) \times (\text{generation rate in tons for the business type})] \times \$70}{1.3} = \text{Annual Fee}$$

A commercial ratepayer can apply to have the assessment based on actual waste container sizes and collection frequency or tonnages. This provision is intended to reward entities that are recycling or reducing their waste below the typical generation rate for their activity.

6.2.5 Enterprise Fund of Diverse Revenues in Emmet County

The solid waste program operates as part of the Disposal System Fund, which is an enterprise fund which has been in existence since 1991. A little over half of revenues are from the Transfer Station that the County operates, including payments from other counties to participate in household hazardous waste services and from grants. The balance of revenues is from the recycling program, including fees charged for curbside recycling, sale of mulch and compost, fees charged for recycling of items such as appliances and tires, sale of processed recyclables, and fees charged to other counties for use of the County’s recycling processing facility. 2017 revenues were projected in the budget process to be \$4,392,913.00 and expenditures to be \$4,384,704.00.

Rate Structures Recommendation

It is recommended to study the feasibility of an approach for setting and enacting rate structures similar to that of Orange County, NC. In Orange County, everyone—i.e., every resident and every business—pays

²² Residents and businesses inside the incorporated towns and the cities do not pay a Solid Waste Fee, and waste collected from these sources is charged a per-ton landfill tipping fee.

a fee and everyone gets one or more services. Funding is distributed among the rate-payer base so that no one fee is particularly burdensome, and the fees are directly connected to the receipt of service.

6.3 Transfer Station Facility and Layout Design

6.3.1 Recovering Value and Flow Control in Ramsey County and Washington County, MN

After 20 years of partnership, Ramsey and Washington counties changed their approach to waste and recognized the inherent value in the materials that are put in the trash, viewing these items as local assets. The economic and environmental value of these assets can be realized only through a complete system that seeks to recover that value. This resulted in the 2016 purchase of the Ramsey/Washington Recycling & Energy Center (R&E Center) from Resource Recovery Technologies. Trash from Washington and Ramsey County homes and businesses is delivered to the R&E Center which processes it into a refuse-derived fuel for Xcel Energy's Red Wing and Mankato power plants. The facility processes over 1,000 tons of trash each day. The R&E Board established the tipping fee for acceptable waste delivered to the R&E Center at \$79.00 per ton for 2019. The R&E Center assesses special fees for items that are unacceptable or difficult to manage. This includes items such as furniture, mattresses, tires, appliances, and electronics.

In owning the facility, and requiring all garbage produced in Ramsey and Washington Counties be brought to it,²³ the counties are more able to recover the value that lie within the trash. In fulfilling this vision, R&E Board aims for the East Metro area (of the Twin Cities) to maximize the recovery of resources, divert as much as possible from landfills and meet and the state's 75% recycling goal.

The R&E Board has agreements with certain haulers to allow them to deliver waste to six privately-owned transfer stations for the same negotiated price as they deliver waste to the R&E Center.

6.3.2 Maximizing Facility Space and Consolidating Truck Miles in Rockland County, New York

Rockland County operates three regional transfer stations. The County uses flow control to direct waste collected within its borders to one of the three transfer stations. Collection vehicles are unloaded and waste is deposited in transfer trailers. After this, waste is hauled approximately 800 miles to a landfill. Two of the transfer stations are multi-purpose sites and have several other activities ongoing in addition to the transfer of waste.

- The first transfer station, Clarkstown, is located at a closed landfill, and in addition to accepting and transferring out MSW, the facility accepts both yard waste and construction and demolition (C&D) material. There is a large-scale windrow composting operation on site. Some of the compost is used in public projects or given to residents for free, and the rest is marketed commercially. The C&D is sorted, and concrete and asphalt are crushed on site. The facility markets Recycled Concrete Aggregate (RCA) and Recycled Asphalt Pavement (RAP) commercially. There is also a solar power array on the landfill.
- The second transfer station, Hillburn, is also located at a closed landfill, and on site there is a dual stream material recovery facility (MRF) and an in-vessel co-composting plant. The MRF accepts commingled papers and commingled containers from all the villages and towns in the county. The co-composting plant accepts clean wood and brush waste from the public and combines it in-

²³ As of January 1, 2018, "waste designation" ordinances in Ramsey and Washington counties required that all trash from the two counties be delivered to and processed at the R&E Center. As of January 1, 2019, the R&E Center no longer accepts public entity waste from outside of Ramsey and Washington counties.

vessel with wastewater treatment plant biosolids to produce a soil amendment that is marketed commercially. Also located at Hillburn are a conference center available for public use, a demonstration greenhouse for educational purposes, and the administrative offices of the Rockland County Solid Waste Management Authority.

- The third transfer station, Haverstraw (also sometimes called Bowline), is a free-standing MSW transfer station located in an industrial area along the Hudson River, near a wastewater treatment plant, a power production plant, and other public lands.

6.3.3 Convenient Access to Recycling and Diversion in Emmet County

The County's Transfer Station is a centrally located facility where garbage is loaded into semi-trailers and hauled to the Republic Services landfill in Presque Isle County. This serves as a revenue stream for the County, as other localities bring their waste to the transfer station.

The Department also operates thirteen drop-off centers. Twelve of them are called Drop Sites, and they accept the same dual-stream recyclables as at the curb. They are located across the county at various public facilities like fire stations or town halls and semi-public sites like parking lots or shopping centers. The thirteenth location is a comprehensive convenience center called The Drop-Off Center, located in Harbor Springs. This staffed facility is open six days per week and accepts a wide variety of materials. In addition to yard waste, garbage, and the dual-stream recyclables, the Drop-Off Center takes dozens of other hard-to-recycle materials that are not accepted anywhere else. This includes textiles, special plastics, mattresses, automotive fluids and tires, batteries, appliances, latex paint, fluorescent lights, rubble and debris, scrap metal, cooking oil, and e-waste. Some are accepted for free, while others have nominal fees.

Furthermore, Emmet County has a comprehensive program to collect hazardous materials and chemicals. There are four household hazardous chemical drop off days per year, which are free to attend. The events are held on the site of The Drop-Off Center. During the events, there is a waste exchange, where attendees can take something they see they want which someone else brought in. The events are free for residents, and guests can participate but must pay \$1 per pound for their material. Typical guests include seasonal visitors or owners of rental properties. The events are also open to conditionally-exempt small quantity generators (CESQGs) like churches, civic groups, and qualifying businesses. Emmet County's Department of Public Works and Recycling also participates in two grant programs from the state of Michigan aimed at reducing toxic releases: the clean-sweep program, which accepts for free pesticides from any users including households, farmers, and businesses; and, a mercury recovery program which is also open and free to any user.

Also at The Drop-Off Center, yard waste is accepted, composted or ground, and re-distributed to residents and other users. Since 2015, the Department has done seasonal food scrap diversion with local businesses, and in 2017 began operating drop off services for residents' food scraps. The County also subsidizes purchase of at-home composting bins and machines by residents.

6.3.4 Safe and Easy Access on Guam



On Guam, a new residential transfer station—a design also sometimes called a convenience center—opened in January 2015 as part of the EPA consent decree. One of three such facilities on the island, the Harmon Street Transfer Station accepts household trash; sofas, mattresses, and box springs; cardboard; glass bottles and jars;²⁴ and, household hazardous waste (HHW). Customers enter the facility through a staffed Pay Station where the loads are initially checked. If the material is such that there is a charge, then the attendant collects the fee at the Pay Station, records the transaction, and provides the customer with a receipt. The trash and furniture are charged a fee; the cardboard, glass, and HHW are accepted for free to be recycled.

The Harmon Street facility is 119,792 square feet, or 2.75 acres. It was designed to handle the amounts of waste shown in Table 6.

Table 6 – Design Capacity and Projected Tonnages for Harmon Street Transfer Station

Material	Projected Monthly Tons	Projected Annual Tons	Annual Tonnage Capacity
MSW & Bulky	50 to 300	600 to 3,600	10,000
Recycling	5 to 30	60 to 360	1,000
HHW	7 to 27	80 to 320	1,000
Total:	63 to 357	740 to 4,280	12,000

In addition to the pay station and the drop-off areas, there is a detached office for HHW operations. Further beneficial use is made of the facility by the placement of a truck wash on the site. The Guam Solid Waste Authority (GSWA) vehicles that service Harmon Street, and other GSWA vehicles as needed, use the wash on a regular basis. The wash has an oil-water separator that recycles the wash water.

An important feature of the drop-off areas is that they are best practice for both safety and for ease of operations. Customers and their passenger vehicles are completely segregated from the heavy truck traffic on the site, with the exception that all vehicles use the same exit (there are separate entrances, for safety and to prevent back-ups). Customers move through the facility to designated points or stations to drop off the various materials. They park and deliver HHW to the HHW building, which is attended. Bulky items are unloaded at-grade. Household trash is loaded into a compactor hopper. The compactor is situated to provide the safest access to the hopper. Recyclables are dropped into open-top containers. All along the one-way route, there are two lanes of roadway. This means there is room for through-traffic to maneuver safely past vehicles that are stopped to unload. The heavy trucks that service the facility enter separately and have their own one-way roadway in an outer perimeter. They service the containers from the opposite or “back” side, so that they do not intersect with customers. This is also how heavy vehicles can access the truck wash and some GSWA offices that were existing at the site. All vehicles exit at the same point, with heavy trucks and GSWA office traffic having a hard stop to yield to customer traffic. Figure 11 shows the design of the Harmon Street Transfer Station, including traffic flow and the various drop-off points for the different materials.

²⁴ When the facility first opened, additional recyclables such as plastics and mixed papers were accepted, but the markets have changed and as of May 2019, only glass and cardboard are accepted for recycling.

Figure 11 – Design for Harmon Street Transfer Station on Guam



Transfer Station Recommendation

It is recommended that Saipan study the feasibility of two concepts from the example best practices. The first is for the Lower Base Transfer Station, and is to examine the approach of Emmet County, MI, which has an expanded and sizeable list of materials that can be donated, reused, or recycled at its drop sites and drop off facility. The concept diverts as many individual item *types* as possible from the landfill, and create or preserves value where once there was waste. The second idea is to create one or more convenience centers like on Guam, where the facility is slightly more than a garbage or recycling drop off center, and offers the opportunity for residents to properly manage some of the most common and most problematic materials, such as household hazardous waste.

Relatedly, with the high proportion of inert and debris material being brought to Marpi Landfill, it is recommended to study the feasibility of opening a new cell as Class III and start putting debris in there, conserving the current cell for Class I waste.

6.4 Collection Service

6.4.1 Universal Access to Recycling in Orange County, NC

Orange County has one of the best recycling rates (above 60 percent) in North Carolina and all the eastern states. They have accomplished this partly through extensive curbside recycling access throughout the mostly rural county, and an ordinance which controls the materials from construction and demolition (C&D) that can be disposed without additional processing. To ensure compliance with the ordinance, the County tracks nearly all C&D materials collected through the program. Orange County receives monthly tonnage reports from the processor via email, including an excel spreadsheet version of tonnages received from county. For a builder to receive a permit within the County, they must use (or be) a licensed C&D hauler for the County. Each roll-off or bin is assigned a tracking number by the county and tagged as such. The container must be taken to one of four County approved C&D facilities that will track the incoming tonnage for each bin tracking number, as well as any other incoming loads from Orange County.

The approved facilities provide a monthly report of tons for each tracking number, overall tons from the County, and an estimate of the amount of materials recovered for recycling from the incoming tonnages for that month. To remain an approved facility, each processor must recover a certain percentage of materials. In addition to the C&D, all collected recyclables from curbside and convenience centers are consolidated at the County's solid waste facility for transport to the regional MRF. The materials are weighed before transport at the facility scales. The records from the scale and the records provided by the C&D recyclers give the County a very clear picture of the material flow and recovery of materials. This also provides extensive data to track such things as growth, the effects of education and ordinances, and to estimate the lifespan and utility of the existing C&D landfill.



Photo credit: Raleigh News & Observer, 2017

In a program called "Urban Curbside," residents within the town limits of Hillsborough, Carrboro, and Chapel Hill (including the portion of Chapel Hill within Durham County) in single-family homes or duplexes qualify for weekly curbside collection of recycling in 95-gallon roll carts. Recycling cart sites are also located at over 95% of multi-unit housing complexes (apartments, town homes, and condominiums) in these areas. The carts are for single stream recycling except cardboard; most multi-unit housing locations have separate dumpsters for cardboard. In the "Rural Curbside" program, recycling is collected every other week on a regular schedule in 100% of the unincorporated areas of Orange County.

In the commercial sector, Orange County operates a limited, cart-based recycling program. It is primarily focused on businesses with liquor licenses, which businesses are required by state law to recycle container glass. The program is often extended to other businesses adjacent or in close proximity to these customers. Orange County also operates a small commercial organic waste diversion program, collecting food scraps and other compostables from about forty restaurants, hotels, grocery stores, institutions, and other businesses. Where available, Commercial Recycling services are provided at no direct cost to participating businesses.

Cardboard is banned from landfill disposal by the state, and businesses that generate fewer than 50 boxes per week may use the free drop off centers to recycle cardboard. Any business can deliver unlimited amounts of clean, prepared cardboard to the Orange County Landfill for recycling. Additional services for businesses include a full-time CESQG hazardous waste facility and technical assistance for waste reduction and recycling at no charge. The assistance includes answering marketing questions, conducting facility waste audits, and helping to set up a recycling program. County staff will work with the businesses to determine elements of the waste stream that can be reduced, reused or recycled. Recycling consultation services can also be provided to help ensure the success of an in-house recycling collection program or special events.

6.4.2 Ramsey County & Washington County, MN

R&E Board does not provide any solid waste collection services. Haulers assess and collect the County Environmental Charges and remit them to the respective governments, as described in Section 6.2.2.

6.4.3 Rockland County, New York

Rockland County Solid Waste Management Authority does not provide any solid waste collection services. The system of transfer stations the county operates allows off-route time to be more efficient.

6.4.4 Prince William County, Virginia

All solid waste collection in Prince William County is conducted by the private sector hauling companies. Haulers are induced to bring the waste they collect to the Prince William County Landfill because the disposal has been “pre-paid,” meaning they can tip for “free.”

6.4.5 Ensuring a Level of Service in Emmet County

Emmet County households and businesses subscribe directly with private waste haulers for garbage collection service,²⁵ but the Emmet County Department of Public Works and Recycling collects recyclables curbside from three of the townships, the two cities, and two unincorporated resort communities. The service, which started in 2004, is provided to single family homes, and is available upon request at a very low annual cost to larger condo and apartment complexes. This covers about 60 percent of residents. Material is collected dual stream, meaning that residents source separates their recyclables by type into two bins: Paper, Boxes, and Bags; and, Mixed Containers. Paper, Boxes, and Bags includes any clean paper that tears, including cardboard and shredded documents. Plastic bags and film (if bundled/tied together) may also be placed in this bin. Mixed Containers includes cartons; plastic and paper cups, plastic bottles, jugs, jars, and tubs; metal cans, foil, and trays; and, glass bottles and jars. Materials have traditionally been collected in open-top bins; however, in the summer of 2016, some customers started getting rolling carts for their paper, boxes, and bags, to pair with the bins which are still used for containers. The carts were purchased primarily with sponsorship money from public and private partners and with a grant from the Recycling Partnership in Washington, DC.

Collection Service Recommendation

Two concepts from the best practices are recommended for feasibility study. The first is a universal fee from all customers which funds universal collection of one or more waste streams. The permutations on this study will be many, and this will be one of the most complex parts of the study. There are many

²⁵ There are presently three haulers providing garbage collection—two local/regional firms and one national firm. All of them offer both rolling carts and “bargain bag,” the local vernacular for bag-based pay-as-you-throw service.

different ways to assess a fee, as discussed in 5.2. This aspect of the feasibility study will focus on possible costs to implement universal collection, regardless of the fee structure (or lack thereof). The second concept, which goes hand-in-hand with universal collection—and, in fact, requires it—is to ban cardboard from disposal in the landfill, as in North Carolina.

6.5 Alternative waste diversion programs to reduce the tons disposed of at Marpi Landfill

6.5.1 Reaching People Where They Are in Orange County, NC

Orange County operates a robust education and outreach program, with services for businesses, nonprofits, faith organizations, civic groups, and other public groups. Recycling presentations and workshops are provided. Topics can range from the "3R's"- a hands on discussion about waste reduction, what can be recycled, what is reuse, and why they are important; to higher level discussions regarding recycling markets, processes, policy and economics. Topics can be of specific interest as well general, such as plastics, food waste reduction, or special event waste diversion. The speakers will come to the audience or the County will host an event at their training facility. Orange County also provides printed material about its programs and services and provides content regarding Orange County recycling or composting to local or regional publications.

6.5.2 Helping Businesses Reduce and Recycling in Ramsey County & Washington County, MN

In 2013, Ramsey/Washington Recycling & Energy Board (R&E Board) created a program called BizRecycling to increase source separation of recyclables and food waste from businesses and institutions. The BizRecycling program is staffed by members of the counties' respective public health departments and is served by a variety of consultants.

BizRecycling is a program to help businesses in Ramsey County and Washington County start, expand, improve, and manage business recycling, including organics collection. BizRecycling connects businesses with recycling experts who can help identify recycling and waste reduction opportunities. The program offers free on-site consultations, technical assistance, expert advice and guidance. Businesses can request free labels for their trash and recycling bins.

BizRecycling also has grants available of up to \$10,000 per business to start or improve business recycling, and grants over \$1 million per year. BizRecycling grant funds can be used to:

- Purchase recycling and organics bins and containers;
- Purchase trolleys and carts to move recyclables and organics from collection to pick-up points;
- Reconfigure a loading dock to add recycling dumpsters, compactors, and/or organics dumpsters;
- Build an enclosure to cover outside recycling dumpster/compactors and/or organics collection equipment;
- Purchase a 6-month supply of compostable items for enhancing or starting an organics recycling program (i.e. compostable bin liner bags, compostable to-go packaging);
- Purchase dishwashers and reusable dishware; or,
- Cover hourly rate for employees to attend training on a new recycling program.

BizRecycling has partnered with local chambers of commerce, business alliances, and economic development authorities who help educate and connect businesses to BizRecycling resources. As the local, trusted source of business information for their members, the partners are able to effectively connect

businesses with the free recycling resources. These resources add value for their business members and help to protect the environment for the long run. BizRecycling partners directly reach nearly 2,500 businesses in the area.

6.5.3 Opportunities for Learning in Rockland County, New York²⁶

To help residents reduce waste and prevent pollution, Rockland County provides several services and facilities.

- Repair Café is a local meeting place that brings together people with broken items (lamps, appliances, jewelry, clothing) and Repair Coaches, or volunteers, with the expertise to teach them to fix them. The event is free.
- The HHW facility is a drop-off collection point that accepts household hazardous waste materials from Rockland County residents and small businesses that qualify for CESQG status. There is drop off available every weekday, every week, and one weekend day each month.
- Residents can bring yard waste to the Clarkstown facility for free; later, a supply of compost and mulch are distributed to the localities (towns and villages) where residents can pick up for free.
- Rockland County offers on-site presentations for schools, businesses, and other groups (such as civic, senior, garden and residential). The presentation includes an overview of waste and recycling in Rockland County, as well as solutions for protecting our environment. Presentations can be customized by age, type of group and duration.

The County also supports the popular Recycle Coach app through “Green Up Rockland.” <https://recyclecoach.com/>

6.5.4 Building Public/Private Partnerships to Encourage Beverage Container Recycling in Republic of Palau

The Republic of Palau is an island nation located in the North Pacific with a population of 21, 720 (As of 2017). The country has a GDP per Capita that exceeded the US\$16,000 with tourism as the primary economic sector.²⁷

The collection and disposal activities on the island are primarily managed and financed by the state and federal governments. The state governments, all 32 states, are responsible for the collection of residential and commercial waste in their jurisdictions, and the federal government is responsible for the island’s disposal facilities. The solid waste management system consists of a municipal solid waste landfill (the M-dock semi-aerobic landfill), composting facilities, a plastic to energy project, a glass cleaning program, scrap shredding program, and a beverage container program. The island’s diverse disposal infrastructure undergirds the federal government’s 3-R program, a system that currently diverts 51% of solid waste away from landfills Republic of Palau.²⁸

²⁶ <http://www.rocklandrecycles.com/>

²⁷ Voluntary National Review Pathway to 2030: Progressing with our Past Toward a Resilient, Sustainable, and Equitable Future, June 2019

²⁸ Voluntary National Review Pathway to 2030: Progressing with our Past Toward a Resilient, Sustainable, and Equitable Future, June 2019

Overview of the Beverage Container Recycling Program

In 2011, the Republic of Palau instituted the Beverage Container Recycling Program, an economic-based program geared towards the recovery of 32-oz metal, plastic, and steel beverage containers.²⁹ The program requires the beverage distributors to pay a \$.10 deposit to the national government, 0.025 goes to the redemption center and 0.025 to the federal costs associated with administrative fees. At the end of the bottle's useful life, customers can sell containers back to the bottle redemption center for \$0.05. From 2011 to 2018, the island recovered 105,624,976 beverage containers and exported 1,522,260.76 redeemed bottles to international markets.³⁰

In addition to achieving a 87 percent bottle recovery rate, the government was able to collect an estimated \$3,018,817.88 for the Recycling Fund and provide \$5,281,248.80 of refunds to island customers.³¹ The funds collected for the Recycling Fund were used to improve the efficiency of the redemption center through the purchasing of equipment and program activities. Figure 12 illustrates the economics of the program. Figure 12 is a graphical representation of the Beverage Container Program.

3. Overview of the Program

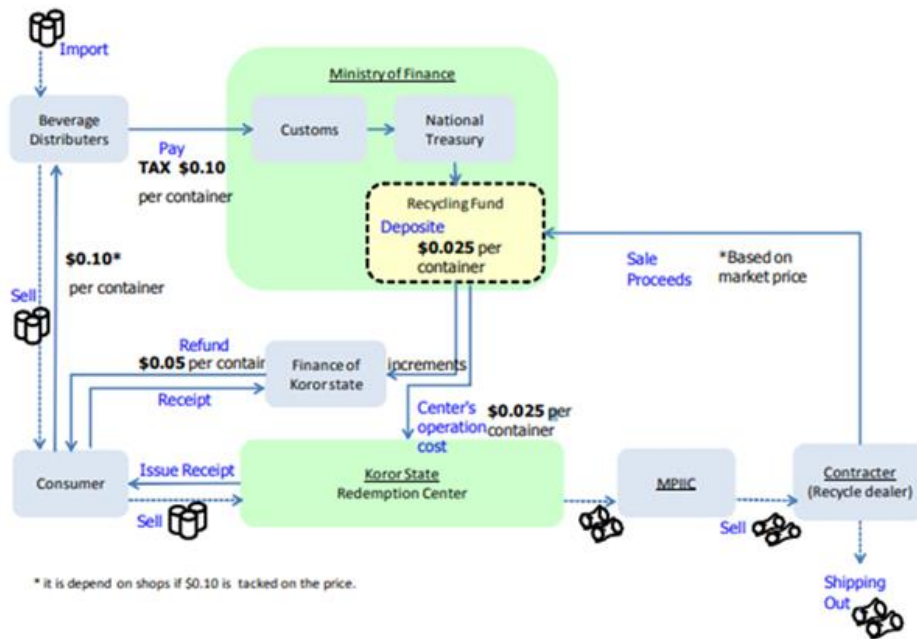


Figure 12 – Diagram of the Beverage Container Program in the Republic of Palau³²

²⁹ Bureau of Public Works Ministry of Public Infrastructure, Industries and Commerce Republic of Palau. Refer to <https://www.sprep.org/attachments/Publications/Presentation/cprt-2018/1-cp-2025-palau-cdl-calvin.pdf>

³⁰ : Bureau of Public Works Ministry of Public Infrastructure, Industries and Commerce Republic of Palau. Refer to <https://www.sprep.org/attachments/Publications/Presentation/cprt-2018/1-cp-2025-palau-cdl-calvin.pdf>

³¹ Bureau of Public Works Ministry of Public Infrastructure, Industries and Commerce Republic of Palau. Refer to <https://www.sprep.org/attachments/Publications/Presentation/cprt-2018/1-cp-2025-palau-cdl-calvin.pdf>

³² Bureau of Public Works Ministry of Public Infrastructure, Industries and Commerce Republic of Palau. Refer to <https://www.sprep.org/attachments/Publications/Presentation/cprt-2018/1-cp-2025-palau-cdl-calvin.pdf>

Policy Framework and strategic use of Public Private Partnerships

The program is supported by a series of island-wide regulation, two of the most notable being the “Establishing of a Recycling Program” and the Beverage Container Recycling Regulations. Additionally, the national government implemented strategic Public/Private Partnerships with bottling companies, Belau Garbage & Swap Co. and Palau Waste Company, to export bottles recovered by the program. These partnerships supported the exportation of collected bottles. In keeping with partnership agreements, companies buy compressed containers from the redemption center and transport them to international markets.³³

6.5.5 Prince William County, Virginia

Prince William offers an array of programs for residents to reduce waste, beyond curbside collection.

Donation Center (used clothing, electronics, furniture, etc.)

The Donation Place replaced the former “Too Good to Waste Place,” which had been a venue for people both to drop off and pick up good or working items. The facility was very popular, but management proved difficult, and so it was closed. The Donation Place, which is contracted to and operated by a vendor, accepts reusable items, including clothes and shoes; linens, drapes and textiles; kitchen items, gadgets and small appliances; home decorations, furniture and rugs; books, CDs and DVDs; toys, musical instruments, bikes and sporting equipment; and, tools or any other household items. The Donation Place does not accept electronics, mattresses and bedding, children’s safety items such as car seats and cribs, combustibles or chemicals, or anything broken or dangerous. The idea of passing along unwanted but usable items continues to be popular with Prince William County residents. In FY2014, 7,961 donations were made—on average, 663 per month. Donations totaled well over half a million pounds at 581,470, with an average of 48,456 pounds per month and almost 75 pounds per donation. This represents over 24 tons of material that was not only diverted from disposal but, in many cases, sent for reuse by people in need. Contamination is low, with only 1.4 to 5.2 percent of the material (by weight) being sorted out by the vendor for disposal.

Electronics

Electronics are accepted at the landfill on Wednesdays and Saturdays from 10 a.m. to 5 p.m., and at the Balls Ford Road Yard Waste Compost Facility on the second Saturday of each month from 9 a.m. to 3 p.m. The program essentially accepts TVs and computers and their peripherals, cell phones, and other electronic equipment with a circuit board or electric cord. Residents are limited to three items per visit, and are encouraged to donate working electronics to charitable institutions.

Batteries, Oil, and Antifreeze

The County accepts rechargeable batteries for recycling at the landfill and the Balls Ford Road facility, and promotes the nationwide Call2Recycle campaign, which provides a network of retail drop off locations where people can recycle rechargeable batteries at no charge. The drop-off centers for batteries include information about the difference between single-use and rechargeable batteries, why recycling rechargeable batteries is valuable, and how to properly prepare them for recycling and shipping.

³³ Bureau of Public Works Ministry of Public Infrastructure, Industries and Commerce Republic of Palau. Refer to <https://www.sprep.org/attachments/Publications/Presentation/cprt-2018/1-cp-2025-palau-cdl-calvin.pdf>

Also at both the landfill and the Balls Ford Road facility, residents can recycle automotive batteries, used motor oil, and antifreeze. These items, along with the rechargeable batteries, are accepted daily during all operating hours at both facilities.

Used clothing, textiles and shoes

The County encourages residents to take usable clothing and shoes to charitable institutions or thrift shops. In addition, drop off bins are provided at the Donation Place at the landfill and at the Balls Ford Road facility. These bins accept all types of clothing, linens, drapes/curtains, handbags, belts and paired shoes.

White goods and other special items

Residents can recycle scrap metal at the Landfill, including appliances. Other accepted scrap metal items include car parts, bicycles, swing sets, mowers (with fluids removed), metal pipes, metal fixtures, metal siding, chain, microwave ovens, sheet metal, tire rims, fencing, and cable. Residents can bring Freon-containing appliances intact; however, businesses must have a certificate showing that the Freon has been safely removed from any appliances before bringing such items to the Landfill.

6.5.6 Building Stability Through Marketing Emmet County

Emmet County operates a regional MRF that serves the immediate localities plus Cheboygan, Presque Isle, and Otsego Counties. The original recycling center opened in 1990 with a grant from the Michigan Department of Natural Resources. In 2010, the current processing facility opened. The materials, which were collected dual stream, are also processed dual stream on two sorting lines. The processing of the Paper, Boxes, and Bags is all done by hand into office paper, books, plastic film, cardboard, and a news mix. Processing of the mixed containers uses equipment similar to a single-stream MRF, utilizing magnets, forced air, and other machinery, in addition to manual sorting. Emmet County markets materials almost exclusively to domestic users. The relatively clean process of dual-stream collection allows the MRF to ship about 12,000 tons directly to manufacturers each year—in fact, the County prides itself on marketing 97 percent of its materials to Michigan-based users.

Waste Diversion Programs Recommendation

It is recommended to consider the feasibility of creating a “speakers bureau” of subject matter experts who can visit in the community—scheduled, spontaneously, or by request—and inform residents and businesses about their opportunities regarding waste and why their choices matter. Another recommended program for feasibility study is a “Too Good to Waste Place,” as in Prince William County, VA. This is closely related to the idea of the drop sites with a multitude of materials collected, as in Section 6.3. It is part of the idea of re-fashioning the “dump” as a community place, rather than something undesirable to be avoided.

7 Feasibility Study

The following subsections assess the technical, market, economic, financial, and management feasibility of the recommendations. As a summary, Figure 13 shows the recommended program and policy changes from Section 6.

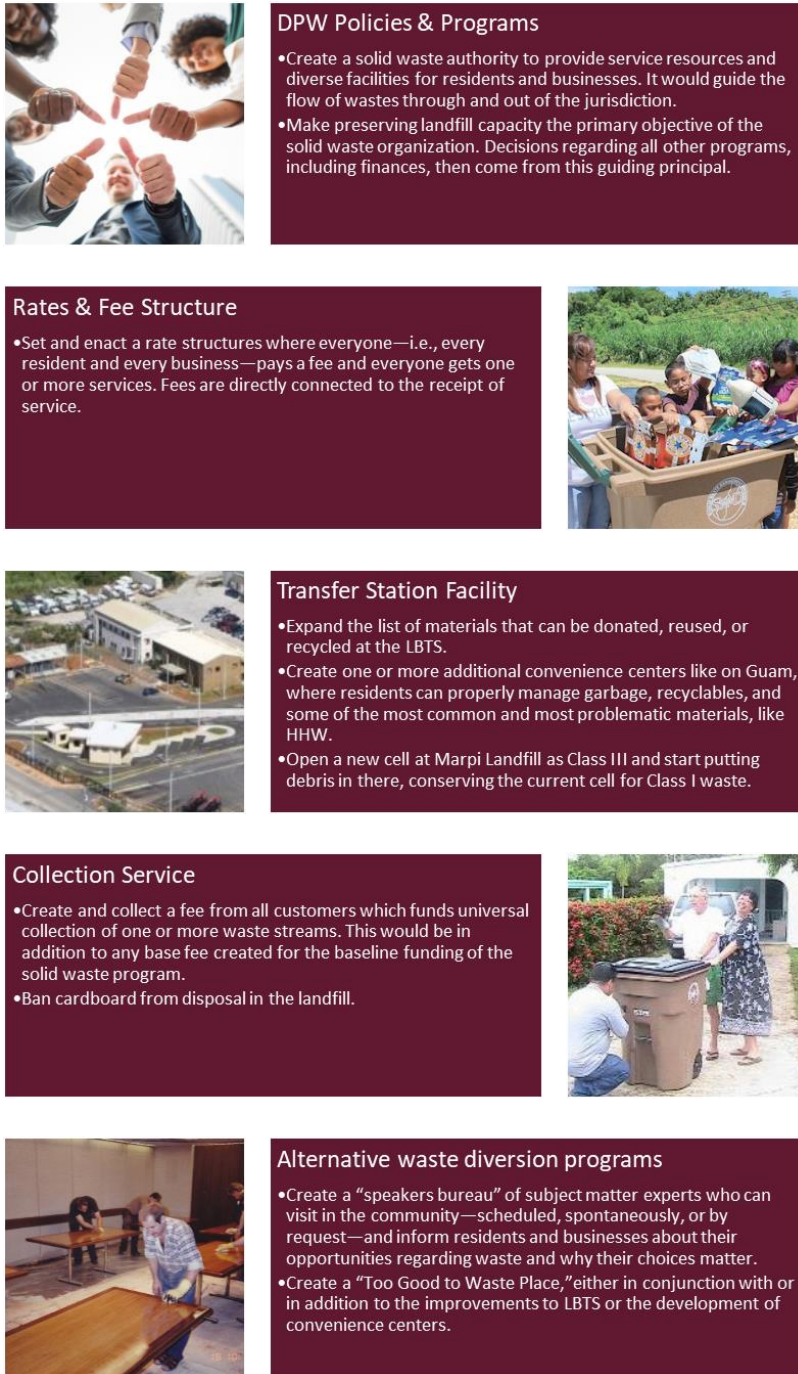


Figure 13 – Summary of Recommendations

7.1 DPW Policy and programs

The first recommendation of all is to create a solid waste authority to provide service resources and diverse facilities for residents and businesses. It would guide the flow of wastes through and out of the jurisdiction. The creation of the authority would establish a mechanism for accomplishing most of the other recommendations in this analysis that is preferable to a general fund agency. Once the authority is created, there would need to be by-laws established and a Board of Directors appointed. The authority would hire staff, such as an Executive Director among others, to manage the day-to-day activities of the authority. The system that would be implemented is something that would need to be better defined through the process of creating the authority. Chiefly, however, it is recommended that preserving landfill capacity would be the primary objective of the solid waste authority. Decisions regarding all other programs, including finances, then come from this guiding principal.

Elements of the new system could be provided through public-private partnerships. Additionally, the authority could reach beyond the island of Saipan to other parts of CNMI for purposes of administration, funding, marketing, and economics.

The costs associated with initializing an authority would start with CNMI government. This would include planning for the creation of the authority and start-up or “seed” money until the authority can begin to collect fees and raise revenue. This could likely be borne by present staff supported by a solid waste or governmental consultant. After the creation of the authority, the CNMI government might continue to indirectly support the authority with operational details. Examples include providing office space to the new authority at little or no cost; allowing employees of the authority to participate in CNMI government employee benefits such as health insurance or retirement investing; and, providing services such as legal or technology to the authority at an interagency rate below market rate.

Creation of the Guam Solid Waste Authority (GSWA)

The government of Guam created the GSWA to deliver solid waste collection and disposal services to the residents of Guam. The Authority is responsible for the financing and oversight of the island's comprehensive solid waste management program. Under the management of the federal receiver, GSWA modernized Guam's solid waste management system by closing the Ordot Dump, opening a new sanitary landfill, implementing new recycling programs and a new household hazardous waste facility, and upgrading Guam's residential transfer stations.

The creation of the Guam Solid Waste Authority was accomplished through the enactment of Guam Public Law 31-20 (GSWA Act) in 2011. The government of Guam created the Authority to prepare for the eventual resumption of governance over the solid waste management program after the completion of the federal receivership. Additionally, the government of Guam created the GSWA Board of Directors, a governing body responsible for reviewing financial activities and approving the Authority's Annual Budget.

According to the GSWA Act, the Authority functions as an autonomous public corporation and has replaced the government's former solid waste management division. As a municipal corporation, the Authority oversees the financial activities related to the solid waste management system, including the Solid Waste Operations Fund and Guam Solid Waste Authority Revenue Bonds. The Authority can, with the approval of the Public Utility Commission, set and enact payment rate structures, such as solid waste fees and tipping fees, for commercial and residential customers. Additionally, the entity can independently procure consulting services related to the operational management and capital improvement activities of the island's solid waste collection and disposal services.

The GSWA Act was widely supported in the Legislature and met with little political resistance. The support for the creation of the Authority was derived, in part, by the island's 2006 Integrated Solid Waste Management Plan, which included the creation of a public utility solid waste authority as a strategic recommendation. Additionally, the Island's Federal Receiver supported the Administration's decision to make the Authority and worked with the Legislature in the creation of separate monetary funds for expenses related to solid waste collection and disposal services. The GSWA was established two years after the enactment of the GSWA Act.

Guam Public Law 31-20, http://www.guamlegislature.com/31st_public_laws.htm
 Guam 2006 Integrated Solid Waste Management Plan,
https://issuu.com/guamepa/docs/2006iswmp_final

7.2 Rate and fee structures

With an authority created, that authority can set and enact a rate structures wherein everyone—i.e., every resident and every business—pays a solid waste program fee and everyone gets one or more services. The fees would be directly connected to the receipt of service by full cost accounting.

The amount of the solid waste program fee, or SWPF, would be determined by the program needs. It would effectively make up the deficit to fund the program after the revenues from the 10 percent tax, the tipping fees, and the interest income. As an example, this table shows the average revenues from the three-year period of FY16-FY18; the expenditures from that same period; the funding deficit; and how the solid waste program fee might have been calculated if it had existed.

Table 7 – Example of Deficit Funding Using a Solid Waste Program Fee

REVENUES	FY16-FY18 3-YR AVERAGE
Tax 10%	\$ 1,625,301
Tipping Fees	\$ 490,568
Overage / Interest income	\$ 2,348
TOTAL REVENUES	\$ 2,118,216

EXPENDITURES	FY16-FY18 3-YR AVERAGE
SUB-TOTAL EXPENDITURES	\$ 2,020,142
Payroll & Benefits	\$ 373,344
TOTAL EXPENDITURES	\$ 2,393,486
SURPLUS (DEFICIT)	\$ (\$275,270)
Revenue needed from Solid Waste Program Fees	\$ 275,270

It is recommended that of the SWPF revenue needed, 50 percent should be paid from the tourism industry, 25 percent should be paid by businesses, and 25 be paid by households (residents). The particulars of how those should be assessed, billed, and paid would be determined by the newly-created solid waste authority.

In this example, the deficit that the SWPF would need to cover is relatively small. For example, in the recommended break-down of payers, the tourism industry would have been responsible for just \$137,635. The share for residents would have been \$68,817.50, only about \$1.32 per person for the entire year. That would be for the current services, as they exist presently. As the authority would grow its programs in fulfillment of its obligation to provide services to every ratepayer, the amount the SWPF would need to “cover” would grow, and the funding level would increase accordingly. As will be shown in Section 7.6, to operate the recommended programs in this section, excluding curbside collection which has its own fee, the residential portion of the SWPF would be less than \$1 per month.

7.3 Transfer Station Facility and Layout Design

There are three recommendations regarding transfer stations. The first is to expand the list of materials that can be donated, reused, or recycled at the LBTS. The facility is current designed as a transfer station, primarily, and other activities are secondary. Reconfiguring the facility and reassigning some of its assets

could transform its primary function to be a facility where individuals and small businesses can easily discard many types of materials for recovery, reuse, or recycling. This serves the operational goal of the new program to conserve landfill space, first and foremost. The variety of materials accepted could be somewhat flexible, changing as supply or demand grow or shrink. An example might be collecting strings of electric lights around the November and December holidays. Perhaps the facility could host special events, such as repair clinics where residents can bring in nonfunctioning items that they think could be repaired and be connected with repair people or just “handy” volunteers. The transfer infrastructure would not need to be demolished, and the very small collection trucks could still tip there; but, the LBTS could serve the larger community as a waste reduction facility. The only limitations would be creativity, and the costs associated with these new opportunities lie primarily staffing. Many of these activities would be about waste reduction and avoiding waste in the first place, and not necessarily collecting recyclables that have to be baled and exported. The estimated cost for a position to operate heavy equipment and for a position to act as a planner and broker for the site’s activities and materials marketing. The cost break-down is shown in Table 8.

Table 8 – Operational Cost Break-down for New Services at LBTS

Operational Costs (annual)	Tourism Industry Share (annual)	Business Sector Share (annual)	Residential Sector Share (annual)	Per-household (monthly)
\$170,000	\$85,000	\$42,500	\$42,500	\$0.19

The second recommendation is to create one or more additional convenience centers like on Guam, where residents can properly manage garbage, recyclables, and some of the most common and most problematic materials, like HHW. The original capital costs would be funded by grants from other agencies, and to best serve the community while reducing litter and illegal dumping, operations at the convenience center(s) would be funded by the SWPF described in Section 7.2. Any eligible rate payer could come to the convenience center for easy and convenient access to proper waste management. Annual operational costs for similar facilities on Guam are \$60,000 each. Funding for two such facilities on Saipan, via the SWPF, is shown in Table 9.

Table 9 – Operational Cost Break-down for Two New Convenience Centers

Operational Costs (annual)	Tourism Industry Share (annual)	Business Sector Share (annual)	Residential Sector Share (annual)	Per-household (monthly)
\$120,000	\$60,000	\$15,000	\$15,000	\$0.13

The third recommendation is to open a new cell at Marpi Landfill for Class III and start putting debris in that cell, conserving the current operating cell for Class I waste. There will be some new operating costs associated with having two working faces at a time. The costs would be “made up” by the SWPF, as shown in Table 10.

Table 10 – Operational Cost Break-down for New Class III Landfill Cell

Operational Costs (annual)	Tourism Industry Share (annual)	Business Sector Share (annual)	Residential Sector Share (annual)	Per-household (monthly)
\$205,000	\$102,500	\$51,250	\$51,250	\$0.23

7.4 Collection Service

A major recommendation of this study is to create and collect a fee from all customers which funds universal collection of one or more waste streams. This fee would be in addition to the SWPF, which was created for the baseline funding of the solid waste program. For the purposes of cost analysis, and in order not to underestimate potential cost impacts, the current operational costs from Guam for curbside collection were used. These customers receive collection of waste in a cart and of recyclables in a cart. Their service is provided by Guam Solid Waste Authority employees. The operational costs also include removal of waste and recyclables from three convenience centers, which is also recommended for Saipan. The current annual cost is \$143.00 per customer, per annum. The actual rate charged to customers on Guam is \$360 per year, to help fund several other programs, which is a typical practice. For the purposes of this analysis and as summarized in Section 7.6, only actual operational costs were considered. Implementation of a new collection business operated by the solid waste authority would be a measured and time-intensive process. It would take at least two years from the creation of the authority. Important steps would include consideration of the impact on the existing private haulers; procurement of equipment such as trucks; decision-making on the use of carts, bins, or personal containers; creation of a customer database; creation of a funding mechanism for collecting the fee; rate setting in accordance with local laws; creation of collection routes; and a detailed public outreach and engagement process.

The provision of curbside collection would support the recommended ban on cardboard from disposal in the landfill. If cardboard is banned from the landfill, a system of collection via curbside service and drop off centers is essential. This policy change would require legislation and then a plan for implementation of that legislation, such as provisions for rejecting loads of MSW containing an unacceptable amount of cardboard. Other than the afore-described collection program, there are no other direct costs to the government or the new solid waste authority associated with a ban on cardboard in the landfill.

7.5 Alternative waste diversion programs to reduce the tons disposed of at Marpi Landfill

There are a few other recommendations to help divert tons of waste from the Marpi Landfill. The first is part of an outreach program to build waste reduction as a value on Saipan. The solid waste authority could create a “speakers bureau” of subject matter experts who can visit in the community—scheduled, spontaneously, or by request—and inform residents and businesses about their opportunities regarding waste and why their choices matter. The speakers would include solid waste authority staff, but could also feature trained members of the community who are passionate and want to volunteer their time.

Another recommendation for embracing local culture and values is to create a “Too Good to Waste Place,” either in conjunction with or in addition to the improvements to LBTS or the development of convenience centers. This is a formalization of informal “swaps” or trading, which are traditional and commonplace even today in many rural and island communities—although in the wake of social media developments, they are increasingly popular in urban and suburban communities as well.

Both these programs and possibly others would be funded as part of an in-depth public outreach program, to be operated by a member of the solid waste authority staff. A best practice level of funding for such a program is \$3.00 per household, per year.

7.6 Summary

As mentioned previously, the program recommendations in this feasibility study—excluding curbside collection—would have needed to raise just \$11 per household per month in the period FY16-FY19. Stated

another way, the solid waste program could be expanded to provide greater opportunity to all and the budget balanced for about \$1 per household per month, as shown in Table 11

Table 11 – Using a Solid Waste Program Fee to Expand and Fund Solid Waste Programs

REVENUES	Example (FY16-FY18)
Tax 10%	\$ 1,625,300
Tipping Fees	\$ 490,568
Overage / Interest income	\$ 2,348
Solid Waste Program Fees	\$ 826,319
TOTAL REVENUES	\$ 2,944,535

EXPENDITURES	Example (FY16-FY18)
SUB-TOTAL EXPENDITURES	\$ 2,020,142
Payroll & Benefits	\$ 373,344
New Programs	\$ 551,049
TOTAL EXPENDITURES	\$ 2,944,535
SURPLUS (DEFICIT)	\$ 0

Of the \$826,319 in SWPF revenue shown, 25% would be paid by residents, or \$206,580. Divided by the number households, this yields about \$11.05 per year to fund the new programs and balance the budget. Combined with \$143 in costs to operate curbside collection, or \$11.92 per month, the monthly cost per household to implement all the recommended program enhancements is about \$12.84 per month. The assignment of 25% to residents could be less, with businesses or the tourism industry paying a greater share. Or the SWPF could be increased beyond the revenue needs of the general programs, to help subsidize the curbside collection program. The summary result, however, is that for a negligible SWPF, residents and businesses could enjoy greater access to safe and convenient waste reduction and recovery resources; and for a monthly rate that is highly competitive with other communities in the U.S., residents could have curbside collection that makes recycling easy, reducing illegal dumping, helps control litter, and stabilizes costs for the entire system. The experience for residents and businesses is illustrated in Figure 14.



Figure 14 – A Future Solid Waste System for Residents and Businesses of Saipan

8 Glossary of Terms

Name (Abbreviation)	Definition
Access roads	A road giving access to a place or to another road.
Airspace Utilization Factor	The effective density of waste material in the landfill (tons of waste per cubic yard of landfill airspace).
Bulky Waste	Oversized material such as mobile homes, boats, furniture, logs, mattresses, etc.
Collection vehicle	Residential collection vehicles include front-loading and rear-loading garbage trucks, as well as special trucks with compartments used to pick up source-separated recyclables. Commercial (businesses), institutional (hospitals and schools), and industrial (plants) waste, as well as C&D waste, is often discarded in roll-off boxes, which are dropped at the facility and then collected on schedule.
Construction and Demolition debris (C&D)	Includes broken concrete, wood waste, asphalt, rubble. This material can often be separated for beneficial use.
Container	Any receptacle used to accumulate waste from residential, commercial and industrial sites. Containers vary in size and type according to the needs of the customer or restrictions of the community. Containers are also referred to as dumpsters.
Convenience center	Small transfer facilities used in low-volume or rural settings. These low-technology options often use roll-off boxes with an inclined ramp for cars and pickups. Bins can be included for recyclables that are source separated.
Direct haul	The practice of sending collection vehicles (mostly garbage trucks) directly to the landfill without using transfer stations.
Disposal Fee	A fee charged for the amount of waste disposed of by customers at a landfill. (also see Tipping Fee)
Energy from Waste Facility	A facility that burns municipal solid waste and produces electricity. The facility reduces the volume of waste by 90% and results in producing ash residue
Enterprise Fund	A self-supporting government fund that sells goods and services to the public for a fee.
Flow control	A general term that refers to the ability of municipalities and their agencies to mandate — through laws and regulations — that all locally-generated solid waste be delivered to designated solid waste management facilities.
GHD Team	GHD, Inc. and Gershman, Brickner, and Bratton, Inc ("GGB")
Green Waste Unit Charge - Per Parcel (PP)	This unit charge is for the operations and maintenance costs for the yard waste composting program for composting all of the leaves, grass, and brush collected in the County.
Hauling Fee	A fee charged to roll-off customers calculated from the amount of time it takes to pick up their roll-off container or compactor, dispose of the waste and return it to the customer.

HDPE (#2)	Plastic #2 - High-density polyethylene (HDPE) is a polyethylene thermoplastic made from petroleum. HDPE is hard, opaque and can withstand somewhat high temperatures.
Household Hazardous Waste (HHW)	Household products that contain hazardous substances such as pesticides, propane canisters, cleaning products, etc., categorized as flammable, corrosive or poisonous.
Host Community Agreement (HCA)	A transfer station or landfill operator can offer specific benefits to the community selected for a proposed facility. The benefits are listed in a Host Community Agreement. Benefits can include cash, free tipping, highway improvements, and tax reductions.
Landfill airspace (capacity)	The volume of space on a landfill site which is available for the disposal of municipal solid waste (MSW).
Landfill Cells	This is the area in a landfill that has been constructed and approved for disposal of waste.
Landfill	A solid waste facility or part of a facility for the permanent disposal of solid wastes in or on the land. This includes a sanitary landfill, balefill, land spreading disposal facility, or a hazardous waste, problem waste, special waste, wood waste, limited purpose, inert, or demolition waste landfill.
Landfill closure	The period of time after a landfill has reached its permitted capacity but before it has received certification of closure from a state regulatory agency. During the closure period, certain activities must be performed to comply with environmental and other regulations (e.g. capping, landscaping, etc.).
Landfill airspace utilization Efficiency	A calculation that estimates the capacity of a landfill (the weight of the waste landfilled divided by the volume of the total airspace utilized) .
Lower Base Transfer Station (LBTS) Facility	Transfer Station (Convenience Centers) located in Saipan
Material Recycling	Processing waste material into a different form for re-introduction into the market (e.g. plastic re-manufacturing, mechanical material segregation, mattress recycling, pallet recycling, ash vitrification, composting, etc.);
Material Re-use	Salvaging reusable waste material so it can be re-introduced into the consumer market, diverting the material from disposal (e.g. repair, salvaging bicycles, furniture, clothing, etc.)
Materials Recovery Facility (MRF)	Material Recovery Facility – a facility that processes and separates materials for the purposes of recycling from incoming mixed solid waste stream, or from mixed source-separated recyclable stream.
Materials Recovery Facility (MRF)	This is a facility where recyclable materials are sorted and processed for sale. This process includes separating recyclable materials (manually or by machine) according to type, and baling or otherwise preparing the separated material for sale. Operating costs and revenues for MRF's are accounted for as a separate line of business.

Municipal Solid Waste (MSW)	Waste generated by residences, offices, institutions, commercial businesses and other waste generators not producing special wastes.
Old Corrugated Cardboard (OCC)	Post-use corrugated packaging material that is commonly known as "cardboard"
OY	Operational Year
PET (#1)	Plastic 1#- Polyethylene terephthalate, is a form of polyester (just like the clothing fabric). It is extruded or molded into plastic bottles and containers for packaging foods and beverages, personal care products, and many other consumer products.
Post-closure	The period of time after a landfill is certified as closed by a regulatory agency, until the owner has no further monitoring responsibility. Environmental and other regulations require the owner of the closed landfill to continue monitoring activities and general maintenance of the site for a specific period of time (generally 30 years).
Private Collection Haulers	A person or entity who disposes of Acceptable Waste at the Landfill, including individuals or entities delivering Household or Residential Waste in privately owned vehicles.
Public/private partnership	Partnerships between a government agency and a private-sector company that can be used to finance, build, and operate projects, such as public transportation networks, parks, and convention centers.
Recycling Rate	The percentage of materials recycled, relative to the amount of waste generated (compare to recovery rate).
Request for Proposals (RFPs)	A procurement process that allows for public private partnerships and negotiated contracting.
Residential Garbage	Post-consumer waste material generated by single-family and multi-family residences
Residential Recyclables	Post-consumer material that is source separated to be processed through a Material Recovery Facility. Recovered materials are sold on the secondary material markets and residues are disposed.
Scale House	The office, usually located a short distance from the main entrance, where all incoming vehicles must stop to be weighed or measured and receive a disposal ticket
Service providers	Privately-owned businesses that provide garbage collection services. Other terms used include haulers or waste haulers.
Single-stream recycling	A collection method where recyclables are source separated, combined for collection in a storage container, collected, and taken to a facility for sorting and production of marketable products.
Sludge Co-composting Unit Charge – Per Unit (PU); Water Usage (WU)	A unit charge for the operation and maintenance costs for the co-composting facility, which composts municipal sewage sludge collected from the wastewater treatment plants in the County with clean wood waste.

Solid waste	As defined by the Resource Conversation and Recovery Act, a broad term which includes garbage, refuse (e.g., metal scrap, wall board, etc.), sludge from treatment facilities, and other materials including solids, semisolids, liquids, or gaseous material from industrial, commercial, mining, agricultural, and community activities. Exceptions include domestic sewage, industrial wastewater, irrigation return flows, nuclear materials, and mining material not removed during the extraction process.
Special waste	Certain wastes which have disposal regulations that differ from MSW. Each special waste category has its own characteristics and handling requirements. Some examples of special waste are: incineration ash, fluorescent bulbs, hazardous waste, latex paint, Styrofoam, and appliances.
Tipping fee	The unit price charged at the disposal site or transfer station to accept waste, usually expressed as dollars per ton or dollars per cubic yard.
Tipping floor	The floor of a transfer station or MRF.
Tons per day (TPD)	The most common unit of measurement for waste generation, transfer, and disposal. Accurate TPD measurements require a scale; conversion from “cubic yards” without a scale involves estimated density factors.
Waste diversion	The process of separating certain materials at the transfer station to avoid the cost of hauling and the tipping fee at the landfill.
Waste screening	Inspecting incoming wastes to preclude transport of hazardous wastes, dangerous substances, or materials that are incompatible with transfer station or landfill operations.
Waste Stream	Specific types of waste found in customer's disposal (trash, cardboard, aluminum, metal, etc.) or a more broad definition of disposal type. (e.g. MSW, C&D, Hazardous, etc.)

Appendix A – Definitions of Waste Categories from Waste Sort Activity

#	Material Type	Material	Definition
1	Fiber	Old Corrugated Cardboard (OCC)	Old corrugated containers (cardboard) that are clean and dry enough to be recycled. Most shipping boxes are OCC.
2		Other Fiber Materials	All other fiber items including newspapers and magazines and other recyclable fiber materials such as gable-top containers and cereal boxes
3	Plastic	PET (#1)	Narrow necked bottles and other containers identified by the recycling symbol with the number #1, contents shall be emptied into the Food category.
4		HDPE (#2)	Narrow necked bottles or containers that can be identified by the recycling symbol with the number #2. Examples include laundry soap bottles and milk jugs.
5		Mixed Plastic	All rigid plastic containers or rigid items identified by the recycling symbol with any other number but #1 and #2.
6		Bags and Film	All film plastic including trash bags, grocery bags, shrink wrap, plastic sheeting, etc. Also includes flexible packaging such as chip bags and food pouches.
7	Glass	Glass and Ceramics	Glass bottles or containers, window and sheet glass, ceramic toilets, and other glass or ceramic items
8	Metals	Ferrous Metals	Any ferrous containers or other items including cans used to store soup, beans, or other non-perishable items. Composite materials that are a majority ferrous metals will be placed in this category.
9		Non-Ferrous Metals	Aluminum cans and utensils and other non-ferrous materials and fixtures that are mostly non-ferrous
10	Organics	Yard Waste	Grass, branches and brush items, other landscaping items
11		Other Organics	Food or other items not considered yard waste
12	Other	C&D Materials	Any construction and demolition materials such as dimensional lumber, composite building components, roofing, drywall (gypsum), vinyl siding, non-metallic plumbing, etc.
13		Textiles, Leather and Rubber	Clothing and towels, canvas paint covers, leather or Rubber items including shoes and belts
14		Dirt and other Fines	Materials less than approximately 2" square in size mostly consisting of the debris that is left on the sorting tables after all other material that can reasonably be separated has been sorted.
15		Other Bulky or Composite Items	Other unidentifiable or special waste including illegal substances, composite items, or any other items that don't fit into the described categories. Large bulky items that would be difficult to process or are a combination of materials that would be difficult to separate in normal processing

Appendix B - Waste Sort Results Subdivided by Type of Hauler

			# of Samples														
D = Private Direct Haul	6	D															
P = Private Collection Hauler	27	P															
C = Commercial Hauler (Joeten)	8	C															
T = Transfer Station	9	T															
	50																
	Cumulative Sample Number	Source	Old Corrugated Cardboard (OCC)	Other Fiber Materials	PET (#1)	HDPE (#2)	Mixed Plastic	Bags and Film	Glass and Ceramics	Ferrous Metals	Non-Ferrous Metals	Yard Waste	Other Organics	C&D	Textiles, Leather and Rubber	Dirt and other Fines	Other Bulky or Composite Items
C = Commercial Hauler (Joeten)	10	C	13.8	9.8	4.3	0.1	1.8	3.4	1.9	2.6	1.5	0.2	7.1	0.0	5.3	4.0	0.0
	15	C	34.0	11.7	1.3	0.5	0.5	7.5	1.8	0.7	2.3	0.0	4.7	0.0	0.0	2.4	0.0
	23	C	23.4	3.3	0.4	1.2	2.0	2.5	0.3	2.3	0.9	0.0	4.0	6.3	4.6	6.6	14.0
	24	C	30.0	15.8	3.6	3.0	3.4	9.6	16.6	2.4	4.2	0.0	16.5	0.0	0.7	13.3	0.5
	33	C	28.7	0.0	0.0	0.0	0.4	1.1	0.0	0.0	0.0	0.0	9.7	3.5	1.8	0.0	0.0
	40	C	53.9	6.8	0.4	0.7	3.3	5.4	1.1	0.7	0.8	0.4	5.0	6.6	5.5	1.5	0.0
	42	C	17.4	63.3	0.2	3.0	0.4	4.1	1.4	2.3	1.9	0.0	5.1	0.0	0.9	1.6	0.4
	44	C	39.0	2.9	0.1	0.0	0.5	2.3	0.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
		Total	240.0	113.4	10.2	8.5	12.1	35.8	23.2	10.9	11.5	1.0	51.9	16.3	18.8	29.2	14.9
		Mean	30.0	14.2	1.3	1.1	1.5	4.5	2.9	1.4	1.4	0.1	6.5	2.0	2.3	3.6	1.9
		%	40%	19%	2%	1%	2%	6%	4%	2%	2%	0%	9%	3%	3%	5%	2%
D = Private Direct Haul	3	D	10.5	12.9	7.6	0.3	12.1	6.8	8.8	0.7	12.7	5.5	5.7	0.1	1.5	10.7	11.1
	29	D	0.0	0.0	0.9	0.9	13.5	18.2	2.6	2.0	0.7	0.5	0.2	0.4	22.7	4.7	27.5
	30	D	4.0	55.3	0.2	0.2	0.5	3.1	2.9	1.1	0.4	0.1	5.8	0.0	0.0	0.0	14.9
	32	D	7.7	45.1	13.1	2.2	4.0	9.4	4.0	2.3	0.8	4.1	16.0	0.2	13.1	5.7	1.4
	39	D	2.8	12.5	6.4	3.2	8.2	5.5	12.9	2.1	9.0	0.0	14.9	0.0	2.3	1.3	10.7
	41	D	2.7	12.7	4.8	0.2	4.7	7.2	5.7	1.7	6.7	3.3	13.9	3.4	0.0	3.2	7.7
			Total	27.6	138.4	32.9	6.9	42.9	50.2	36.8	9.7	30.1	13.4	56.4	4.0	39.5	25.6
		Mean	4.6	23.1	5.5	1.1	7.1	8.4	6.1	1.6	5.0	2.2	9.4	0.7	6.6	4.3	12.2
		%	5%	24%	6%	1%	7%	9%	6%	2%	5%	2%	10%	1%	7%	4%	12%

Appendix B - Waste Sort Results Subdivided by Type of Hauler

P = Private Collection Hauler	1	P	1.1	15.7	3.7	0.7	3.2	6.0	4.5	0.6	2.1	0.0	17.6	0.0	8.9	10.5	2.5	
	4	P	6.4	19.4	2.0	1.1	5.5	6.8	2.5	2.8	1.5	11.1	25.3	0.0	2.6	1.8	17.2	
	5	P	42.6	13.7	0.7	0.5	2.3	7.6	6.6	3.7	0.5	0.4	6.7	23.9	1.2	2.3	2.0	
	7	P	8.9	24.4	5.5	0.7	5.3	9.8	6.7	2.9	2.4	1.6	8.8	0.4	7.1	11.4	2.1	
	8	P	10.6	24.6	6.1	1.6	4.0	13.6	6.1	5.7	3.0	5.5	5.9	0.5	3.4	3.4	12.5	
	9	P	7.5	14.1	1.4	1.6	2.9	13.1	3.4	11.0	6.1	0.5	5.0	1.0	38.3	17.9	11.5	
	11	P	22.9	20.8	0.6	2.9	2.1	9.3	3.5	3.6	1.4	0.0	6.4	0.3	4.0	4.8	34.8	
	12	P	7.3	16.9	8.0	1.5	0.8	10.8	11.8	2.3	7.8	0.0	1.7	0.0	1.1	15.5	0.2	
	14	P	17.1	10.9	3.2	0.9	4.6	11.0	13.2	2.3	0.9	7.2	17.7	1.1	5.3	23.7	11.8	
	16	P	9.5	21.7	1.7	1.9	6.3	4.3	0.0	1.4	0.7	0.2	11.5	2.0	1.4	4.4	10.7	
	17	P	12.2	29.5	5.0	0.8	4.0	9.4	1.3	2.0	1.8	0.0	40.7	0.0	1.1	11.9	0.5	
	18	P	6.3	14.7	2.8	2.1	3.7	12.3	9.1	4.5	6.5	0.5	25.9	0.5	8.8	10.7	5.0	
	19	P	12.5	35.2	7.1	1.2	4.7	11.4	1.4	3.4	4.9	0.0	14.5	0.0	1.3	13.1	7.8	
	22	P	54.3	6.6	5.2	1.4	1.6	7.3	2.4	1.9	0.0	0.8	12.4	0.9	3.0	10.8	2.0	
	25	P	32.7	16.9	3.5	1.4	4.1	12.1	7.4	3.6	1.2	0.2	18.5	0.0	2.9	23.6	21.5	
	27	P	11.6	16.2	3.8	0.8	3.1	12.6	1.8	4.7	2.4	0.9	20.5	0.9	4.8	15.9	31.4	
	28	P	26.0	10.6	3.2	1.4	2.8	10.4	3.7	5.5	1.7	0.5	13.0	0.3	13.4	15.4	9.8	
	31	P	34.3	17.1	5.0	1.6	2.0	6.5	4.8	3.2	2.1	0.0	20.5	0.7	1.0	6.9	6.7	
	34	P	37.1	9.0	3.0	1.2	1.8	11.4	3.8	4.2	1.4	0.3	27.8	0.5	3.2	32.9	8.0	
	36	P	9.5	42.6	3.2	0.7	2.0	11.6	13.8	2.9	2.1	10.1	26.7	0.9	4.4	2.0	5.3	
	37	P	24.8	23.1	2.0	0.2	2.2	5.9	4.0	3.9	2.0	5.0	20.0	0.0	4.5	0.2	5.7	
	38	P	39.0	18.4	3.9	1.8	5.0	10.7	11.8	4.2	2.7	0.0	17.2	0.7	0.9	2.3	5.6	
	45	P	36.8	14.1	3.2	0.6	15.0	9.0	3.8	3.9	3.1	0.0	14.1	0.9	1.2	9.0	0.0	
	46	P	14.2	59.0	4.4	3.5	3.7	12.7	3.7	2.1	1.2	0.0	27.7	1.5	11.5	3.4	1.6	
	47	P	28.8	17.7	2.4	0.9	3.4	10.8	7.3	6.5	4.2	0.7	19.9	3.5	4.3	9.0	3.8	
	48	P	22.2	18.7	2.1	1.9	4.4	11.0	5.8	8.1	1.3	0.4	34.3	0.7	2.1	3.8	0.5	
	50	P	23.2	9.5	1.9	0.6	2.3	11.2	10.0	4.7	2.4	0.0	50.9	5.0	1.6	2.8	0.1	
			Total	558.6	540.5	93.6	34.8	102.1	268.0	153.4	104.8	66.8	45.7	510.5	45.8	142.6	268.9	220.1
			Mean	20.7	20.0	3.5	1.3	3.8	9.9	5.7	3.9	2.5	1.7	18.9	1.7	5.3	10.0	8.2
			%	18%	17%	3%	1%	3%	8%	5%	3%	2%	1%	16%	1%	5%	9%	7%
T = Transfer Station	2	T	6.6	8.2	9.4	0.2	8.7	8.6	6.3	4.3	7.6	0.5	1.4	7.2	4.2	14.3	23.4	
	6	T	12.1	12.2	2.5	1.8	2.9	12.0	7.7	5.9	1.0	0.0	21.0	0.0	2.7	4.1	4.4	
	13	T	18.8	12.6	4.1	3.3	2.2	5.8	2.0	10.1	2.1	2.7	16.9	1.3	16.7	7.2	43.0	
	20	T	6.7	12.6	4.2	1.5	3.6	9.6	1.8	3.5	2.0	0.1	8.8	1.9	2.7	7.1	24.6	
	21	T	6.3	6.6	2.1	0.8	2.7	5.8	3.5	2.7	1.9	0.9	3.3	55.8	14.3	3.8	14.4	
	26	T	4.4	9.0	3.5	1.9	1.8	11.9	12.7	3.1	2.9	0.1	6.3	9.8	4.0	12.2	13.7	
	35	T	4.6	18.3	2.2	1.6	1.5	9.0	2.1	4.4	3.7	0.8	11.9	0.0	5.8	9.5	38.3	
	43	T	31.1	18.9	1.2	1.2	3.2	8.8	6.9	2.9	2.1	1.1	15.2	3.9	11.3	12.9	20.9	
	49	T	4.7	23.7	4.9	0.0	3.0	16.4	6.5	4.1	3.3	0.5	29.7	7.5	3.6	13.8	17.5	
			Total	95.1	122.0	33.8	12.2	29.5	87.7	49.5	40.7	26.4	6.6	114.4	87.3	65.1	84.7	200.0
		Mean	10.6	13.6	3.8	1.4	3.3	9.7	5.5	4.5	2.9	0.7	12.7	9.7	7.2	9.4	22.2	
		%	9%	12%	3%	1%	3%	8%	5%	4%	3%	1%	11%	8%	6%	8%	19%	