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PATTLE DELAMORE PARTNERS LTD

Assessment of Status and Options for Solid Waste Management on Majuro Atoll

Secretariat of the Pacific Regional Environment Programme

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Prepared for

Secretariat of the Pacific Regional Environment Programme

June 2015

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Executive Summary

Preamble

1. Pattle Delamore Partners Ltd (PDP) has been engaged by the Secretariat of the Pacific Regional Environment Programme (SPREP) to undertake an assessment of the status and options for solid waste management (SWM) on Majuro Atoll. This work is being done under the Atoll Waste Management Component of the Pacific Hazardous Waste Management Programme (PacWaste) which aims to demonstrate the establishment of an integrated sustainable SWM system in the Republic of the Marshall Islands (RMI) which improves and expands on existing 4R practices (Refuse, Reduce, Reuse, Recycle), improves existing waste collection and disposal practices, and which is founded on user-pays and polluter-pays principles. The field work for this consultancy was completed in June-July 2014.

2. Since 2007 SWM on Majuro has been the responsibility of the Majuro Atoll Waste Company (MAWC). MAWC currently provide a free weekly collection service to households from Rita to the airport (approximately 3,000 households) with households from the airport to Laura currently managing solid waste through burial, burning or self-transport to the current landfill at Jable. Approximately two thirds of the households between Rita and the airport have large wheelie bins provided by the Government of Japan in 2010 and 2012. MAWC provide a commercial waste collection service (daily to biweekly depending on each customer's needs) for 99 commercial establishments, collecting approximately 15% of commercial waste and generating approximately $70,000[1] in revenue. The vast majority of commercial waste (the other 85%) is self-transported to the landfill by the respective establishments and disposed of for free (no gate fee at the landfill). Some separation of wastes (organic/compostable, aluminium cans and other metals) occurs at the landfill but current recycling rates are low.

3. There is an urgent need to address the landfill situation on Majuro. The current landfill at Jable was full approximately 5 years ago and waste is now piled up into a large mound. There is a risk of failure of the sea wall and consequent discharge of landfilled waste into the ocean, as occurred in 2006/2007. The proposed new landfill site on the ocean-side reef at Jenrok is understood to have land owner and Cabinet approval. However, necessary preliminary design, environmental impact assessment (EIA) and detailed design steps are yet to be completed, and there are reservations about the suitability of the site for a landfill and the cost (financial and environmental) of building a seawall engineered to withstand the potential high impact waves at that location. Further discussion of the landfill issue, including recommendations, is included in the recommendations section below,

[1] US$ used throughout the report.

although it should be noted that the landfill was not part of the Terms of Reference (TOR).

4. The current SWM system on Majuro is illustrated in Diagram 1. Recommendations for an improved SWM system are illustrated in Diagram 2. The sections below present a summary of the information under the scope of work tasks detailed in the TOR, followed by recommendations for implementation.

Summary of Findings

5. MAWC has sole responsibility for SWM on Majuro (apart from minor litter collection by the Marshall Islands Visitor Authority (MIVA) and Majuro Atoll Local Government (MALGov) at selected public spaces) and hence MAWC is the only organisation with a budget for SWM. Other government agencies have responsibilities as lead or implementing agencies under the draft National Waste Management Strategy 2012-2016 and Action Plan (NWMS) but no allocated budget for carrying out those activities.

   MAWC had operating expenses of $845,800 in 2013. Revenue from sustainable sources (commercial waste collection and recycling activities) was $118,700 and revenue from the Compact of Free Association with the United States (Compact) operation funding was $352,800. Capital grants from the Republic of Marshall Islands (RMI) government and the Government of Japan totalled $557,900 and $114,700 respectively.

   Approximately 50% of MAWC operating expenses in 2013 were for payroll (for approximately 46 staff), followed by 25% for depreciation on equipment, 10% for fuel and lubricants, and 4% for repairs and maintenance. The balance (approximately 10%) covered recycling expenses and various administration expenses.

   The total cost per tonne for the waste collection activities undertaken by MAWC in 2013 is estimated to be $130 per tonne, assuming approximately three quarters of MAWC expenses are used for collection-related activities (the other quarter being used for landfill operation). The MAWC household waste collection is estimated to cost $100 per tonne (approximately 50% of MAWC expenses) compared to over $250 per tonne for the commercial collection (approximately 25% of MAWC expenses).

   MAWC budgets for 2014 and 2015 total $1.26 million and $1.30 million respectively, with the increase from the 2013 expenses due to pending costs associated with the development of a new landfill. Compact infrastructure funding (approximately $1.4 million from 2011-2014) is available for landfill development works subject to receipt and approval of detailed spending plans.

Current MAWC recycling activities are limited to the baling of aluminium cans (Al cans) and small scale composting, although some separation of metals and organic waste also occurs at the landfill.

6. Current and planned SWM activities by active donors on Majuro are limited to the following:
   a. Compact (funding only) – operations ($325,000 per year) and capital ($600,000 per year) subject to ongoing approval by the RMI government (until the Compact funding agreement expires in 2023).
   b. SPREP (funding and technical assistance) – $800,000 over 4 years under the PacWaste project.
   c. Government of Japan (funding and technical assistance) – mainly technical assistance under the Japan International Cooperation Agency (JICA) J-PRISM project and the Japan Overseas Cooperation Volunteers (JOCV) programme for development of the NWMS and increasing recycling activities. Some funding for equipment may also be available.
   d. Other donors previously active on SWM on Majuro, such as the Asian Development Bank (ADB), are no longer active in SWM.
   e. A Memorandum of Understanding (MoU) has been signed between the RMI and South Korea for the establishment of a Waste Gasification Plant on Majuro. Details on this proposal are very limited.

7. Surveys of community awareness levels and preferences for waste services, and the public's ability and willingness to pay for waste management services on Majuro were completed (155 households and 25 establishments).
   a. Community awareness levels are relatively high with almost everyone knowing where the current landfill is and a reasonable appreciation of the types of materials that can be recycled.
   b. Households between Rita and the airport are generally satisfied with the current weekly collection service and there is a general preference for ongoing use of the wheelie bin (those currently without a wheelie bin want one). Households between the airport and Laura want to have the same weekly waste collection service using wheelie bins. Commercial establishments using the MAWC collection service are generally satisfied with the current system and there is a waiting list of approximately 30 establishments (more dumpster bins are needed). Some establishments prefer to self-transport to the landfill on a daily basis for hygiene reasons (larger supermarkets).
   c. The ability of a significant proportion of households to pay for waste services is extremely limited with a median household income of $9,600 and many workers earning little more than the minimum wage of $2.00/hr. The situation is unlikely to improve with increasing food costs and inflation eroding the value of static wages. Establishments have the ability to pay for waste services given the costs associated with the

existing MAWC collection and the costs incurred through self-transport of waste to the landfill.

d. The household survey data indicates that there is a general willingness to pay for waste collection with approximately 70% of respondents willing to pay up to $1/week for the current system. Willingness to pay $0.50/prepaid bag for waste collection is slightly lower (65%). There is a significant drop off in willingness to pay more than the amounts above. There are some reliability issues with the survey data and further work is recommended in this area prior to and during implementation of any user pays charges. Other factors, such as the influence of the RMI Government (Cabinet) and other decision makers, will also need to be considered.
e. Establishments are generally willing to pay for waste collection provided that costs are reasonable. A proposal for landfill gate fees of $5 to $8 per vehicle (commercial waste only) is currently with Cabinet for approval and will provide valuable information on establishment willingness to pay should it be implemented.

8. An assessment of the quantity, type and condition of waste storage, collection and transportation equipment was completed as summarised below:
   a. There are currently over 2,000 plastic wheelie bins (1 each for approximately two thirds of households between Rita and the airport). The wheelie bins are generally in good condition but some broken bins were observed. The wheelie bins are large (95gal or 360L) which enables the collection of large quantities of waste but can discourage the separation of recyclables and diversion of organic waste.
   b. There are currently approximately 80 plastic dumpsters (most $2yd^3$, some 4 and $6yd^3$) distributed amongst the 99 current commercial customers. These dumpsters are in variable condition and a significant number will reach the end of their service life soon.
   c. There are two large rear load compactor trucks (one near new and one older) currently being used for the residential collection service. There are two other rear load compactor trucks (one small and one large) currently out of action pending minor repairs.
   d. There is one large front load compactor truck for dumpsters which is very under-utilised.
   e. There is one old flat deck truck for bulky waste and multi-use.

9. A time and motion study was completed for one of the rear load compactor trucks and the front load compactor truck to supplement existing time and motion study raw data supplied by JICA/JOCV for two of the rear load compactor trucks. The JICA/JOCV data was processed by PDP prior to the collection of the new time and motion study data.

a. The current rear loader collection system is reasonably efficient with an average lift time of around 40 seconds per wheelie bin and the trucks returning to the landfill between half and three quarters full on most trips. The average trip time was approximately 3 hours and the average weight per load was estimated to be approximately 5 tonne.
b. There is some opportunity for increased efficiency through longer trips and heavier loads, but considerable risk of decreased efficiency if waste is not contained in easily loaded containers (such as might occur if wheelie bins are not replaced at the end of their life and an alternative system, such as a prepaid bag system, has not been successfully implemented).
c. The current front loader collection system is inefficient with long dumpster loading times (mainly due to difficult access to some dumpsters) and low utilisation (truck only quarter full on return to the landfill). There is significant operational risk with only a single front loader truck.
d. There is opportunity to expand the MAWC commercial waste collection service (and revenue) considerably but 100-200 more dumpsters are needed for this to occur. Other options to evaluate are switching to rear load dumpsters, prioritising dumpsters for high volume waste generators and switching lower waste generators to wheelie bins.

10. A prepaid garbage bag waste collection system has been designed and costed. Prepaid bags can be supplied for $0.15 each (landed cost at Majuro Port) and a mark-up of $0.10 per bag has been allowed for the distributor and retailers. The collection cost per bag is estimated to be between $0.33 and $0.53 per bag based on 2013 MAWC expenses (this equates to a collection cost of approximately $50 - $75 per tonne). Hence the cost of the prepaid bag system, and the target purchase price for prepaid bags on Majuro, is estimated to be between $0.60 and $0.80 per bag.

    The data above is based on a prepaid bag usage rate of 1 per household per week (50L or 7kg of waste with separation of recyclables and diversion of organic waste). A higher prepaid bag usage rate would result in a lower collection cost per tonne and hence a lower break even cost for the prepaid bags. Based on a usage rate of 2 prepaid bags per household per week, a collection cost of $30 per tonne could be achieved and a prepaid bag cost of $0.50 per bag would be enough for cost recovery.

    Costs associated with setting up the prepaid bag system (consultation, public awareness and a subsidised trial period of up to 12 months) and managing the waste on disposal at the landfill have not been included in the cost per bag given above. A prepaid bag system could be implemented in conjunction with the existing household collection system to avoid duplicating/increasing collection costs.

11. A costed design of a container deposit programme (CDP) has been completed for aluminium cans, PET bottles, glass bottles and used lead acid batteries (uLABs). Costed designs for recycling other materials (ferrous scrap) have also been completed. Similar CDPs are operating in Kiribati, Palau and the Federated States of Micronesia (Yap and Kosrae).

    The CDP has been designed on the basis of a $0.05 deposit being imposed on each aluminium can, PET bottle and glass beverage bottle imported, a refund of $0.03 per container for the person returning the empty container to the Materials Recovery Facility (MRF), and the remaining $0.02 per container going to the operator of the MRF (for baling and export of the returned Al cans and PET bottles, crushing glass bottles, and packing and export of uLABs). The refund of $0.03 per container may be sufficient to provide enough incentive for a reasonable return rate (>80%) to be realised. Final deposit and refund amounts can be determined through consultation and monitoring prior to and during a Pilot Trial. A minimum of $0.02 per container is recommended to support the MRF operations and possibly to support additional recycling and waste diversion activities (such as upscaling organic waste collection and composting activities). The CDP should also include uLABs with the deposit set at $5, refund at $3 and the remaining $2 per battery used to support storage and export activities undertaken in compliance with the Basel Convention.

    In mid-2014 there was enough value in ferrous scrap (~$200/t) to cover shipping costs (~$100/t) (subject to efficient processing of ferrous scrap (baled or hand loaded) to achieve 20t per 20ft container (TEU)). However, the value of ferrous scrap (and many other recyclables) is volatile and in May 2015 ferrous scrap was worth ~$75/t. Other types of plastic and other recyclables (such as cardboard) have not been considered but could be included in the future.

12. Approximately 370 end-of-life (EOL) vehicles were observed around Majuro. The locations of these EOL vehicles were recorded. The total number of EOL vehicles currently on Majuro is estimated to be at least 500. This excludes EOL heavy machinery and the large stockpiles of scrap steel (including EOL vehicles) at the Jable landfill. Approximately 300 to 500 new and used vehicles are imported each year so a similar number of 'new' EOL vehicles per year is expected. There are currently no recycling activities for EOL vehicles although until recently they have been collected and stockpiled by MAWC at the landfill.

13. The quantity, type and condition of existing recycling and waste disposal equipment has been assessed. There is currently no landfill compaction being undertaken.

a. The Caterpillar landfill compactor is currently not working. A quote for $20,000 for spare parts for repair of the compactor was supplied by MAWC (from Caterpillar dealer in Guam).
b. The newer Hitachi excavator (ZX350) is in good condition and is used daily to manage the waste at the landfill. Regular maintenance is carried out in accordance with the manufacturer's recommendations (based on operating hours).
c. The older Hyundai excavator is currently out of order pending the repair of one of the caterpillar tracks (new spring required). The engine and hydraulics are reportedly in good condition.
d. The large front end loader is not being used at present but is reportedly in working condition. It does however need a new battery and starter assembly.
e. The small front end loader is currently out of order and requires work on the cylinder head gasket.
f. The aluminium can baler (Taylor RD10) is operational and in use. The original petrol engine has reportedly been replaced with a diesel engine. The unit is understood to achieve container weights of less than 8t per TEU.
g. The wood chipper (Bandit Industries SPIII) is understood to be operational but it was not in use in June/July 2014.
h. The tyre cutter has not been used for more than 2 years and is considered to be at the end of its useful life.

Recommendations

The following recommendations are made to improve the SWM on Majuro:

14. Landfills (not part of the TOR but of critical importance)
    a. Priority should be given to addressing the landfill issue on Majuro. There is existing funding available under the Compact ($1.4 million from 2011 to 2014, and further Compact infrastructure funding available 2015 onwards). Technical assistance is recommended to prepare detailed spending plans and other documentation required to access these funds. A request for proposal for an Environmental Impact Assessment (EIA) and preliminary design for the proposed Jenrok landfill closed in August/September 2014 and it is understood that $500,000 of Compact infrastructure funding has been approved for release to support this work.
    b. Other potential landfill sites, including on the lagoon-side of the atoll, should be investigated. The cost of the proposed landfill at Jenrok was estimated to be $4.25 million in 2003 (Beca, 2003). The inlet immediately opposite the current landfill should be investigated as a possible landfill site.
    c. The current landfill should be closed and secured as soon as possible on opening of a new landfill.
    d. Space should be made available at the current and any new landfill for a MRF to allow for composting, recycling and other waste diversion activities (otherwise land rental costs of more than $3,000 per acre per year will be incurred).
    e. The proposed gate fee at the landfill for commercial waste should be implemented at the earliest opportunity (potential to generate revenue of $100,000+ per year).
    f. The landfill compactor should be repaired and used on a daily basis to compact the existing and incoming waste at the landfill.
    g. Repair of the two front end loaders and the Hyundai excavator should be costed and the repairs completed if financially viable. One front end loader should be used to manage an expanded composting operation. The other front end loader and the excavator could be leased out or used during the construction of a new landfill.

15. Collection
    a. The household collection system between Rita and the airport is currently working well and should be continued, although collection costs per tonne ($100/t) are relatively high. Two large rear loader trucks have sufficient capacity to service the entire atoll (Rita to Laura).
    b. A prepaid bag system could be phased in using the existing subsidised household collection service. Ideally an MRF should be set up prior to implementing the prepaid bag system and options for recycling and

diversion of organic waste offered. A long lead in time is recommended for the necessary consultation, Cabinet approval and phase in period (free bags for 1 month, subsidised bags for 6 months and then gradual price increases to breakeven point ($0.50 to $0.80 per bag)). The commencement of the prepaid bag system could coincide with expansion of the waste collection service from the airport to Laura. The prepaid bag system should be part of an integrated waste collection and management system so that households have disposal/recycling options for organic waste and recyclables.

c. It is understood that JICA/JOCV plan to consolidate wheelie bin collection points (one location per community/weto) to reduce collection time. Further analysis is needed to estimate the potential costs savings. There is spare collection capacity under the existing system with two large trucks operating, even with expansion of the collection system to include households from the airport to Laura.
d. Repair of the existing rear loader collection vehicles currently out of order (International and Sterling) should be costed and the repairs completed if financially viable.
e. All vehicles and equipment should be used on a regular basis so that they remain operational (disused equipment quickly becomes obsolete).
f. The existing commercial waste collection system is very high risk given that there is only one front loader truck capable of emptying the commercial front loader dumpsters. A second front loader truck would reduce the risk of failure of the collection system, but the existing front loader is only running at approximately 25% utilisation. There are several options to consider:
    i. Purchase 100-200 more front loader dumpsters and a second front loader truck (can be older, cheaper and smaller than the existing front loader truck), and expand the commercial waste collection service (currently only 15% coverage).
    ii. Use wheelie bins and rear load trucks to service smaller commercial waste producers.
    iii. Purchase 100-200 rear loader dumpsters and use the existing rear load trucks for collection of commercial waste (some rear loader trucks may need additional lifting equipment for dumpsters). Under this scenario the existing front loader truck and front loader dumpsters would eventually be phased out.
g. Further evaluation and costing of wheelie bins versus garbage bags should be completed prior to any purchase of additional wheelie bins (1 wheelie bin at $85 (CIF) = 570 prepaid bags at supply cost of $0.15/bag, (ie nearly 11 years of prepaid bags at a usage rate of 1 bag per week, with the cost spread over 11 years)).

16. Recycling
    a. Build or establish an MRF to accommodate recycling activities. The ideal location in the interim is on the existing landfill but there is currently not enough space due to stockpiles of waste, organic material and ferrous scrap.
    b. The existing stockpiles of ferrous scrap at the landfill could be baled and exported for recycling. A large baler is needed to enable this to occur, unless the scrap can be cut and manually loaded into shipping containers. Baling equipment could be purchased or leased. It is understood that a ferrous baler has been donated by the Government of Japan and is due to arrive on Majuro in March 2015. The current value of ferrous scrap is low (~$75/t) as noted above.
    c. A deposit of $100 per vehicle (paid on import) could provide an incentive for the recycling of EOL vehicles (say $50 refund on delivery to the EOL vehicle facility and $50 to support recycling). Recycling will likely include stripping of valuable spare parts and non-ferrous metals, removal of engine and transmission, and further dismantling prior to baling or hand loading into shipping containers.
    d. Organic waste (garden, green, food, paper/cardboard) separation and composting should be a high priority (~50% of the current waste stream) to minimise waste to landfill. This will require a significant amount of space given the volume of organic waste (12t/day), and an organic waste collection service. Once the new landfill is operational some of the landfill space could be used temporarily for the storage and composting of organic waste.
    e. A CDP should be set up in the MRF to allow for the recycling of aluminium cans (baled and exported), PET bottles (baled and exported), glass bottles (crushed and used as sand replacement or as landfill cover) and uLABs (packed and exported). Funding for baling and crushing equipment, and for providing a refund for returned containers, is required prior to implementing a pilot CDP trial.
    f. A system for the collection, storage, packaging and export for recycling of uLABs should be set up. Funding is required for the collection of uLABs (either by MAWC or for refund for uLABs delivered to the MRF) and for technical assistance to set up the system and ensure that Basel Convention regulations are complied with (some training on the collection, handling, storage and export of uLABs is currently being organised by SPREP for the RMI and three other Pacific countries).
    g. Collection systems should be planned to ensure high recycling rates are achieved (ie need to make it easy), via separate recyclables collection if possible, or centralised recycling drop off points. Ongoing donor funding may be needed to subsidise recycling activities unless the CDP is set up to provide adequate funding (ie minimum of $0.02 per container for recycling activities).

17. There is an ongoing need for technical assistance over the next few years as the changes to SWM on Majuro are implemented (close/open landfills, establish MRF, implement CDP and prepaid bag).

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DIAGRAM 1: EXISTING SWM ON MAJURO JUNE/JULY 2014

WASTE GENERATION	
Total 2013	23.6 t/day
(JICA/JOCV)	1.1 t/person/day
Total 2010	20.3 t/day
(JICA/JOCV)	0.9 t/person/day
Highest rate of waste generation in Pacific Islands	
Rita to Airport only, does not include Airport to Laura	

WASTE COLLECTION		
MAWC	14.1 t/day	Household (Mon-Fri)
	2.5 t/day	Commercial (Mon-Fri)
		Green waste (Sat)
SELF-TRANSPORT	13.7 t/day	Commercial (Mon-Sat)

WASTE SORTING	
TOTAL	27.5 t/day (Mon-Sat)
COLLECTION	Monday-Saturday

WASTE DISPOSAL	
TOTAL	27.5 t/day (Mon-Sat)
COLLECTION	Monday-Saturday

HOUSEHOLDS		
WASTE GENERATION (JICA/JOCV 2013)		10.1 t/day
WASTE COMPOSITION (JICA/JOCV 2013)	COMPOSTABLE	50% Organic, kitchen, paper
	RECYCLABLE	25% Metals, plastics, glass
	LANDFILL	25% Other
Waste generation and composition based on Rita-Airport area		
RITA TO AIRPORT		3000 households
		22,000 population
SURVEY RESULTS		
AWARENESS	High awareness for waste and recycling	
PREFERENCES	Wheelie bins and regular collection	
ABILITY TO PAY	Low - incomes generally <$10k/HH/yr	
WILLINGNESS TO PAY	Medium but further research recommended	
AIRPORT TO LAURA		1000 households
		5,000 population
SURVEY RESULTS		
AWARENESS	Medium - less than Rita-Airport	
PREFERENCES	Wheelie bins and collection service	
ABILITY TO PAY	Low	
WILLINGNESS TO PAY	Medium	

ESTABLISHMENTS		
WASTE GENERATION (JICA/JOCV 2013)		13.5 t/day
WASTE COMPOSITION (JICA/JOCV 2013)	COMPOSTABLE	50% Organic, kitchen, paper
	RECYCLABLE	25% Metals, plastics, glass
	LANDFILL	25% Other
SURVEY RESULTS		
AWARENESS	High awareness for waste and recycling	
PREFERENCES	Some collection, some self-transport	
ABILITY TO PAY	Medium	
WILLINGNESS TO PAY	Medium	

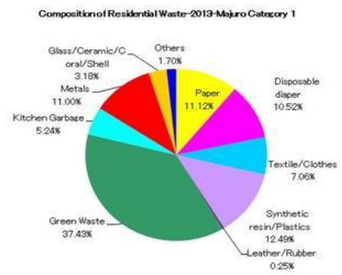
FREE WEEKLY COLLECTION SERVICE BY MAWC (BASED ON 2013 ACCOUNTS)			
FINANCIAL	REVENUE	$ -	/year
	EXPENSES	$ 370,000.00	/year
Good service but not financially sustainable (collection cost $100/t)			
TIME & MOTION	TRUCKS	2	REAR LOADER
	CREW	3 OR 4	
	EFFICIENCY	Medium	
Medium to high efficiency - some increase possible			

NO COLLECTION SERVICE			
FINANCIAL	REVENUE	$ -	/year
	EXPENSES	$ -	/year (landfill opex)
No collection service - bury, burn, self-transport			
TIME & MOTION			
Not applicable			

PAID COLLECTION SERVICE BY MAWC (1.8t/day or 15% of total)			
FINANCIAL	REVENUE	$ 70,000.00	/year
	EXPENSES	$ 190,000.00	/year
Good service but not financially sustainable (collection cost $280/t)			
TIME & MOTION	TRUCKS	2	Front loader & long bed
	CREW	2 and 4	
	EFFICIENCY	Low	
Low efficiency			

SELF-TRANSPORT TO LANDFILL (11.7t/day or 85% of total)			
FINANCIAL	REVENUE	$ -	/year
	EXPENSES	$ -	/year
Some want collection service but MAWC cannot provide (not enough bins)			
Some prefer to self-transport to retain control due to unrealiable service			

WASTE SORTING AND PROCESSING		
FINANCIAL		
EXPENSES	$ 100,000.00	/year



COMPOST	BAG	SELL
RECYCLE	COMPACT	EXPORT
RECYCLE	STOCKPILE	

LANDFILL (minimal diversion from landfill at present)		
FINANCIAL		
EXPENSES	$ 185,000.00	/year

DIAGRAM 2: PROPOSED SWM ON MAJURO 2015 ONWARDS

WASTE GENERATION (PDP, 2014)		
TOTAL	27	t/day (7 days per week)
PER CAPITA	1.0	t/person/day
WASTE COMPOSITION (JICA/JOCV, 2013)		
COMPOSTABLE	50%	Organic, kitchen, paper
RECYCLABLE	25%	Metals, plastics, glass
LANDFILL	25%	Other

WASTE COLLECTION			
Total 2013	37.8	t/day (5 days per week)	
MAWC	6.3	t/day (prepaid bag)	Household (Mon-Fri)
	10.0	t/day	Commercial (Mon-Fri)
	12.6	t/day	Organic waste
SELF-TRANSPORT	8.9	t/day	Commercial (Mon-Fri)

MATERIALS RECOVERY FACILITY		
TOTAL	27.5	t/day (6 days per week)
COLLECTION	Monday-Saturday	

WASTE DISPOSAL		
TOTAL	27.5	t/day (6 days per week)
COLLECTION	Monday-Saturday	

HOUSEHOLDS (RITA TO LAURA)			
WASTE GENERATION (PDP, 2014)	LANDFILL	3.4	t/day
TOTAL = 13.5 t/day	COMPOSTABLES	6.8	t/day

USER PAYS PREPAID BAG WEEKLY COLLECTION SERVICE BY MAWC			
FINANCIAL	REVENUE	$ 140,000.00	/year
	EXPENSES	$ 140,000.00	/year

Financially sustainable system using prepaid bag (for landfill waste only) based on one large rear loader truck, one driver and three crew (mid-range costed design).

FREE ORGANIC WASTE BIWEEKLY COLLECTION SERVICE BY MAWC			
FINANCIAL	REVENUE	$ -	/year
	EXPENSES	$ 50,000.00	/year

Biweekly collection using existing and new wheelie bins based on one large rear loader truck, one driver and two crew.

ESTABLISHMENTS			
WASTE GENERATION (JICA/JOCV, 2013)	LANDFILL	3.4	t/day
TOTAL = 13.5 t/day	COMPOSTABLE	6.8	t/day

PAID COMMERCIAL COLLECTION SERVICE BY MAWC (10t/day)			
FINANCIAL	REVENUE	$ 260,000.00	/year
	EXPENSES	$ 250,000.00	/year

Target of MAWC collecting all commercial waste using 2 front loader trucks (1 in use, 1 back up). A separate recyclables and organic waste (including paper and cardboard) collection could be considered to maximise diversion from the landfill if economics allow. Dumpsters leased out on a cost recovery basis ($200,000 capital cost for 200 new dumpsters).

HOUSEHOLDS AND ESTABLISHMENTS			
WASTE GENERATION (PDP, 2014)	RECYCLABLE	6.75	t/day
TOTAL = 13.5 t/day			

CONTAINER DEPOSIT PROGRAMME FOR RECYCLABLES			
FINANCIAL	REVENUE	$ 615,000.00	/year
	EXPENSES	$ 490,000.00	/year

Container Deposit on import of $0.05/container and $5.00/uLAB. Refund on return of containers (Al cans, PET bottles and glass bottles (all $0.03/container), and uLABs ($3.00 each).

CARDBOARD	SHRED	USE AS ABSORBANT PACKING MATERIAL FOR uLABs
ORGANIC WASTE	COMPOST	BAG AND SELL OR USE AS ALTERNATIVE LANDFILL COVER MATERIAL
OTHER WASTE	SORT AND DIVERT REMAINING RECYCLABLES	LANDFILL
AL CANS	BALE	EXPORT
PET BOTTLES	BALE	EXPORT
GLASS BOTTLES/JARS	CRUSH	USE AS SAND REPLACEMENT, FILL OR ALTERNATIVE LANDFILL COVER MATERIAL
ULABs	PACK	EXPORT

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Appendices

1.0 Introduction

Pattle Delamore Partners Ltd (PDP) has been engaged by the Secretariat of the Pacific Regional Environment Programme (SPREP) to undertake an assessment of the status and options for solid waste management (SWM) on Majuro Atoll. This work has been done under the Atoll Waste Management Component of the Pacific Hazardous Waste Management Programme (PacWaste) which aims to demonstrate the establishment of an integrated sustainable solid waste management system in the Republic of the Marshall Islands (RMI) which improves and expands on existing 4R practices (Refuse, Reduce, Reuse, Recycle), improves existing waste collection and disposal practices, and which is founded on user-pays and polluter-pays principles. The Terms of Reference (TOR) for the project are included in Appendix J.

This report is written for SPREP and for those on Majuro Atoll directly involved in SWM. Familiarity with the RMI and Majuro Atoll is assumed. Refer to the References for background and country information as necessary. US dollars are used throughout the report. The field work for this consultancy was completed in June-July 2014.

2.0 Brief History of SWM on Majuro

SWM on Majuro has been a challenge for many years and there have been many projects undertaken to improve the situation. Several existing reports include summaries of the history of SWM activities on Majuro[2]. In 2007, the Majuro Atoll Waste Company (MAWC) was formed to manage solid waste on Majuro Atoll, taking over collection activities from Majuro Atoll Local Government (MALGov) and operation of the landfill from the Ministry of Public Works (MPW), and overall responsibility for solid waste from the existing Solid Waste Task Force[3].

The 1996 US Environmental Protection Agency (EPA) report and the 2010 Asian Development Bank (ADB) report (pre-feasibility study) both present Waste-to-Energy (WtE) as a viable alternative to landfilling on Majuro Atoll[4]. The 2003 Beca report evaluates the merits of incineration and landfilling on Majuro and concludes that over a 20 year planning period landfilling is more economical (the report suggests that this conclusion should be reviewed in 10 years with further information available). A United Nations Development Programme (UNDP) project from 2005 by Mr Alice Leney looks at waste minimisation and recycling on Majuro, focussing on a Container Deposit Programme (CDP)[5]. The Japan International Cooperation Agency (JICA) has been involved in pilot SWM projects on Majuro for many years and are currently running the Japanese Technical

[2] US EPA, 1996; Beca, 2003; O'Meera, 2008; and SCS Engineers, 2010.
[3] OAG, 2010.
[4] Both use high predicted waste generation rates
[5] Leney, 2005.

Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries (J-PRISM) project across the Pacific, including in the RMI, until 2015. JICA also assisted with preparation of the draft National Waste Management Strategy 2012-2016 and Action Plan (see Section 3.1 below).

There have been other initiatives and assessments by the US Department of the Interior with consultants from San Diego (2003-2005), a US State Department Science Fellow (2007), and the US Army Corps (2011). The sea wall at the current landfill site is understood to have collapsed in 2006 and again in 2007, and resulted in significant quantities of waste being swept out to sea and being washed up on ocean side beaches and properties for several weeks.

3.0 Current SWM Activities

The current SWM situation on Majuro is both good and bad. Initial impressions on arrival on Majuro were that the waste was well controlled, with a reliable weekly wheelie bin collection service for most households, lots of signage for the promotion of recycling and prevention of litter, and large compactor trucks for waste collection (one of which looked almost new). But investigating further revealed some significant challenges and risks, with the most important and obvious being the landfill situation and the very limited amount of sustainable revenue generated by MAWC. These and other challenges are discussed in more detail through the report.

3.1 National Waste Management Strategy 2012-2016

The National Waste Management Strategy 2012-2016 and Action Plan (NWMS) is still in draft form, but is currently with the RMI Cabinet for approval (latest version dated February 2014 supplied by JICA and included in Appendix B). JICA have been assisting the Office of Environmental Planning and Policy Coordination (OEPPC), EPA and other RMI government ministries and departments in preparing the NWMS. The NWMS has eight key thematic areas which each have several tasks for completion under the Action Plan, each with lead and partner agencies, timeframe and estimated budget nominated. However, the NWMS is still in draft form and many of the timeframes have passed with limited progress, and there are no estimated budget amounts for funding many action items. (Refer to NWMS in Appendix B for further detail including the Action Plan items, lead agency, partner agencies, timeframe and estimated budget).

Table 1: NWMS Summary

Thematic Area	Specific Activities	Agencies Involved
Education and Communication	Workshops, action plans, communication strategy, accreditation program	EPA, MAWC, OEPPC and others
Policy, Legislation and Enforcement	Review laws, regulations and ordinances, and strengthen enforcement and compliance	OEPPC, EPA and others
Sustainable Financing	Monitor SWM, develop CDP, implement waste collection fees, commission new landfill	MPW, OEPPC, MAWC, AG Office
Equipment and Infrastructure	Commission new landfill, decommission existing landfill, conduct time and motion study, implement preventative maintenance, expand waste collection service	MAWC, CSO and others
Capacity Building	Training at national and local level, waste minimisation and management plans	CSO, MOE, MAWC, IA and others
Waste Minimisation	4Rs, reusable bags, paper briquettes, composting, scrap metal, recycling points, PET, uLABs, PPE, monitor and report	MAWC, COC, EPA and others
Hazardous Waste and Chemical Management	POPs, NIP review, Waigani Convention, waste oil management plan, e-waste, ODS, implement best practice	EPA, OEPPC, MAWC and others
Medical Waste Management	Planning and budgeting, incinerator, ash disposal, regulate/licence, training, monitor and review	MOH and EPA

Notes: EPA = Environmental Protection Agency; OEPPC = Office of Environmental Planning and Policy Coordination; MPW = Ministry of Public Works; AG = Attorney General; CSO = Chief Secretary Office; MOE = Ministry of Education; IA = Internal Affairs; COC = Chamber of Commerce; MOH = Ministry of Health.

None of the lead or partner agencies listed in the NWMS, apart from MAWC, appear to have any budget allocated for completing the actions that they have been tasked with in the NWMS, based on the field work undertaken during this consultancy[6]. This may be rectified once Cabinet approve the draft NWMS, although in early July 2014 the RMI government convened meetings to discuss the possibility of a 15% cut to operating budgets across the government

[6] Also supported by pers. comm. Esther Richards (SPREP) on 09/06/14.

ministries and departments. Hence gaining Cabinet approval for funding for implementation of the NWMS may be a challenge.

This work focuses on the project TOR but also addresses some of the action items in the NWMS where there is commonality. The recommendations from this work are aligned to action items in the NWMS as much as possible to ensure that there is a coordinated approach to SWM on Majuro.

3.2 USA

3.2.1 Compact and US Embassy

The Compact of Free Association (Compact) is an open ended agreement between the RMI and the USA that continues as long as both parties want it to. The Compact Sectors Grants (CSG) is a twenty year program that will end in 2023. Part of the twenty year CSG program includes the building up of a National Trust Fund which, in theory, will facilitate the longer term future economics of the RMI[7].

The process for MAWC to access CSG funding is through the RMI national government and the US-RMI Joint Economic Management and Financial Accountability Committee (JEMFAC). Hence, if the RMI government wants MAWC to get funding from the CSG, then they have to request this via the JEMFAC process[8].

The operating funds available through the Compact ($325,000 per year) are transferred automatically to MAWC on a quarterly basis. This arrangement is understood to be ongoing until the end of the current Compact agreement in 2023. The infrastructure funds available through the Compact ($650,000 per year in 2011 and 2012, and $600,000 per year in 2013 and 2014) are granted on receipt and acceptance of detailed spending plans, with the funds drawn down based on accrued expenditures. Based on information provided by MAWC there is approximately $226,000 from 2011 and $650,000 from 2012 which is yet to be granted. Some of these funds are allocated for reimbursement of expenses already incurred (long bed diesel truck and equipment parts in 2011, and garbage trucks (two), sea wall, equipment parts and import tax in 2012), leaving approximately $240,000 for 2011/2012. In addition the Compact infrastructure funds for 2013 and 2014 are yet to be granted. Hence there is a total of approximately $1.44 million available to MAWC for infrastructure pending the submission and acceptance of a detailed spending plan[9].

From 2015 there is $10-11 million per year until the end of the Compact (2023) for RMI infrastructure projects (~30% of total Compact funds each year). The

[7] Pers. Comm. Norman H Barth, Deputy Chief of Mission, US Embassy, Majuro, RMI.
[8] Pers. Comm. Norman H Barth, Deputy Chief of Mission, US Embassy, Majuro, RMI.
[9] Pers. Comm. Alan Fowler, Grants Management Specialist, Department of the Interior, US Embassy, Majuro.

National Budget Coordination Committee headed by the Chief Secretary is responsible for recommending funding allocations to the Cabinet for approval. The Cabinet then submits the annual budget to the Parliament for review and passage. The Cabinet is ultimately responsible for deciding how much is allocated to MAWC on an annual basis[10].

The US Embassy does not have any specific SWM related work underway or planned, apart from their involvement via the Compact agreement and the funding associated with that.

3.2.2 US EPA

The US EPA Region 9 (Pacific Islands Office) has provided technical assistance on SWM to the RMI in the past but there are no specific future activities planned at the moment[11]. There is however an EPA Region 9 project titled "*Sustainable Approaches for Materials Management in Remote, Economically Challenged Areas of the Pacific*" which is due to start July 2014 and be completed at the end of 2014[12]. This project is focussed on two EPA Region 9 territories (Commonwealth of Northern Mariana Islands (CNMI) and American Samoa) but the findings may be relevant to Majuro Atoll and other remote islands.

A copy of the US EPA Region 9 Conceptual Integrated Solid Waste Management Plan (1996) is included in the supporting information available electronically.

3.3 Japan

The activities of JICA, J-PRISM and Japan Overseas Cooperation Volunteers (JOCV) are closely aligned and are discussed together in this section.

JICA have been active on SWM in the Pacific since at least 2000 when a JICA expert was dispatched to SPREP. Activities since then have included regional SWM training, rehabilitation of the Tafaigata landfill in Samoa, development of a Regional SWM Strategy RSWMS 2010-2015), several bi-lateral cooperation projects, and most recently the J-PRISM project.

J-PRISM, running from 2011 to 2015 across 11 countries in the Pacific (including the RMI), aims to enhance sustainable SWM in the Pacific Region and develop/increase the capacity of the counterparts and the recipient countries through implementing priority actions listed in the RSWMS 2010-2015.

Current JICA activities in the RMI include implementing the NWMS, improving recycling (including introducing a school-based system) and composting on

[10] Pers. Comm. Alan Fowler, Grants Management Specialist, Department of the Interior, US Embassy, Majuro.
[11] Pers. Comm. John McCarroll, Manager, Pacific Islands Office, EPA Region 9 (10/06/14)
[12] Pers. Comm. Norwood Scott, Technical Advisor, Pacific Islands Office, EPA Region 9 (24/06/14).

Majuro, and improving the SWM system on Ebeye[13]. Refer to Appendix B for further information.

A JOCV senior volunteer is currently based at MAWC and is collecting data on waste generation and composition, recording all loads of waste disposed of to the landfill (MAWC collections and self-transport of waste by others). The JOCV senior volunteer is supported by a JICA SWM expert (currently Mr Akira Haseyama who is also responsible for similar SWM work in other Pacific Islands (Federated States of Micronesia (FSM) and Palau)).

A time and motion study for the MAWC collection vehicles was completed by JICA/JOCV in February 2014 (data collection only) and various recycling initiatives are being implemented. Future initiatives are understood to include separate collection of recyclables and consolidation of wheelie bin collection points. Manufacture of paper briquettes has ceased due to a lack of interest[14]. A ferrous scrap metal compactor has reportedly been donated by the Government of Japan and is scheduled to arrive on Majuro in March 2015[15]. This baler is understood to be for the processing of ferrous and other metals for export to recycling markets.

3.4 SPREP

The Pacific Hazardous Waste Management Project (PacWaste) is funded by the European Union and implemented by SPREP. PacWaste is a 4 year project (commenced May 2013) valued at approximately $10 million that focusses on improving the management of medical waste, asbestos and electronic waste (e-waste) across the Pacific. Draft reports for medical waste and e-waste have been submitted to SPREP and the asbestos consultant was due on Majuro in mid-July.

PacWaste also includes an Atoll Pilot valued at $800,000 to develop an integrated SWM system on Majuro. An inception mission was conducted on 10-14 March 2014 and a draft Inception Report has been prepared[16] and submitted to the OEPPC.

3.5 Korea

Reports in the local weekly newspaper, The Marshall Islands Journal, indicate that a Memorandum of Understanding (MoU) has been signed between RMI and South Korea for the establishment of a biomass gasification plant on Majuro[17]. The gasification plant would use waste from Majuro as an energy source and generate electricity. The only information on this scheme available at the time of this consultancy has been what has been published in the Marshall Islands

[13] Pers. Comm. Mr Akira Haseyama 23/06/14. According to Esther Richards (SPREP) (Pers. Comm. 13/06/14) JICA's work in the RMI is focussed on Ebeye.
[14] Pers. Comm. Mr Mitsushi Hyodo (current JOCV senior volunteer based at MAWC, approximately half way through a 2 year term (as of October 2014)).
[15] Pers. Comm. Stewart Williams, SPREP.
[16] SPREP, 2014.
[17] The Marshall Islands Journal newspaper article 30/05/14.

Journal. A delegation from Korea was reportedly due on Majuro in late July 2014 to progress the project[18] [19].

3.6 Others

There do not appear to be any other active donors targeting SWM on Majuro. An ADB consultant, Bruce Chapman, confirmed that there were no ADB projects underway or in the pipeline for SWM on Majuro[20]. Attempts to contact Terry Keju (Country Development Manager, UN Joint Presence Initiative) to confirm whether they are active in this area, or know of any other donors that might be, were unsuccessful.

4.0 Summary of Household and Establishment Survey

The TOR for the project included the requirement to complete surveys of community awareness levels, community preferences for waste services, and the public's ability and willingness to pay for waste management services. A summary of the survey design, implementation and results is given below.

4.1 Survey Design

The survey design process commenced with research into existing and available solid waste survey resources applicable to the developing country context. A World Bank model survey form (included in Appendix C) was selected as a template for developing a survey form specific to the Majuro Atoll situation and tailored to meet the project TOR. A draft Household Survey Questionnaire form was prepared in consultation with SPREP prior to the field work. The final Household and Establishment Survey Questionnaire forms used also included amendments based on a preliminary SWM situational analysis completed on arrival on Majuro Atoll prior to commencement of the survey work.

The survey included a minimum of 160 respondents. Consultation with SPREP confirmed that the survey respondents (particularly the household respondents) must be random and that there should be a pro-rata split between household and establishment respondents based on the total number of households and the total number of establishments on Majuro Atoll. SPREP also confirmed that the survey was to extend from Laura to Rita. Based on Census information from 2011 compiled by Economic Policy, Planning and Statistics Office (EPPSO) there are approximately 4000 households on Majuro Atoll[21]. MALGov were approached to confirm the number of establishments operating on Majuro Atoll (based on the number of business licences) but this information was not able to be obtained

[18] Pers. Comm. Hiroshi Yamamura, Minister of Public Works (20/06/14).
[19] The RMI person promoting the deal is Ambassador Kejjo Bien. Anecdotal reports from several government officials was that Mr Bien has previously promoted other developments, such as a luxury resort on one of the islands, which have not proceeded.
[20] Pers. Comm. Bruce Chapman, ADB Consultant (03/07/14).
[21] EPPSO, 2012.

during this consultancy. The proposed household and establishment split was set at approximately 140 households and 20 establishments.

Due to required number of survey respondents, potential language issues and to make most efficient use of the available time and funds, the survey included the recruitment and use of local personnel to undertake most of the survey work. On SPREP's recommendation, a not-for-profit organisation (Women United Together in the Marshall Islands (WUTMI)) was approached and engaged to assist with carrying out the survey work.

The selection of random households was completed by John Henry of EPPSO. Majuro Atoll was divided into 22 zones and each household numbered (as per 2011 census). A computer generated random selection of household numbers was produced for participation in the survey. Maps for each of the 22 zones, showing the numbered households, were printed and individual household survey locations were marked.

The selection of establishments for inclusion in the survey was more targeted to ensure that a wide range of establishment types (schools, hotels, restaurants, offices, retail outlets, garages, etc) and sizes (small/medium/large) were covered. The establishment survey was limited to the main commercial area between the airport and Rita.

The approximate location of each household and establishment survey respondent is marked on Sheets 1 to 12 in Appendix A.

4.2 Survey Implementation

A summary of how the survey work was undertaken is given below.

Table 2: Survey Implementation

Date	Activity
Pre 19 June	a. Preliminary research on conducting solid waste surveys. b. Draft household survey form submitted to SPREP for comment. c. Draft household survey form updated based on SPREP comments.
19 – 22 June	a. Initial discussions with WUTMI manager and selected surveyors. b. Training of WUTMI surveyors and review of draft household survey with WUTMI surveyors. c. Internal testing of draft household survey with other WUTMI staff. d. Update of draft household survey based on survey test results

Table 2: Survey Implementation

Date	Activity
	and preliminary SWM situation analysis conducted 19 and 20 June 2014. e. Translation of final household survey into Marshallese.
23 June	a. Selection of random households across Majuro Atoll by EPPSO. b. External testing of survey on 16 randomly selected households in Delap. c. Debriefing and review of test survey results.
24 – 30 June	a. Daily briefing and debriefing sessions. b. Completion of household surveys (total of 155) by WUTMI surveyors. c. Daily review of selected returned survey forms. d. Preparation of final establishment survey form (including translation into Marshallese) and commencement of establishment surveys.
1 – 7 July	a. Completion of establishment surveys (total of 25) by PDP (larger establishments) and WUTMI (smaller establishments). b. Data entry and evaluation of the survey results. c. Final debrief with WUTMI manager and discussion of possible additional willingness to pay for solid waste services research.

Notes:

1. *Five (5) WUTMI surveyors were engaged to undertake the household survey work. Surveyors completed 8-10 surveys per day. Surveyors initially worked in pairs/groups but then individually as they became more comfortable and familiar with the work. Briefing and debriefing sessions at the start and end of each day helped to identify and address any issues that arose during the household survey work.*
2. *Two (2) WUTMI surveyors were engaged to assist with the establishment survey work, focussing on the smaller establishments where language issues prevented the survey being completed directly by PDP.*

4.3 Survey Results

4.3.1 Respondents

4.3.1.1 Household

As noted above, the households selected for participation in the survey were selected randomly from across Majuro Atoll (Rita to Laura). Hence there is a good geographical distribution of survey respondents across the study area. Approximately 75% of the respondents interviewed were female, as might be expected with the survey conducted by women during normal work hours. Approximately half of the respondents were the head, or spouse of the head, of the household. The average household size in the survey population was 9.1 people, and the total number of people represented in the survey was

approximately 1,400 (~5% of the population of Majuro). There was also a good spread of education levels respondents (32% college, 52% high school, 14% elementary) and household income levels (<$5,000 to >$20,000) across the survey respondents.

4.3.1.2 Establishment

A variety of types establishments were selected for participation in the survey from across the main commercial area of Majuro Atoll (Rita to airport). Hence there is a good geographical distribution of establishment survey respondents across the study area. There was an even split between male and female respondents in the establishment survey. Over half of the establishment survey respondents were managers of the respective establishments.

4.3.2 Community Awareness

4.3.2.1 Household

The household survey included several questions aimed at understanding the awareness amongst households of SWM (B1 to B21). The table below summarises the main findings. There has been a long history of projects to improve the waste situation on Majuro, and hence most people have a reasonable awareness of waste issues.

Table 3: Household Awareness Survey Summary

Item	Key Findings
1	There is a range of opinion about the seriousness of SWM issues on Majuro (Serious 30% vs Not Serious 37%). The current good collection service may have had an influence on some respondents who answered 'Not Serious'.
2	The waste generation rate is variable but the most common response was 1 wheelie bin per week.
3	Approximately half of respondents had a wheelie bin (as expected with 4000 households and approximately 2000 wheelie bins distributed).
4	Almost all respondents from Rita to the airport confirmed that they receive a free weekly collection service from MAWC, with the collection point generally within 25ft of the houses. Most have been satisfied with the collection service for 1-2 years.
5	Respondents from the airport to Laura confirmed that they do not receive a collection service. Burying, burning and self-transport to the landfill were the most common waste disposal methods from the airport to Laura.

Table 3: Household Awareness Survey Summary	
Item	**Key Findings**
6	Almost all respondents everyone know that waste goes to the current landfill at Jable.
7	There is a reasonably good level of awareness about recycling with Al cans, plastic and glass being the most common materials identified. While recycling is generally viewed as important many do not recycle as they are too busy or it is inconvenient. Many that do recycle simply put the recyclables in a different bag in the wheelie bin with other waste, relying on MAWC to separate the waste at the landfill.
8	Most food waste (~75%) is fed to animals.
9	Organic waste is generally disposed of with other waste to landfill, although there is some composting (more common in Laura).
Notes: Refer to Appendix C for further detail on the survey and survey results.	

4.3.2.2 Commercial

The establishment survey included several questions aimed at understanding the awareness amongst establishments of SWM (B1 to B21). The table below summarises the main findings.

Table 4: Establishment Awareness Survey Summary	
Item	Key Findings
1	Most establishments consider SWM as a serious issue.
2	Most establishments produce at least 1 dumpster ($2yd^3$) of waste per week.
3	Approximately half of the establishments surveyed receive a regular waste collection service from MAWC. Waste collection is generally directly outside the establishment. The remainder self-transport their waste to the landfill. There is an even split (46% satisfied, 46% not satisfied) in regards to satisfaction with the MAWC collection service.
4	Many establishments want the MAWC collection service but there are currently not enough bins (there is a waiting list of approximately 30 establishments). Others prefer to maintain control and self-transport their waste to the landfill, citing the reliability of the MAWC collection service as the main issue.
5	Reliability and frequency are the two main issues with the current

Table 4: Establishment Awareness Survey Summary	
Item	Key Findings
	MAWC collection service specified by the respondents that are not satisfied.
6	Almost all establishments know that waste goes to the current landfill at Jable.
7	Almost all establishments think that recycling is important and most have an understanding of what can be recycled. There is an even split between those the separate recyclables and those that do not. Many establishments keep 'dry' waste and 'wet' waste separate, mainly for hygiene reasons but also to help with separation at the landfill and recycling.
8	A lack of separate recyclables collection and general busyness/inconvenience are the main reasons given for not recycling.
9	Most food waste is fed to animals although some is disposed of to the landfill.
10	Organic waste is disposed of to the landfill or by composting.
Notes: Refer to Appendix C for further detail on the survey and survey results.	

4.3.3 Community Preferences

4.3.3.1 Households

The household survey included several questions aimed at understanding the preferences amongst households in regards to SWM (C1 to C12). In general, there is a high level of satisfaction with the current free weekly household collection service by MAWC, and with the use of the wheelie bins. Many of those within the current collection area who do not have a wheelie bin specifically requested one during the survey. Those currently outside the collection area wanted a similar service (free, weekly, wheelie bin). The satisfaction with and preference for a wheelie bin collection service is important to note as it will make trying to implement an alternative system, such as a prepaid bag system, challenging. There is no preference either way between public or private operation of the waste collection system.

The survey results indicate that there are similar levels of support for landfilling and incineration as the final disposal option. Most respondents indicated that ocean-side was preferable for a landfill, although many did not know.

4.3.3.2 Establishments

The establishment survey included several questions aimed at understanding the preferences amongst establishments of SWM (C1 to C12). There is a reasonable

level of satisfaction with the current commercial waste collection service offered by MAWC. There is a waiting list of approximately 30 establishments for the MAWC collection service (the MAWC collection service is currently limited to 15% of the total commercial waste stream due to a shortage of dumpsters). Some of the smaller establishments may be able to use wheelie bins or prepaid bags if that option was offered.

There is a preference by some establishments to self-transport their waste to the landfill to maintain control over waste management. This is understood to stem from a historically unreliable MAWC collection service. Most establishments believe that landfilling is environmentally safe and acceptable if managed well and there is a slight preference for ocean-side to lagoon-side. There was an even split in terms of support for incineration as a waste disposal option.

4.3.4 Ability and Willingness to Pay

The survey results below on ability and willingness to pay are presented as clearly as possible, with comments on reliability of the data included to assist with interpretation. It must be emphasised that any proposal for a user-pays SWM system on Majuro will need support from the Cabinet, Nitijela, Mayor of Majuro, the Iroij (landowners), community and business leaders and heads of households. For example, a proposal for a gate fee at the landfill (for commercial waste only) is currently with Cabinet for approval.

4.3.4.1 Households

The household survey included several questions aimed at understanding the ability and willingness to pay amongst households in regards to SWM (A7 and D1 to D10).

The 2011 census indicated that the median annual household income on Majuro is approximately $9,600, up from $9,030 in the 1999 census[22]. This is in agreement with the survey data undertaken during this consultancy as summarised in the table below.

[22] EPPSO, 2012.

Table 5: Household Income on Majuro	
Annual Household Income	**Survey Data (2014)**
Less than $5,000	27%
$5,000 to $10,000	31%
$10,000 to $15,000	13%
$15,000 to $20,000	12%
More than $20,000	7%
Don't Know	7%
Notes:	

The median annual household income across the RMI based on the 2011 census data is $6,880. This is essentially the same as the 1999 census data[23]. However, real wages have been declining since they peaked in 2005 with a 14% decrease in 2008 and a 2.1% annual decrease between 2008 and 2012. The Consumer Price Index (CPI) has risen by 5.5% and 4.3% in 2011 and 2012 respectively[24].

A detailed social and economic survey in Jenrok (one of the poorest areas of Majuro and the site for the proposed new landfill) was conducted in 2005. The survey painted a very bleak picture with very high unemployment, low wages (average $2.57/hr, just above the $2.00/hr minimum wage), increasing food costs (high inflation of 4.45% between 1994 and 2001) and little prospect for an improvement in the situation[25].

Overall, the ability of much of the Majuro population to pay for SWM services is very limited. Household incomes are low and are decreasing in real terms, and there is clear evidence of increasing hardship in certain groups.

The results from the willingness to pay survey questions (D1-D10) are presented and discussed below. The household survey results indicated that, overall, there is a willingness to pay for waste collection (70% 'yes', 17% 'no' and 9% 'don't know' for question D1). The results for questions D2 to D7 regarding specific dollar amounts for the current collection system and a prepaid bag system are shown in the table below.

[23] EPPSO, 2012.
[24] Department of the Interior, 2013. *Fiscal Year 2012 Economic Review.* Sourced from http://www.pitiviti.org/news/wp-content/uploads/downloads/2013/10/RMI_EconReview_FY12.pdf
[25] Ben Chutaro, 2005. *Social and economic baseline survey: Jenrok Village, Majuro (Republic of Marshall Islands)*. SPREP.

Table 6: Household's Willingness to Pay		
Survey Question	**Yes**	**No**
D4. $0.50/week for current system	72%	17%
D2. $1+/week for current system	71%	19%
D3. $2+/week for current system	59%	24%
D7. $0.25/ prepaid bag	67%	17%
D5. $0.50/prepaid bag	65%	21%
D6. $1/ prepaid bag	59%	26%
Notes: Some respondents did not answer the willingness to pay questions (only approximately half of survey respondents were the head/spouse of head of the household). Hence percentages do not add up to 100%.		

The results presented in the table above indicate that there is a general willingness to pay for waste collection. For the current system there is a general willingness to pay up to $1/week, with somewhat less willingness to pay $2/week. For a prepaid bag system the trend is similar, with general willingness to pay up to $0.50/prepaid bag and less willingness to pay $1/prepaid bag.

Overall there was less willingness to pay for a prepaid bag system compared to the current system. This is inferred to be due to respondents being unfamiliar with a prepaid bag system and hence being less willing to pay for it, although it could also be a reflection of the perceived 'value for money' (360L wheelie bin vs 50L prepaid bag).

The willingness to pay the full cost of waste collection (question D8) was lower than the responses in the table above. This should be acknowledged as a difficult question to answer when the full cost of waste collection per household is unknown. For those that were unwilling to pay for waste collection (ie 'no' to question D1), the most common reason was affordability and the preferred option to minimise costs was fortnightly (biweekly) collection.

While the willingness to pay results presented above are relatively positive (ie general willingness to pay), there are some possible issues with the reliability of the data and challenges in implementation of any proposed 'user pays' waste collection system due to a number of factors as discussed below.

Households between Rita and the airport currently receive a reliable weekly collection service at no cost, with most households having the use of a large wheelie bin (also at no cost). This is a recent improvement and there is a general satisfaction amongst households with the current system. Clearly it will be a challenge to convince households of the need to pay for SWM services when they are used to and satisfied with the current free system.

While significant effort was put into preparation of the household survey and training of the surveyors, there were challenges in conducting the survey, particularly in regards to the willingness to pay questions. The main challenges in conducting the survey were language (household surveys had to be conducted in Marshallese by WUTMI surveyors) and in respondents understanding of the survey questions. Analysis of the survey results indicates that there is some correlation between the willingness to pay answers and the surveyor (ie who was asking the questions[26]).

It is also important to note that MAWC is a state owned enterprise managed by a board of directors who need approval from Cabinet prior to implementing any changes to MAWC operations. Hence any proposal to introduce or alter MAWC charges (such as the current proposed landfill gate fee) requires Cabinet approval prior to implementation. At present there is understood to be little or no political will for introducing user pays charges to households for waste collection services[27].

Further work is recommended on household's willingness to pay for waste collection services. This could be in the form of open community meetings or discussions with selected groups (WUTMI chapters or Parents as Teachers groups). Discussion with community leaders, Cabinet and other decision makers is also recommended. The NWMS 2012-2016 recommends conducting public hearings on any proposed waste collection system and disposal fee schedule, and extensive public awareness campaigns, prior to implementation (items 8b, e and f in the Action Plan).

4.3.4.2 Establishments

The establishment survey included several questions aimed at understanding the ability and willingness to pay amongst establishments for SWM (D1 to D8).

Currently establishments on Majuro either pay for the waste collection service provided by MAWC, or they self-transport their waste to the landfill (no gate fee at present). In either case there is a cost to each establishment, through the direct payment to MAWC or through the labour and equipment costs (vehicle, fuel, maintenance, etc) associated with self-transport to the landfill. The establishments that receive the MAWC collection are obviously willing and able to pay for the service and there is an even split in terms of satisfaction (reliability and frequency were cited as the main reasons for dissatisfaction). The establishments that self-transport are expected to incur similar or greater costs than the MAWC subscription cost. Hence these establishments are considered to

[26] For one surveyor almost all the answers to questions D1 to D8 were 'yes' and for another surveyor almost all the answers were 'no'. This bias may due to the surveyors own opinion and hence in the particular way the questions were asked. The positive and negative bias will, to an extent, have cancelled each other out. There was no obvious bias for other three surveyors.
[27] Pers. Comm. Jorelik Tibon (General Manager, MAWC) and Wilbur Allen (Secretary of Public Works and Chairman of MAWC).Possibly due to upcoming election in November 2015.

also have the ability to pay for waste collection. Some of these establishments are on the waiting list for the MAWC collection service indicating a willingness to pay.

The conclusions above are supported by the survey results which clearly indicate a willingness to pay for waste collection. Some establishment survey respondents conditioned their willingness to pay on being able to review MAWC's operating costs to check that the fees charged are reasonable. One respondent was of the opinion that waste collection should be covered by existing taxes (MALGov sales tax and RMI import duty).

Some establishments, such as the large supermarkets, are not willing to pay for MAWC waste collection services and prefer to manage their own waste disposal (self-transport to the landfill on a daily basis). The main reason for this preference is hygiene at their premises and perceived reliability issues with the MAWC collection service.

5.0 Current Status of Solid Waste Management

A summary of the current SWM situation on Majuro is presented in diagram form in Diagram 1 in the Executive Summary. The information below provides further detail as well as the context and source of data in Diagram 1.

5.1 Waste Characterisation

5.1.1 Waste Generation

The waste generation rate for Majuro was reportedly 0.9kg/person/day in 2010 based on a waste characterisation study completed by a JICA/JOCV in 2010[28]. The most recent data from 2013, also gathered by JICA/JOCV, indicates that the waste generation rate has increased to over 1kg/person/day[29]. This waste generation rate is very high compared to other urban areas in the Pacific (for example 0.33kg/person/day in South Tarawa, Kiribati)[30]. The total waste generation rate increased from 20.3t/day in 2010 to 23.6t/day in 2013, of which 10.1t/day is household waste and 13.5t/day is commercial waste (Rita to the airport).

Several previous SWM studies have also included data and predictions on waste generation. Some of this data is presented in the table below along with an update for this study (2014 PDP) which is based on the 2013 JICA data and the population of the entire Majuro Atoll (Rita to Laura).

[28] NWMS 2012-2016 and Action Plan
[29] Data provided by Mr Makoto Tsukiji, Project Coordinator (J-PRISM), JICA via email on 08/06/14.
[30] NWMS 2012-2016 and Action Plan

Table 7: Waste Generation Predictions for 2014

Study	Predicted Population	Waste Generation (kg/person/day)	Waste Generation (t/day)
1996 US EPA[1]	57,857	0.6	37.4
2003 Beca[1]	31,485	0.6	20.3
2010 ADB[2]	29,399	1.5	45
2010 JICA[3]	22,260	0.9	20.3
2013 JICA[3]	22,260	1.1	23.6
2014 PDP[4]	28,980	1.1	27.0

Notes:

1. From Appendix B of the Beca, 2003 report.

2. From ADB report (population based on 27,699 in 2009 (Water Survey) and 1.5% growth, waste generation includes used oil (1t/day) and tyres (1.4t/day), and may also include 5t/day coconut husks (from copra plant)).

3. From JICA (population based on census data (Rita to airport MAWC service area only) for 2010 and 2013, waste generation rate for Rita to airport only).

4. From PDP (population based on 2011 census and 1.4% growth per annum (Rita to Laura), per household waste generation rate assumed to be the same as 2013 JICA data (commercial waste generation rate assumed to be the same as for JICA 2013 since commercial activity is almost entirely confined to the Rita to Airport area). The higher prevalence of composting in the airport to Laura area means that the actual waste generation rate should be less than 27t/day.

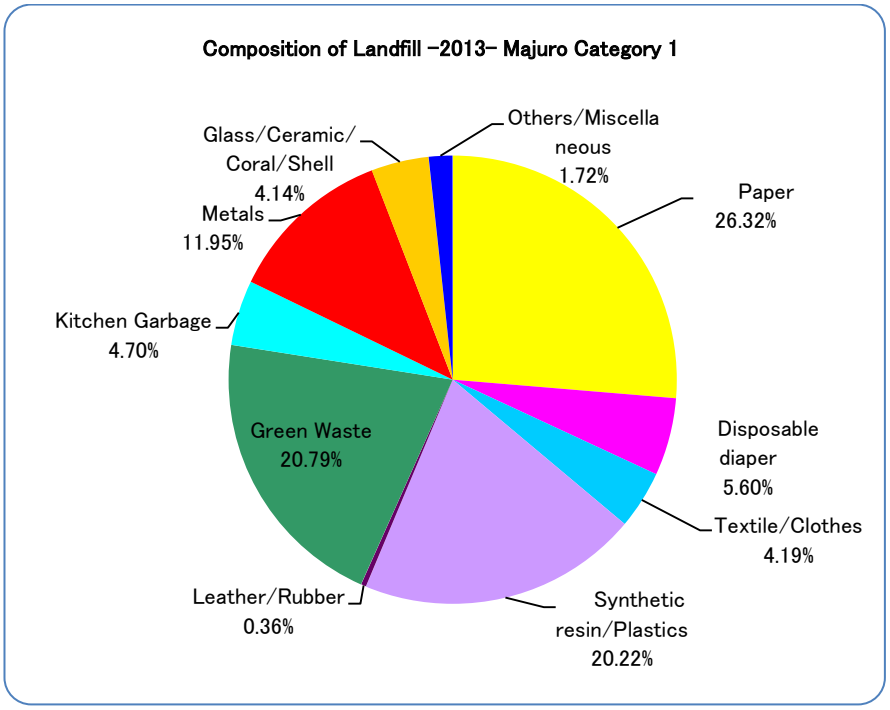
All residential waste is currently collected by MAWC in their two large operating rear loader trucks (Freightliner and Peterbilt). Only around 15% of commercial waste, from a total of 99 customers, is collected by MAWC, using the single front loader truck (Mack). The remainder of the commercial waste is self-transported to the landfill by the waste producers. Refer to Section 5.3 for further detail on waste collection.

5.1.2 Waste Composition

The waste characterisation study by JICA/JOCV in 2013 included analysis of the composition of household waste from different areas on Majuro (Rita, Uliga, Small Island, Delap and Long Island) and the composition of commercial waste collected from three establishments (Flame Tree, Uliga Catholic and College of the Marshall Islands (CMI)[31]). The overall composition of waste disposed of to the landfill has also been analysed and is illustrated in the pie chart below (sourced from JICA). The 2013 waste characterisation study built on earlier work by JICA/JOCV in 2010 which is included in the NWMS. Previous studies have reported similar waste composition[32].

[31] Waste composition from the three selected establishments may not be representative of the overall commercial waste composition. For example, waste from Flame Tree has a high proportion of aluminium cans and glass beverage bottles, as would be expected from a restaurant and drinking establishment. Likewise there is a high proportion of paper in the CMI waste.

[32] Refer to ADB, 2010.



From the 2013 waste composition data (courtesy of JICA/JOCV), over 50% of waste is cardboard/paper, green waste and kitchen waste. This waste should be diverted from the landfill and used to make compost, mulch and alternative landfill cover material. The volumes are significant however, and hence collection, handling and composting systems will need to be set up to manage the volume of material (up to 12t/day) to achieve significant diversion of organic waste from the landfill. Realistically, manufacture of good quality compost should be scaled to meet local demand (imported compost, topsoil and potting mix are available at local hardware stores), with the remainder of organic material used to make alternative landfill cover material (replacement for sand dredged from the lagoon).

A more detailed breakdown of waste composition is included in the information sourced from JICA. This data indicates that there are significant amounts of recyclables present in the waste stream as summarised in Table 8 below. However, the accuracy of some of the data in Table 8 is questionable compared to good data from other Pacific Island countries where CDP have been implemented (such as Kiribati, Yap, Kosrae and Palau). Refer to Section 7.1.2 for further data on anticipated recyclable volumes. For example, 1.6 tonnes/day of aluminium cans equates to approximately 100,000 cans per day or between 3 and 4 cans per person per day for Majuro (which is unrealistically high).

Table 8: Recyclables in Landfill Waste		
Item	**Percentage of Total**	**Tonnes/day**
Aluminium cans	5.8%	1.6
PET bottles	5.2%	1.4
Glass beverage bottles	4.1%	1.1
Steel cans	3.9%	1.1
Cardboard	10.6%	2.9
Paper	15.7%	4.2
Green Waste (Compostable)	16.7%	4.5
Green Waste (Other)	4.1%	1.1
Kitchen Waste	4.7%	1.3
Notes: Based on JICA 2013 composition data and the PDP 2014 waste generation rate (includes airport to Laura area)		

5.2 Financial

5.2.1 MAWC Accounts 2013

MAWC accounts are audited each year by Deloitte. Audit reports from 2008 to 2012 are available online[33]. The most recent audit report for the years ending 30 September 2012 and 2013 has recently been completed by Deloitte and was provided by MAWC (refer to Appendix B). MAWC also provided a more detailed statement of revenue, expenses and changes in net assets for the year ending 30 September 2013 (refer to Appendix B), and a breakdown of the waste collection revenue listing each customer and the amount charged for the collection service. A summary of the MAWC accounts for 2013 is given in the table below.

Table 9: Audited MAWC Accounts for Fiscal Year 2013		
Item	Operating Revenue	Amount
1	Operating Revenue	$118,701
2	Contribution from RepMar (Compact (operations))	$352,769
3	Capital Grant from RepMar (Compact (infrastructure))	$557,894
4	Capital Grant from Japan Government	$114,733
	Total	**$1,144,097**
Item	**Operating Expenses**	**Amount**

[33] Accessed from http://www.rmioag.com/report_component.php on 08/06/14.

Table 9: Audited MAWC Accounts for Fiscal Year 2013		
Item	Operating Revenue	Amount
1	Payroll	$419,873
2	Depreciation[34]	$204,982
3	Fuel and lubricants	$83,862
4	Repairs and maintenance	$36,179
5	Recycling	$27,875
6	Miscellaneous	$73,051
	Total	**$845,822**

Notes: Based on Deloitte audit of MAWC accounts. Refer to Appendix B for the Deloitte Audit report and the detailed accounts provided by MAWC for further information including a breakdown of individual revenue and expense items.

From the summary table above it is clear that MAWC's sustainable revenue (from the provision of waste collection services to commercial customers) is only a fraction of the total revenue (10%) and the total expenses (14%). Hence MAWC currently relies almost entirely on Compact, RMI government and donor support. The capital grants from RepMar (RMI government) and the Government of Japan are understood to have been used for purchasing garbage trucks and wheelie bins respectively.

Approximately half of MAWC expenses are for payroll (MAWC has 46 employees for 2014-2015[35]) and approximately a quarter are for depreciation (due mainly to the capital cost of collection trucks and other equipment purchased through Compact grants and other donors)[36]. MAWC operating expenses could be reduced through a reduction in staff numbers (a reduction in staff numbers to 36 appears to be feasible based on the current MAWC activities and services) and the use of smaller/cheaper collection vehicles.

The total cost per tonne for the waste collection activities undertaken by MAWC in 2013 is estimated to be $130 per tonne[37], assuming approximately three quarters of MAWC expenses are used for collection-related activities (the other quarter being used for landfill operation), with the proportion of payroll expenses being approximately 60% of the total payroll (based on position

[34] Straight line, 10 years for heavy equipment and 5 years for office equipment.
[35] 1 General Manager, 1 Accountant, 4 Administration, 3 Drivers, 14 Collection Crew, 9 Landfill, 3 Recycling, 2 Composting, 3 Mechanics, 3 Carpentry, 3 Security. Hourly rate for unskilled labour is $2.50 per hour, increasing to between $3.00 and $6.00 for semi-skilled and skilled labour.
[36] The depreciation expense of just over $200,000 indicates that MAWC has approximately $2 million in assets. This differs from the audited MAWC accounts for 2013 which state that net assets at the end of the year were $948,539.
[37] For comparison, the cost of waste collection by Betio Town Council on South Tarawa, Kiribati, was estimated to be approximately A$150 per tonne (source: FTL, 2012). The cost of waste collection in Palau was estimated to be $87 per tonne (source: Hajkowicz et al, 2006).

descriptions). The MAWC household waste collection is estimated to cost $100 per tonne (approximately 40% of payroll and 50% of other MAWC expenses) compared to over $250 per tonne[38] for the commercial collection (approximately 20% of payroll and 25% of other MAWC expenses). Note that the income from commercial waste collection ($70,000) is significantly less than the MAWC cost of providing the service (estimated to be $190,000).

5.2.2 MAWC Budgets 2014 and 2015

The MAWC budgets for FY2014 and FY2015 (draft yet to be approved by the Board and yet to be submitted to Ministry of Finance) specify total budgets of approximately $1.262 million and $1.304 million respectively. These funds are from several sources and allocated to four key objective areas and outcomes as detailed in the table below (refer to Appendix B for further detail):

Table 10: MAWC Budgets for Fiscal Years 2014 and 2015

Item	Revenue	2014	Draft 2015
1	Compact (operations)	$325,000	$325,000
2	Special/Operating Revenue	$284,485	$247,399
3	Reimbursable/Additional Operating Fund Required	$52,262	$131,712
4	Compact (infrastructure)	$600,000	$600,000
	Total	**$1,261,747**	**$1,304,111**
Item	**Expenses**	**2014**	**Draft 2015**
1	Outcome 1: Waste Collection	$177,551	$253,757
2	Outcome 2: Landfill Operations and Management	$785,441	$755,406
3	Outcome 3: Recycling	$197,970	$164,768
4	Outcome 4: MAWC Institutional, Sustainable Financing and Revenue	$100,785	$130,180
	Total	**$1,261,747**	**$1,304,111**

Notes: It is unclear how some of the budget costs have been calculated for 2014 and 2015. For example, fuel is $16,000 in the 2014 budget but nearly $97,000 in the 2015 budget (compared to approximately $54,000 in the 2013 audited accounts.

Special/operating revenue in 2014 and 2015 is significantly higher than operating revenue in 2013. It is understood that the increase is for revenue generated by a

[38] The high cost per tonne is mainly due to low utilisation (only ~2t per day collected by MAWC with the front loader truck).

gate fee at the landfill. This is yet to be implemented (currently with Cabinet for approval)[39] so the special revenue for 2014 is expected to be significantly lower than the amount given above (should be similar to operating revenue from 2013).

5.2.3 Other Government Ministries and Departments

The Action Plan included with the draft NWMS includes nominated lead and implementing agencies to carry out the various tasks listed in the Action Plan (refer to Appendix B and Section 3.1 above). None of the agencies listed appear to have any budget allocated for completing their responsibilities.

The RMI EPA reportedly receives $242,893 under the Compact Agreement for SWM activities on Ebeye. The EPA is understood to not have any budget for SWM on Majuro.

It is understood that the Marshall Islands Visitors Agency (MIVA) and the Majuro Atoll Local Government (MALGov) have some responsibilities for the collection of litter and waste from several public areas on Majuro, including the picnic area at the end of Laura and Delap Park. There is a $1 parking fee at the Laura picnic area which is understood to be used for litter control and waste collection at that location.

5.2.4 Other Information Sources

The draft NWMS confirms that MAWC receives $325,000 annually under the Compact for operations. Estimated MAWC revenue for waste collection services (to private sector) and other minor income streams (selling compost and paper briquettes) is $150,000[40].

Under the Compact Agreement, MAWC has been allocated $325,000 per year for operational expenses, and $600,000 to 650,000 for infrastructure. Of the $2.5million total for allocated for infrastructure, $1.5million is available for funding technically sound and well developed proposals. The Compact Agreement expires in 2023 and there is only $90million allocated for completing infrastructure projects in the environment, education and health sectors. There is an urgent need for a financially self-sustaining national solid waste management programme[41].

The Majuro Atoll sales tax (4% on all sales on Majuro) goes to MALGov and in 2004 tax revenue of $2.6 million was almost entirely used up by wages, salaries and other compensations, mostly for local police forces and waste collection personnel (MALGov was responsible for waste collection prior to the establishment of MAWC)[42]. Approximately one quarter of the sales tax revenue

[39] Pers. Comm. Jorelik Tibon, General Manager, MAWC.
[40] NWMS 2012-2016 and Action Plan
[41] SPREP, 2014.
[42] Andic, FM, 2005. *Tax Policy and Administration in the Republic of the Marshall Islands.*

was reportedly used for SWM[43]. The sales tax revenue is currently used by MALGov for other services. The MALGov accounts for 2013 and budget for 2015 were unable to be obtained during this consultancy.

The OAG audited MAWC for the period 2007-2009 and reported the following key information[44].

- MAWC has a user pay system for commercial enterprises and currently has 92 commercial accounts.
- MAWC also maintains a weekly collection schedule for each community. The public is aware of this schedule. The service area is Rita to the airport and consists of 3000 residential properties. For these properties there is no collection fee structure.

5.2.5 Other Potential Revenue Sources

A gate fee at the landfill is currently being proposed by MAWC and is in the process of being reviewed and approved by Cabinet. The gate fee will apply to commercial establishments who self-transport waste to the landfill. A gate fee of $3 to $5 per load is proposed. According to MAWC there are approximately 1200 self-transport loads per week[45] and the MAWC budget for FY2015 projects an income of approximately $110,000 from the landfill gate fee. However, JICA data collected over July-September 2013 during the waste generation survey indicates a total of approximately 500 self-transport loads per week[46].

Another option for increasing revenue is to increase charges for the commercial waste collection service, and also to increase the number of commercial customers (although this would reduce revenue from the gate fee). Collection of all commercial waste by MAWC would generate approximately $450,000 per year based on current rates charged by MAWC. The front loader truck used for commercial waste collection is currently very under-utilised and hence the additional costs associated with the additional collection will be minor, although if the front loader dumpster system is to continue a second front loader would need to be purchased as a back up to the main front loader truck[47].

To expand the commercial waste collection service provided by MAWC new dumpsters need to be acquired. MAWC contracts with commercial establishments should include a dumpster rental fee to cover depreciation (over 5-10 years) and allow for purchase of replacement dumpsters. Dumpster rental

[43] A figure of $2.90 per household per month is given in the ADB report by Tim O'Meara (Feb 2007) which equates to a total of $140,000 per year based on 2011 census data (approximately 4,000 households on Majuro between Rita and Laura).
[44] OAG, 2010.
[45] MAWC data.
[46] 1200 loads per week equates to around 1 load every 2 minutes. While a steady stream of self-transport loads were observed during the numerous visits to the Jable landfill, the JICA data appears to be more realistic (1 load every 6 minutes).
[47] The back up front loader could be older/cheaper, and, if available, smaller than the existing large front loader truck.

should be in the order of $3-$6 per week or $12-$24 per month. Assuming a total of 200 dumpsters distributed to commercial establishments, income will be $30,000-$60,000 per year (this is however only a cost recovery exercise, unless dumpster life exceeds 10 years).

A prepaid bag user pays system would ultimately be expected to operate on a cost recovery basis. Refer to Section 6 for detail on the costed design of a prepaid bag system. If wheelie bins are used for recyclables/organic waste in conjunction with a prepaid bag system for landfill waste then the cost of the prepaid bags could be increased marginally to cover depreciation on the wheelie bins.

Other potential sources of income, in addition to a proportion of the MALGov sales tax, include a proportion of import duty (a surcharge on tobacco, alcohol and soft drinks (for example, $0.25 per beer can/bottle is currently allocated to CMI[48])) and income from a Container Deposit Programme (CDP) if implemented (refer to Section 7).

5.3 Collection System

Currently a free weekly collection service is provided by MAWC for residential households in the main urban area from Rita to the airport (approximately 3,000 households and 22,000 people). Approximately two thirds of households have large wheelie bins supplied in 2010 and 2012 by the Government of Japan. Prior to the use of the wheelie bins waste was in piles or an assortment of containers (plastic bags, baskets, plastic bins) according to MAWC records. Those without a wheelie bin continue to use plastic bags, plastic garbage bins and a range of other containers. The current MAWC household collection schedule is detailed in the table below.

Table 11: Current Household Garbage Collection Schedule

Day	Area
Monday	Long Island
Tuesday	Jenrok and Uliga
Wednesday	Rita
Thursday	Delap
Friday	Delap
Saturday	All areas (green waste only)

Notes: Two rear loader garbage trucks (Freightliner and Peterbilt) currently used for household waste collection.

[48] Title 48 – Taxation. Chapter 2. Sourced from http://www.rmiembassyus.org/ on 20/07/14.

Burning and burying of waste is a common manner of garbage disposal in areas to the west of the airport on Majuro which do not currently receive a collection service[49]. Some self-transport of waste to the landfill is undertaken by households from the airport to Laura. Composting is more common from the airport to Laura. There is also some evidence from the household survey that some food waste is disposed of to the lagoon and the ocean. There is also anecdotal evidence that some other waste is disposed of to the lagoon and ocean.

According to MAWC accounting records, a regular collection service is provided for 99 commercial customers (establishments). Collection frequency varies between daily and biweekly (fortnightly) depending on the needs of each establishment. Charges are understood to be $12 per pick up for a 2 yd^3 dumpster[50].

The amount of commercial waste collected by MAWC represents only 15% of the total weight of commercial waste produced and disposed of to the landfill. The remaining 85% of commercial waste is self-transported to the landfill by each establishment and disposed of for free (there is currently no gate/tipping fee). There is a waiting list of approximately 30 establishments who want MAWC to collect their waste but there is currently a shortage of bins (dumpsters). Some establishments, such as the larger supermarkets (including K&K Island Pride and Triple J Payless), prefer to self-transport waste to the landfill each day to maintain optimum sanitary conditions at their premises.

5.3.1 Time and Motion Study

The NWMS 2012-2016 (Equipment and Infrastructure section) refers to a time and motion study (T&M study) being undertaken in 2014 by MAWC (lead agency) and EPA/J-PRISM (partner agencies) to identify inefficiencies and possible improvements to the waste collection service. Some recent existing T&M study raw data collected in February 2014 by JICA/JOCV and provided to PDP was processed and evaluated as part of this work. The JICA/JOCV T&M study included 14 collection trips over 9 days in February 2014 and covered most or all of the current collection routes (based on all weekdays being included). The JICA/JOCV data relates to household waste collection using the rear loader trucks only.

The PDP T&M study was limited to 2 collection trips (one for a rear loader truck to compare to and verify the JICA/JOCV data, and one for the front loader truck to fill in the gap in the JICA/JOCV data). The evaluation of further collection trips, while preferable, was unable to be completed due to time constraints and the necessary prioritising of other work. The combined PDP and JICA/JOCV T&M study results are considered to provide good data for the rear loader trucks. The T&M study data for the front loader truck is limited, but it is clear from the single

[49] Census 2011.
[50] MAWC accounts.

collection trip analysed, and from other information gathered during the field work, that the front loader is very under-utilised.

The PDP T&M study was conducted on 30 June 2014 (rear loader for wheelie bins) and 3 July 2014 (front loader for dumpsters) using a custom designed T&M Study survey form programmed into Fulcrum (a field survey application). The collection routes that were part of the PDP T&M study are shown on Sheets 6 to 10 in Appendix A.

The T&M study summary data is summarised below, with more detail included in the spreadsheet in Appendix E. The Jable landfill was the only landfill operating at the time of the PDP field work and hence both of the PDP collection trips start and end at the Jable landfill. The rear loader collection trip was along the main road between the Jable landfill and the airport. The front loader collection trip included some of the back roads between Delap and Uliga. The roads on Majuro are generally in reasonable condition and wide enough to allow good access for the garbage trucks, despite the large size of the trucks.

Table 12: Time and Motion Study Statistics

Item	Key Performance Statistics	PDP		JICA[1]
		Rear Loader	Front Loader	Rear Loaders
1	Collection time from first to last stop (hours per trip)	3	1.5	2
2	Distance per trip (km)	10	15	20[2]
3	Number of collection stops per trip (range 23-81)	85	5	50
4	Time per collection stop (minutes:seconds)	2:20	17	2:30
5	Loading time per container (minutes:seconds)	0:34	9:30[3]	0:40
6	Number of wheelie bins per collection trip	213	-	130
7	Number of dumpsters per collection trip	-	9	-
8	Amount of garbage collected per trip (tonnes)[4]	8.7	1.8	5

Notes:

1. JICA data is averaged over the 14 collection trips (5, 17, 20, 21, and 24-28 February 2014) for which data was gathered.

2. Distance estimated based on time from landfill to the start/end of the collection route.

3. The loading time for the front loader was influenced by a 20 minute wait at one location for the long bed truck to arrive with two dumpsters and 2 wheelie bins.

4. See spreadsheet in Appendix E for assumptions used in calculating the tonnes of garbage per trip. For the PDP rear loader collection trip the Freightliner garbage truck was almost full. For the JICA/JOCV collection trips the trucks appear to have only been half to two thirds full.

From the table above it is clear that the rear loaders operating on the household collection routes are reasonably well utilised (more than half full by the end of each collection trip) and efficient (average loading time per bin ~40 seconds) due to the collection trucks being in good condition and the garbage being contained in wheelie bins or other suitable containers easily emptied or loaded into the trucks. Hence there are some limited potential efficiency gains possible based on the current T&M study data (complete existing collection routes in 4 days to increase average load per collection trip to over 7 tonne), but a significant risk of a reduction in efficiency should the garbage not continue to be well contained within easily emptied or loaded containers.

Based on the assumptions detailed in the spreadsheet in Appendix E, approximately 90% of the waste collected during the PDP and JICA/JOCV T&M study collection trips was contained in wheelie bins (the balance was in other types of garbage bins, large plastic garbage bags, cardboard boxes and small plastic bags). Wheelie bins (95 gallon or 360 L capacity) were assumed to be three quarters full and with an assumed uncompacted waste density of 0.13 t/m^3, wheelie bins contained approximately 40 kg each.

Only one collection trip for the front loader truck was included in the T&M study, but it is clear that there is considerable room for increasing utilisation (less than a quarter full at the end of the only collection trip on 03/07/14 with the collection trip completed within 2 hours) and efficiency (some long loading times). This is partly due to the low number of dumpster bins available and the low percentage (15%) of commercial waste collected by MAWC (the remaining 85% is self-transported to the landfill by the waste producers). There are obvious risks with having only one front loader truck for emptying the dumpster bins. A second front loader would reduce the operating risk but would further reduce the already low utilisation of the existing front loader.

5.3.2 Equipment Status

5.3.2.1 Garbage Trucks

MAWC use compactor trucks for waste collection on Majuro including four rear loaders (3 large and 1 small) and one front loader. MALGov have a new large rear loader donated by Taiwan.

Table 13: Garbage Trucks

Item	Make	Type	Year	Size (m^3) [1]	Condition	Life Expectancy[2]
1	Freightliner	Rear Loader	2013	24	Working (near new)	10 years
2	Peterbilt	Rear Loader	2004	20	Working (used condition)	5 years
3	Mack	Front Loader	2008	30	Working (used condition)	5 years
4	International	Rear Loader	Unknown	20	Not working (alternator)	5 years
5	Kia	Flat bed	2008	-	Working (starter solenoid needed)	2 years
6	Sterling	Small Rear Loader	Unknown	9	Not working (air and fuel filters needed)	2 years
7[3]	Unknown	Medium Rear Loader	Unknown	20	Working (near new)	10 years

Notes:
1 Garbage truck size is calculated based on physical measurements of the waste compartment on each truck (length x width x height).
2 Life expectancy (anticipated useful working life from July 2014) is based on depreciation (10 years) and assumes regular preventative maintenance being undertaken and budget available for spare parts as required for repairs. Actual useful working life may be less than 10 years.
3 Donated to MALGov by the City of Taipei, Republic of China (Taiwan). Size estimated. SPREP advised that a garbage truck has recently been purchased by the Government of Taiwan for MALGov.

It must be emphasised that with only one front loader truck to service the commercial dumpsters there is a significant risk of failure of the MAWC commercial collection service. If the front loader was to breakdown then there would be no lifting equipment capable of emptying the dumpsters (at least one of the rear loaders has dumpster lifting equipment but the existing front load dumpsters would need to be modified for lifting by a rear loader truck). Hence a second front loader truck is recommended. However, the existing front loader is under-utilised (refer to Section 5.3.1) and hence the commercial waste collection by MAWC needs to be expanded significantly to justify the purchase of a second front loader. Alternatively, a stock of essential spare parts could be ordered and

held by MAWC to allow for a quick turnaround on anticipated potential repairs. Another option would be for commercial waste collection to be undertaken using the existing rear loader trucks (some may need lifting attachments fitted) and new rear loader dumpsters. In general however, rear loader trucks are not as efficient as front loader trucks for dumpster lifting.

There is significant additional collection capacity for both the rear loaders and the front loader. It is estimated that 1.5 large rear loader trucks should be able to collect all the household waste[51] on a weekly basis (Rita to Laura). Hence there is existing capacity (with the 2 currently operational large rear loaders) for expansion of the collection service to Laura, and also for some separate collection of organic waste and recyclables (if that is to be undertaken). Provided waste generation rates for the airport to Laura are lower (based on the separation of organic waste and promotion of onsite composting), one large rear loader should be able to collect all waste from this area on a weekly basis in a single trip. With the current large compactor trucks undertaking waste collection there does not appear to be any benefit in having a transfer station in Laura, unless this is needed to facilitate separation of organic waste and recyclables from the landfill waste. The single front loader truck has the capacity to collect all commercial waste based on 6 collection days per week.

5.3.2.2 Garbage Containers

There are approximately 2,000 wheelie bins (95 gal or 360 L) in use by the majority of households between Rita and the airport (1 per household). These were provided in 2010 and 2012 by the Government of Japan. These bins are generally in good condition and should last for 10 years based on the supplier's warranty. There was some evidence of rough handling by MAWC collection staff and some damaged bins were observed. A further 2,000 wheelie bins are needed to provide 1 each for the households on Majuro currently without a bin and to provide some stock for replacing damaged bins. The wheelie bins cost approximately $85 each (CIF) based on the costs from the recent purchase of wheelie bins by the Government of Japan.

Large plastic garbage bags are available for purchase from the local hardware stores for between $0.30 and $0.50 each. These appear to be used by commercial establishments rather than by households.

There are approximately 90 plastic dumpsters (mostly $2yd^3$) distributed amongst the commercial establishments serviced by MAWC. These dumpsters are in variable condition and it is estimated that approximately half will reach the end of their service life within 2 years. Hence there is a need for 100-200 new dumpsters to replace the existing stock and enable the expansion of the commercial waste collection service. All dumpsters should be rented out to cover

[51] Based on the current waste generation rate of 1.1kg/person/day (note that much of this waste should not go to landfill (organic waste composted and recyclables recycled)).

depreciation and allow for the replacement of dumpsters as required. Plastic dumpsters should have a service life of approximately 5-10 years although lids, casters and metal components may wear out sooner. Plastic dumpsters (2 yd^3) typically cost around $1,000 (CIF) each.

There are public rubbish containers at several locations on Majuro such as the picnic area at Laura and Delap Park. These containers are usually steel drums, sometimes with plastic bag liners.

5.4 Landfill Equipment

The existing landfill equipment owned by MAWC is listed in the table below.

Table 14: Landfill Equipment

Item	Make	Type	Condition	Life Expectancy
1	Hitachi	Excavator	Working (near new)	10 years
2	Xiajin Machinery	Large Front End Loader	Not working (starter assembly and battery)	5 years
3	Xiajin Machinery	Small Front End Loader	Not working (cylinder head gasket)	5 years
4	Caterpillar	Roller Compactor	Not working (water pump and fuel pipes)	5 years
5	Hyundai	Excavator	Not working (spring for tracks)	5 years

Notes: Life expectancy based on regular preventative maintenance being undertaken and budget available for spare parts as required for repairs.

With the possible exception of the small front end loader, repairs to the landfill equipment that is currently not working should be relatively cheap and straightforward. MAWC should prepare a detailed list of the parts and repairs required for each piece of equipment that is not currently in working condition. The required parts should be ordered and equipment, repaired if economically feasible. MAWC should assess their own equipment requirements and sell or hire out any surplus equipment. Consideration should be given to equipment needs during construction of a new landfill and closing of the existing landfill, in addition to usual landfill operating requirements.

5.5 Recycling

5.5.1 Recycling Activities

There are a limited number of recycling activities being undertaken on Majuro at present. MAWC undertake some separation of recyclables on the tipping floor at the landfill. This is generally limited to the separation of aluminium (Al) cans, cardboard, organic/green waste, steel and various individual items salvaged for repair and re-sale. Currently only a small percentage of the waste stream (<10%) is diverted from the landfill. Only Al cans are currently being exported and the composting operation is very small. There are however significant stockpiles of ferrous metal and organic waste. A separate organic waste collection is undertaken on Saturdays by MAWC.

5.5.1.1 MAWC

Al cans are compacted into bales[52] but the number of cans separated and processed was relatively low (3 months per 20ft container[53]) in June/July 2014 as no refunds were being given for returned cans at that time. MAWC usually buys Al cans for 1c/can but has suspended this due to current cash flow constraints[54]. MAWC also reportedly buy batteries (uLABs) for between $1.00 and $4.00 (depending on size). Currently there are significant stockpiles of Al cans in the community (at the Marshall Islands Club for example). Most of the MAWC income for recycling in 2013 ($34,700) came from the sale of Al cans to Metal Kingdom in Korea. MAWC accounts indicate an expense of $25,310 for Al can and battery purchases. Assuming the majority of this was for Al cans at $0.01/can (significant stockpiling and processing of batteries was not observed), this equates to around 2.5 million Al cans (which at 60 Al cans per kg and $0.88 per kg (see below) matches the recycling income stated above)[55]. The recent arrangement was for Metal Kingdom to pay for all transport costs for exported scrap and then to refund MAWC at the following rates[56].

[52] Existing baler can only achieve container weights of 8t/TEU.
[53] Pers. Comm. Jorelik Tibon, General Manager, MAWC.
[54] Pers. Comm. Jorelik Tibon, General Manager, MAWC.
[55] Based on a container weight of 7 t/TEU that would give a total of 6 20ft shipping containers in 2013. However, 22 containers were reportedly exported in 2013 (Pers. Comm. Joan Quijano, Office Manager/Accountant, MAWC). No other information on these reported shipments was available.
[56] The Korean metal dealer got into trouble with his partners for non-payment of some sort and also with his government for tax evasion. The guy that used to buy from us I hear is in exile in Nauru. Pers. Comm. Jorelik Tibon, General Manager, MAWC.

Table 15: Scrap Metal Values	
Item	
Compressor	$200 / tonne
Electric Motor	$300 / tonne
Electric Wires	$1,500 / tonne
Copper	$1,500 / tonne
Al cans	$880 / tonne
Large Battery	$5 each
Medium Battery	$3 each
Small Battery	$2 each

MAWC records indicate that scrap metal and some PET has previously been exported by MAWC to Eco Metal and Wah Hing Electronic Trading Co in Hong Kong, and Tall Ingots in Australia. Shipping companies used include FSM Line, Matson, Palau Shipping Co. Inc. and RRE Shipping.

MAWC separates some materials at the landfill although the percentage of material diverted from final landfill disposal is low. Organic waste is stockpiled in one area of the landfill and used for a small scale composting operation. There are two MAWC employees dedicated to this activity. Bags of compost are sold for $2.50 each[57]. Ferrous metal is separated from the incoming waste and stockpiled at the landfill. No further processing or export of ferrous metals occurs at present. A heavy duty baler is necessary to enable the baling and export of scrap ferrous metal. MAWC usually offer an EOL vehicle collection service (charging $60 per vehicle) and also allow dumping of EOL vehicles at the landfill ($50 disposal fee) but this has stopped at present due to the lack of space at the Jable landfill. Cardboard and paper were used to make fuel briquettes but this activity has stopped due to a lack of briquette sales. There is limited separation of e-waste and a small stockpile of e-waste, including uLABs, at the landfill.

5.5.1.2 RMI Recycling Company

The RMI Recycling Company (lagoon side opposite the Capitol Building[58]) buys Al cans at $0.10 per lb (equivalent to approximately $0.01 for 3 cans) and compacts into bales for export. It reportedly takes 3 months to fill a 20ft container, and to maintain cash flows containers are often only partly full when they are shipped. Other high value metals (copper and brass) are also recycled but volumes are low. Plastics are not recycled due to shipping costs (need to be ~$500/TEU) with

[57] Do It Best, a local hardware store, sells bags of imported compost, potting mix and topsoil for $5-$8 per bag.
[58] May be the same as Mr Tang's recycling operation identified in the UNDP, 2005 report.

container weights of 8t/TEU possible. Grinding/shredding of PET into bags was preferred as opposed to compacting into bales. Steel is not recycled as this requires heavy compaction machinery. uLABs are not recycled due to safety concerns and regulations. The RMI Recycling Company are interested in expanding recycling activities if the current economic constraints can be overcome via a CDP or other initiative[59].

5.5.1.3 Households and Establishments

The survey of households (155) and commercial establishments (25) undertaken during the field work confirmed that most food waste is separated and fed to pigs and other livestock. There is an initiative by the Taiwan Technical Mission in Laura to double pig production and provide 2 pigs to every household in the RMI[60]. Hence food waste will continue to be used for animal feed, with diversion rates from landfill possibly increasing.

Some households, particularly west of the airport, dispose of organic waste via composting (based on survey results and the Census 2011). There appeared to be a reasonable level of understanding amongst households and establishments of recycling, with some separation of recyclables. There was an understanding however that MAWC separates incoming waste at the landfill, and hence waste is usually not separated by the households.

5.5.1.4 Others

Robert Reimers Enterprises, Inc. (RRE) is also currently investigating recycling opportunities for scrap metal and used oil[61]. Pacific International, Inc. (PII) has exported some shipments of scrap metal from obsolete construction machinery but would prefer to limit their involvement to recycling of their own scrap. The Japan Recycle Corp was closed for the duration of the field work and is understood to no longer be operating.

The Marshalls Energy Company (MEC) are currently building a large warehouse on Majuro and plan to allocate a small area of that for the storage of uLABs from outer island solar energy systems. The collection of these uLABs is yet to commence as MEC are waiting for an $800,000 payment from the RMI government for rental of the solar energy systems. The solar energy system batteries are large gel type lead/acid batteries and MEC expressed a preference for limiting their involvement to the collection and export of these batteries rather than expanding the initiative to include other uLABs[62].

[59] Pers. Comm. Yen Tsung Sheng, RMI Recycling Company.
[60] The Marshall Islands Journal, 30/05/14.
[61] Pers. Comm. Romeo Reimers, Manager, Central Pacific Maritime Agency (A Subsidiary of Robert Reimers Enterprises, Inc).
[62] Pers. Comm. Steve Wakefield, Chief Engineer, MEC.

5.5.2 Recycling Equipment

The recycling equipment currently on Majuro is limited to two Al can balers (low compaction rate giving ~8t per 20ft container) and a wood chipper. The MAWC collection vehicles collect organic waste every Saturday and bulky waste as required. There are some recycling bins, (mainly at the schools and at the entrance to the landfill) but these did not appear to be in use in June/July 2014, although it was school holidays during this time. There are several wire baskets around Majuro, generally directly outside establishments, for Al cans. The small scale composting operation at the landfill utilises manual equipment (small screen, shovels/spades, wheel barrow).

A PET baler (with a broken strapping mechanism) is understood to be present on Majuro[63] but this piece of equipment was not sighted. MAWC previously had a large covered area at the landfill but the roof structure was destroyed in a storm a year or so ago[64].

Table 16: Recycling Equipment

Item	Make	Type	Year	Condition	Life Expectancy[1]
1	Taylor MGF Corp	Aluminium can baler	2008	Working (used with original engine replaced)	5 years
2	Bandit Industries	Chipper	2008	Working (not currently used)	5 years
3	Unknown	Tyre Cutter	Unknown	Not working for 2 years	Obsolete
4 [2]	Unknown	Aluminium can baler	Unknown	Working (unknown condition)	Unknown

Notes:
1 Life expectancy based on regular preventative maintenance being undertaken and budget available for spare parts as required for minor repairs.
2 Based at RMI Recycling Company. Baled cans observed but baling machine not sighted.

[63] NWMS 2012-2016.
[64] Pers.Comm. Jorelik Tibon, General Manager, MAWC.

5.6 End of Life Vehicles

5.6.1 Survey of Numbers

A survey of EOL vehicles from Rita to Laura identified over 360 vehicles (cars, pickups, vans and small trucks). The location of each observed vehicle was recorded (refer to Sheets 1 to 12 in Appendix A). The actual number of EOL vehicles on Majuro, as of June/July 2014, is assumed to be in the order of 500, allowing for EOL vehicles not visible from the main roads, and others that may have been missed.

The local police station was approached to determine the total number of registered vehicles on the Majuro and the number of registration applications (new cars and used cars) each year. This information could not be obtained during the course of the field work. A total number of registered vehicles on Majuro (2,700) is given in the ADB report from 2010[65]. Elm Motors (Hyundai) and Majuro Motors each import around 60 to 70 new vehicles each year. There are also a significant number of used vehicles imported each year either privately or through the various motor trade businesses. Majuro Motors estimated that a total of 500 vehicles may be imported each year. Import statistics from EPPSO were reviewed but information on the number of vehicles imported was not immediately available (database has value (CIF) and import duty ($), rather than the number of vehicles).

5.6.2 Financial

The import duty on a new vehicle is $2,500 and on a used vehicle is $1,500 which must be paid prior to the vehicles being released from customs. Based on total import duty in the EPPSO database (1 April 2013 to 31 March 2014), and an equal split between new and used vehicles, the number of vehicles imported is estimated to be between 300 and 400 per year. It is anticipated that the average life expectancy of a new vehicle will be 8 to 10 years, while that of a used vehicle will be 2 to 5 years. The number of EOL vehicles per year is expected to be similar to the number of vehicles imported each year.

MAWC usually provide a collection service for EOL vehicles for fee of $60 per vehicle and a charge of $50 per vehicle is imposed for disposal of EOL vehicles to the landfill. There are currently no other revenue streams to encourage the collection and recycling of EOL vehicles, with neither the import duty to the RMI government, nor the 4% sales tax collected by MALGov, used for the management of EOL vehicles. Due to the current large stockpile of ferrous metal (estimated to be more than 2,500 tonne, including 500-1,000 EOL vehicles[66]) and

[65] ADB, 2010. *Pre-Feasibility Study, Waste-to-Energy Facility, Majuro Atoll, Republic of the Marshall Islands.*
[66] The footprint area of the two main stockpiles was calculated based on site measurements. Stockpile heights were estimated and a nominal density of 0.5t/m^3 was assumed to allow for the void space within the stockpiles.

the lack of space at the currently landfill, MAWC do not accept EOL vehicles at the landfill at present. Approximately 180 EOL vehicles were collected by MAWC in the 2013 financial year, based on MAWC audited accounts (2013).

5.6.3 Recycling

There is no recycling of EOL vehicles at present. Previously MAWC provided an EOL vehicle collection service, and accepted EOL vehicles at the landfill, but this practice recently stopped due to a lack of space at the landfill. It is unclear when the last export of EOL vehicles (or other ferrous scrap) occurred. Based on the amount of ferrous scrap stockpiled at the landfill it can be inferred that the last significant export of ferrous scrap was some years ago.

MAWC already have the capacity to collect EOL vehicles (based on their collection charge of $60 per EOL vehicle), presumably by towing behind the flatbed truck or other vehicle. A Hiab truck or some other lifting gear would be needed for EOL vehicles that cannot be towed.

Some dismantling of EOL vehicles is needed prior to baling, or to allow manual loading into shipping containers. The engine and transmission, at a minimum, must be removed to allow baling of the remainder of the vehicle[67]. Other parts containing valuable non-ferrous metals should be removed prior to baling. Any useful spare parts should also be removed and sold (value generally higher as a functioning spare part than as scrap). The requirement to remove tyres, plastics and other items would depend on the requirements of buyer of the baled EOL vehicles. Given the low cost of labour on Majuro, dismantling of EOL vehicles to maximise value (spare parts, separated/higher value scrap), is likely to be worthwhile[68].

A baler is generally needed in order to compact EOL vehicles for efficient shipping (up to 20t weight for a 20ft container)[69]. However, the number of EOL vehicles per year on Majuro is too low to justify a permanent vehicle baling machine which is typically capable of baling 10t per hour (more than 5 vehicles/hour). A large baler such as the Sierra RB5000 would be able to bale a year's worth of EOL vehicles on Majuro (assuming 500) within 2-4 weeks[70] [71].

[67] Brett Howlett of CMA Recycling Ltd indicated that the baled vehicle would be put through a shredder on receipt at the scrap metal recycling yard and hence removal of tyres, plastics and upholstery was not necessary (ferrous, non-ferrous and other materials separated by magnets, eddy current separators, gravity post shredding). While this would have the added benefit of reducing waste to landfill on island, the value of the baled EOL vehicles (and return to the operator) would be less due to the mixed nature of the ferrous scrap.

[68] A large baler may be better in the short term for addressing the current large stockpile of scrap at the landfill.

[69] Manual loading of containers is possible where scrap can be reduced to manageable size pieces (by cutting, shearing, grinding or gas axing).

[70] Note that EOL vehicles would have to be collected and dismantled in advance, and stockpiled ready for baling, to make optimum use of a large baler's processing capacity.

[71] Rental rate for the Sierra RB5000 (refer Appendix H) is NZ$6,500 per month (Pers. Comm. Brett Howlett, CMA Recycling Ltd). The rental period would be from pick up from the CMA yard in Auckland to drop off at the same location. A NZ$100,000 bond would be needed (to cover damage

Smaller balers such as the RJ100 (Alert Engineering Ltd) are used for baling steel but more cutting and disassembly of EOL vehicles would be needed. This is likely to be the best option unless a larger vehicle baler can be leased for a short period (say 1 month each year) or shared with other Pacific Islands that have a similar stockpile of EOL vehicles. A ferrous baler is understood to be arriving on Majuro in March 2015 (donated by the Government of Japan)[72]. Refer to Section 7.2 and Appendix H for a costed design for the recycling of EOL vehicles and the current ferrous stockpile at the landfill, using the Sierra RB5000 baler or a smaller ferrous baler such as the RJ100 (the baler arriving in March 2015 is assumed to be similar)[73].

Shipping is typically undertaken with 20ft containers but some scrap was reportedly exported a few years ago by barge by Pacific International Inc. Similar barge shipments have occurred at other Pacific Islands in the past but this option tends to be a 'one off' or, at the least, irregular.

The storage and processing of EOL vehicles would ideally be undertaken on a closed section of landfill, in close proximity to the MRF, and not too far from Majuro Port. Land rental will need to be factored in where the EOL vehicle yard is located away from the landfill[74].

5.6.4 Incentive Mechanism

In the short term, options for incentive mechanisms to support EOL vehicle recycling are limited. Under the recent scenario, where MAWC charged $50 to $60 the receipt/collection of EOL vehicles, a reasonable number of EOL vehicles (180 in 2013) were disposed of to the landfill (for stockpiling and eventual recycling). If baling equipment was available on Majuro for the baling of ferrous scrap (including EOL vehicles), either permanently (or short term for a larger leased baler), then it might be cost effective to temporarily waive or reduce the landfill fee ($50 per EOL vehicle) to encourage the drop off of EOL vehicles to the landfill. An 'at cost' collection service could be provided by MAWC for EOL vehicles that could not be dropped off. The EPA might be able to encourage people to give up their EOL vehicles through the enforcement of existing environmental regulations.

Longer term options for an incentive mechanism for the recycling of EOL vehicles are discussed below.

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to the baler). There are risks with losing some/all of the bond in the event of damage to the machine, and rental cost increases if shipping and/or baling of scrap takes longer than anticipated.

[72] Pers. Comm. Stewart Williams, PacWaste Project Manager, SPREP. The details of this arrangement (such as where the unit will be located, who will own/operate it, model number/capacity, power requirements, etc) are not known.

[73] Costed designs based on a ferrous scrap value of $200/t (current in mid-2014). Note that ferrous scrap value in May 2015 is $75/t.

[74] A land rental cost of over $3,000/acre/year was indicated by Steve Wakefield, Chief Engineer, MEC.

There is already a significant amount of import duty ($1,500 for a used vehicle and $2,500 for a new vehicle) and MALGov sales tax (4% of sale price) associated with the import and sale of vehicles. A portion of this money could be set aside to contribute to the processing and export of vehicles once they become EOL vehicles. Another option would be to include vehicles in a CDP, with a deposit paid on import into the CDP account. A third option would be to include a deposit in the vehicle registration fee (also paid into a dedicated account).

A sum of $100 per vehicle (paid on import/sale/registration) would allow for a $50 to $80 refund once the EOL vehicle is dropped off at the EOL recycling yard. This refund would be claimed by the ones dropping off the EOL vehicle and hence would provide an incentive for a tow truck, flat deck or hiab truck operator to pick up and deliver EOL vehicles. At worst, MAWC or the EOL recycling yard operator could pick up the EOL vehicles and claim the refund to cover their costs. Priced correctly there should be enough incentive for EOL vehicles to be dropped off to the EOL recycling yard rather than being spread across Majuro Atoll.

The remaining $20 to $50 would be claimed by the EOL recycling yard operator to help cover costs associated with processing of the EOL vehicles. This claim would ideally be made/approved on export of the EOL vehicle for recycling. As part of the processing, the EOL recycling yard operator could strip EOL vehicles for spare parts and non-ferrous metals to maximise their income.

The system would have to be designed well to minimise the risk of abuse of the system. This could be achieved through appropriate timing of refunds/claims to encourage the desired outcome, and could work in with the existing vehicle registration system (number plates) to ensure that a vehicle only enters the system once. The system would need to be phased in to ensure that there are sufficient funds available to prevent collapse of the system. Vehicles imported and sold prior to implementation of the deposit/refund system may need to be treated separately, unless there was sufficient funding from outside the system to support their inclusion (some of the import duty/sales tax could be claimed). With a deposit of $100 per vehicle and up to 500 vehicles per year there would be $50,000 per year going through the system.

6.0 Waste Collection System Improvements

Recommendations for the improvement of solid waste collection systems on Majuro are summarised and illustrated in Diagram 2 in the Executive Summary. While the current wheelie bin system is working reasonably well (in terms of waste containment and collection, but not financial sustainability), only half of the 4,000 households on Majuro have a wheelie bin (donated by the Government of Japan).

The household survey data indicated a general preference for the continuation and expansion of the wheelie bin system. That is understandable given that they

are tidy and convenient, and, after people have used a wheelie bin it can be a difficult task convincing them that another system (such as the prepaid bag system) is better. However, there are several disadvantages to the continuation and expansion of the wheelie bin system on Majuro Atoll as summarised below.

- At least 2,000 more wheelie bins are needed to provide one wheelie bin per household on Majuro Atoll at a cost of at least $170,000 (based on $85/bin), and a further 350 at a cost of $30,000 might be needed to replace existing bins that have been damaged. Hence there is a capital cost of approximately $200,000 to expand the wheelie bin system to cover all of Majuro Atoll.
- Once established, there are ongoing costs for replacing wheelie bins. Based on a 10 year service life as indicated by the manufacturer of the existing wheelie bins, this equates to $35,000/year. It will be difficult to get local households to pay for replacement bins.
- Collection of revenue is more difficult with a wheelie bin system compared to a prepaid bag system. This makes it difficult for a waste collection system based on wheelie bins to achieve financially sustainability.
- Existing wheelie bins are very large (360L) which dis-incentivises the separation of organic waste and recyclables. Thus collection volumes will be higher with large wheelie bins compared to smaller prepaid bags which, due to their smaller size and their cost, encourage the diversion of organic waste.

The current wheelie bin based household waste collection system costs approximately $100/tonne to operate as noted under item 5 in the Executive Summary. This does not include the capital costs for new or replacement wheelie bins noted above. This cost per tonne is relatively high compared to the range calculated for a prepaid bag system ($30 to $75/tonne) below. Also, as well as being more expensive on a cost per tonne basis, the total cost of a wheelie bin system will be significantly higher than for a prepaid bag system due to the higher volume of waste generated (due to the high proportion of organic waste in the wheelie bins which would be diverted and not require collection and landfilling under a prepaid bag system).

6.1 Costed Design of the Prepaid Garbage Bag

6.1.1 Introduction

A prepaid garbage bag system for households and smaller commercial waste generators has worked successfully in a wide variety of countries and contexts. Such a system (The Green Bag) is currently being used on South Tarawa, Kiribati. It was initially established in 2004 and then resurrected in 2012. The scheme is

reportedly used by 62% of households[75]. A similar system was attempted in Port Vila but was abandoned due to complaints from the public regarding the cost of the prepaid bags and duplication of waste collection fees (still included on property tax invoices)[76]. A prepaid bag system is reportedly commencing in Luganville Province in Vanuatu in March 2015. An intensive public awareness campaign is planned for February, immediately prior to implementation of the system (a significant amount of public awareness work is already being done). A prepaid bag cost of around $0.80 per bag is proposed (roughly the cost of a bowl of kava)[77].

In a prepaid garbage bag system only waste in the prepaid bags (usually brightly coloured with instructions written on one side) is picked up by the collection trucks. Locals buy the prepaid bag from local retail outlets. Money from the sale of the prepaid bags is split between the waste collection operator and the prepaid bag distributor and retailers to cover the costs of supply, distribution, collection and disposal of the filled/used prepaid bags. The prepaid bag system has several benefits, with the main ones being the generation of revenue (user pays), the containment of waste (to improve collection efficiencies) and waste minimisation (encourages diversion of organic and recyclable wastes).

6.1.2 Situation Analysis

There are obvious similarities between the Majuro and South Tarawa (both atolls with similar population densities), but also significant differences in the context of SWM. Prior to the implementation of The Green Bag system on South Tarawa (in 2012) only one third of households received a waste collection service and much of the collected waste is not well contained. Waste collection on South Tarawa has been the responsibility of the two local councils. In contrast, approximately three quarters of the population on Majuro currently receive a free weekly collection service and approximately half of the population have been provided with free wheelie bins. Hence, on Majuro, the incentive for most of the local population is the long term sustainability of an efficient and reliable waste collection service, rather than the provision of and/or significant improvement in the waste collection service as on South Tarawa. The household survey indicated a reasonable level of willingness to pay up to $0.50/prepaid bag for waste collection (65% willing to pay).

6.1.3 Costed Design

A costed design of a prepaid bag system has been completed. Costs for the collection of the bags have been calculated based on MAWC costs for 2013.

[75] USAID/Pacific Islands Quarterly Newsletter, November 2013, Issue 8.
[76] ADB, 2014. *Solid Waste Management in the Pacific. Financial Arrangements*.
[77] Pers. Comm. Gina Tari Buletare (Waste Management Officer, Luganville Municipal Council) and Sean Toland (Senior Geo-Environmental Scientist, GHD Ltd (formerly a solid waste volunteer in Vanuatu)).

Various assumptions have been made to calculate the collection cost as detailed in the high and low costed design spreadsheets in Appendix F. Both high and low costed designs assume one driver and three collection workers using one of the existing large rear loader trucks, some administration costs, and depreciation of equipment (straight line at 10% over 10 years). The high collection cost estimate assumes that 25% of MAWC expenses (2013) for depreciation on office equipment, fuel and oil, repairs and maintenance, and miscellaneous expenses apply to the prepaid bag collection service[78]. The low collection cost estimate assumes that 10% of the above MAWC expenses (2013) apply to the prepaid bag collection service[79]. The high and low collection cost estimates are $0.53 and $0.33 per prepaid bag, which equates to between $50 and $75 per tonne (based on a 7kg prepaid bag weight). This is significantly less than the current collection system on both a total cost basis (as expected since more organic waste and recyclables would be diverted), and on a cost per tonne basis.

A third scenario (mid), based on waste tonnages, has been used as a further check. Under this scenario it is assumed that 50% of MAWC expenses are for household waste collection (the other 50% being for commercial, bulky and organic waste collection, recycling activities and landfill management). Based on the current household waste composition, only approximately one third of the current household waste stream should end up in the prepaid garbage bag (organics and recyclables diverted). Hence collection costs for the prepaid bag system under this scenario are $0.43 per prepaid bag.

Basic sensitivity analysis has been undertaken on the prepaid bag costed design to understand the influence of prepaid bag costs and numbers. The supply cost of the bags is fixed at around $0.25/bag. Assuming the mid-range prepaid bag scenario, the collection cost is estimated to be $0.43/bag for 1 bag per household per week (or 4,000 bags per week). Using the same mid-range cost scenario and scaling up variable costs by a factor of 1.5, the collection cost is estimated to be $0.26/bag for 2 bags per household per week (or 8,000 bags per week). This equates to a cost of under $40/t for collection. Under this scenario the breakeven cost for the prepaid bag system would be $0.50/bag (not too dissimilar to the predicted breakeven cost of the prepaid bag system on South Tarawa ($0.40/bag)[80]).

[78] MAWC were using 2 rear loader and 1 front loader garbage trucks, and 1 excavator at the landfill in June/July 2014. Hence the use of 25% of MAWC expenses for the high collection cost estimate. The flat deck truck, other vehicles and equipment, and other activities were ignored in the high collection cost estimate.

[79] The low collection cost estimate assumes 10% of MAWC expenses as one of the existing large collection trucks has the capacity to collect all of the prepaid bags within 3 days per week (assuming 1 bag/household/week) and makes some other allowances for possible increases in efficiency.

[80] ADB, 2014. Assuming a prepaid bag weight of 7kg per bag and bag supply cost of A$0.20, the collection cost is approximately $30/t (ignoring any exchange rate differences between A$ and US$).

It is worth noting that in all scenarios depreciation on the collection truck is a significant expense due to the high cost of the existing rear loader trucks used on Majuro (large and relatively new). Smaller, cheaper garbage trucks (such as the Sterling truck which was not working in June/July 2014) may be more suitable and cost effective for the situation on Majuro[81]. Actual collection costs should be calculated and monitored on implementation of the prepaid bag system to revise the estimates above.

The cost of supply and distribution of the prepaid garbage bags is based on quotes from two plastic bag suppliers in New Zealand, margins of $0.05 per prepaid bag each for the distributor and retailers, and standard import duty (12% of CIF). The supply and distribution cost is calculated to be $0.25 per prepaid bag and is used in all three scenarios described above. Some reduction in the supply and distribution cost may be possible if prepaid bags are sourced direct from China, import duty is zero rated and margins for distributor and retailers are negotiated down.

Overall a prepaid bag system is anticipated to cost between $0.50 and $0.80 per prepaid bag, which, at the lower end, is similar to the cost of a can of coke ($0.50 in June/July 2014). Assuming 1 prepaid bag per household per week this equates to between $31.20 and $41.60 per household per year (less than 0.5% of the median household income, with the prepaid bag expense spread over the year).

6.1.4 Implementation

There are several challenges to implementing a prepaid bag system on Majuro including gaining Cabinet approval (election coming up in November 2015) and getting cooperation from the public who, in general, are used to a good weekly wheelie bin collection service provided free of charge[82]. A significant amount of consultation, public engagement and education will be needed. The current weekly wheelie bin collection service has only recently been implemented (approximately 2 years ago) and is a significant improvement on the prior situation (in terms of the containment of waste and keeping neighbourhoods clean). Hence there is a risk that introducing a new system, particularly a user pays system, may result in an increase in undesirable waste disposal practices (burning, burying, fly dumping, disposal to ocean or lagoon) or collapse of the household waste collection system altogether.

A prepaid bag system could work in well with the existing subsidised household waste collection system (prepaid bags can be picked up by the existing rear

[81] Potential cost savings from the use of smaller/cheaper collection vehicles has not been considered given that there is surplus capacity with the existing rear loader trucks on Majuro and replacement trucks should not be needed for several years.

[82] There did not appear to be a high level of use of big black garbage bags by households within the collection area, with wheelie bins most commonly used for waste containment. Those without a wheelie bin appeared to use other bins, cardboard boxes and small plastic bags. Hence few households currently pay to use black garbage bags.

loader trucks), with the existing wheelie bins phased out as the prepaid bag system becomes established[83]. In the interim the wheelie bins could continue to be used as a receptacle, but only filled with waste in prepaid bags. The cost of implementing a prepaid bag system would be minimal, assuming use of the existing subsidised household collection service until the cost of the prepaid bags is increased to achieve full cost recovery.

Implementation of a prepaid bag system would ideally occur in tandem with a CDP (to remove recyclables from the landfill waste stream), and with promotion of organic waste diversion and composting. Organic waste collection may be worthwhile although it is difficult to achieve cost recovery unless the avoided cost at the landfill is included (estimated to be $50/t). If undertaken, say on a fortnightly/biweekly basis, the existing wheelie bins could be used for organic waste. A significant amount of education and monitoring would be needed to ensure that such a system was not abused (landfill waste hidden in wheelie bins). The cost of a separate organic waste has not been calculated. Organic waste collection should not be required from the airport to Laura where there is sufficient space for composting activities.

A basic outline of steps for the implementation of a prepaid bag system is given in the table below. Implementation would have to be phased to allow for the new system to bed in prior to passing on the full costs to the public. The costs of subsidising the prepaid bag system for 1 year would be minimal provided that the collection of the prepaid bags is incorporated into the existing household waste collection system (which is already subsidised).

Table 17: Prepaid Bag Implementation Summary

Item	Key Implementation Tasks	Responsible Agencies
1	Detailed planning, Cabinet approval and tendering/engagement of local partners.	MPW/OEPPC
2	Design and order prepaid bags (two shipments of 100,000 each).	Distributor
3	Design and implement public education and promotion including distribution of free bags for the first month (8 per household (32,000 bags). Promote the diversion of organic waste and recyclables via composting and use of recycling drop off points.	MAWC/EPA (with OEPPC & NGOs)

[83] If the existing large wheelie bins could be recovered they could be sold or leased to establishments and become part of the commercial waste collection system (one of the existing rear loader trucks would be used for collecting commercial waste from these wheelie bins).

Table 17: Prepaid Bag Implementation Summary		
Item	Key Implementation Tasks	Responsible Agencies
4	Prepaid bags distributed to stores throughout Majuro. Initial price 30c per bag for at least 6 months to let the new system bed in (similar cost to black garbage bags at Ace Hardware).	Supermarkets and corner shops
5	Project management team to monitor use of the prepaid bags and further public awareness and education requirements, and gather data for detailed cost analysis.	MAWC with EPPSO, NGOs
6	Increase price (rate of increase to be determined through consultation) to 60c per bag with the project management team monitoring use and gathering further cost data.	MAWC with EPPSO, NGOs
7	Confirm final costing and implement.	MAWC

6.2 Additional Costed Recommendations

JICA are understood to be planning some changes to the waste collection system on Majuro with waste (in wheelie bins) to be collected from centralised collection points (1 per weto (neighbourhood) and possibly also a separate recyclables collection service. The expected efficiency gain from the centralised collection points may not be that significant given that traffic speeds are low. The main driver for centralised collection points is a possible reduction in fuel consumption, as based on waste generation rates and the capacity of the two large rear loader trucks currently in use there is excess collection capacity. Increasing the efficiency of the waste collection service would become a factor if separate recyclables collection is undertaken. The cost of a separate organics and recyclables collection service should be calculated prior to implementation.

The cost of repair of the large and small rear loader garbage trucks currently out of service should be determined and the repairs completed if economically viable. Vehicles not in regular use can quickly become EOL vehicles and hence it is recommended that all operational vehicles are used on a regular basis to ensure that they remain in working order.

Significant sums of money set aside each year with depreciation (over $200,000 in 2013). MAWC need to ensure that this money is used for the replacement of old equipment, or, if appropriate, for the repair of existing equipment to prolong service life. Replacement garbage trucks should not be required for at least 5 years (the only exception being a second front loader to reduce operational risk if the front loading dumpster system is to continue for commercial waste).

Smaller compactor trucks may be more appropriate for Majuro and are significantly cheaper to purchase than the current large trucks.

Additional costed recommendations are summarised in the table below.

Table 18: Collection System Recommendations

Item	Recommendation	Cost
1	Amend the current household collection schedule to maximise utilisation of trucks and expand service to Laura.	-
2	Collection workers to be careful in handling wheelie bins and dumpsters to maximise life expectancy	-
3	Purchase front or rear load dumpsters and expand the commercial collection service to more customers – 200 dumpsters (2yd^3) ($1,000/dumpster)	$200,000
4	Increase charges for the commercial collection service to ensure that cost recovery is achieved.	-
5	Investigate the option of using wheelie bins for smaller commercial waste producers and charge an appropriate amount for a weekly collection service.	-

7.0 Recycling Programme Improvements

There are several recycling programme improvements discussed in the sections below. The primary mechanism for improving recycling is implementation of a CDP focussing on Al cans, PET bottles, glass bottles and uLABs. Recycling of ferrous metals should also be undertaken but is more challenging with the relatively low (and volatile) value of ferrous scrap and the heavy baling equipment needed to maximise container weights for shipping, unless manual filling of shipping containers is undertaken (requires scrap to be cut down to manageable size). In terms of achieving high diversion rates from the landfill there should be a significant focus on organic waste given the size of this waste stream (50% of total waste stream (green waste, paper, cardboard and kitchen waste).

There are many resources available with information on the practicalities of recycling various materials, including the Rubbish is a Resource kit available on the SPREP website[84]. This resource kit provides a large amount of practical information for anyone interested in recycling in the Pacific.

[84] http://www.sprep.org/att/publication/000496_WasteKitBookLR.pdf accessed on 29/10/14.

7.1 Costed Design of the Container Deposit Programme

7.1.1 Introduction

A Container Deposit Programme (CDP) is a system set up where a deposit is included in the cost of an item when the item is imported. This deposit is held in a dedicated account. When the item is returned empty to the recycling depot, or other nominated collection point, the person returning it receives a refund. The refund is typically slightly less than the deposit, with the difference being used to operate the collection and recycling operation. Legislation is used to regulate the process and protect the funds being collected.

This is a simple way to receive containers for recycling as they are not mixed with other wastes and therefore do not require sorting. The containers are then processed (usually crushed and baled) and packed in a shipping container and exported for recycling. CDPs have been established in Kiribati (2004), Kosrae and Yap in the Federated States of Micronesia, and in Palau (2011). These provide examples of CDP legislation as well as working examples of CDP in relatively similar environments.

A United Nations Development Programme (UNDP) funded project on waste reduction in the urban Marshall Islands is presented in a report titled Ejjelok Kwopej! Turning Rubbish into Resource (Leney, 2005). This report presents a costed design for a CDP in Majuro, outlines how a CDP could be implemented and presents information on Container Deposit legislation. Reference is made in this report to the CDP established in Kiribati in 2004. The report concludes that, based on information available in 2005, implementing a CDP for urban Majuro is feasible for Al cans and PET bottles, with other recyclables possibly added later. A deposit of 6c per container and a refund of 5c per container were proposed, with 1c per container for the recycling operator.

The CDPs in Kosrae and Yap are similar to the Kiribati CDP, and to the CDP proposed for Majuro in 2005 (deposit and refund amounts similar). The CDP in Palau is slightly different with a deposit of $0.10 per container, refund of $0.05 per container and $0.025 each for the MRF operator and a recycling fund. The Palau model provides a healthy refund amount to encourage high recycling rates, while also providing substantial sums to the MRF operator and the recycling fund. The possibility of implementing a CDP similar to Palau should be discussed as there are significant advantages to this approach over the CDPs implemented in the other locations. It might however be difficult to get a CDP implemented if there is opposition to or concern over a high deposit amount. The deposit, refund and handling fee proposed in this report for a CDP in the RMI ($0.05, $0.03 and $0.02 respectively) achieves a balance between keeping the deposit to a minimum, providing a reasonable level of incentive for the public to recycle and sufficient funds to operate the MRF and export recyclables.

Building on the information presented in the Palau CDP document (MPIIC, 2013) and the UNDP report (Leney, 2005), the following data has been updated to represent the current situation:

- An assessment of potential containers to be included in a CDP
- Purchase rates for recyclable containers
- Shipping costs
- Expected quantity of containers considered under a CDP
- Capital and operating costs for a CDP

This information is outlined in the following sections.

7.1.2 Materials Considered for the CDP

The UNDP report (UNDP, 2005) considered PET plastic and aluminium beverage containers, such as beer, soda and water containers, as the bulk material of interest. This is still the case. Glass has been included with the material being considered for on-site processing and reuse. uLABs are also considered under the CDP due to their value and the risk to the environment if they are not recycled appropriately. High Density Polyethylene (HDPE) bottles may also be suitable for inclusion in the CDP although there is currently no data on potential volumes.

There are several sources of information that can be used to estimate the expected quantities of CDP materials, namely import/customs data (RMI data rather than Majuro only), waste generation and composition (Majuro data) and previous estimates (UNDP, 2005) (assumed to be Majuro data). There are limitations with each information source, with import data based on value ($) rather than quantity[85], waste generation/composition data based on limited sampling and the UNDP estimates being 10 years old.

Table 19 shows the estimated number of containers based on each information source. As noted in Section 5.1, using the recent waste generation and composition data gives unrealistically high estimates for the number of containers per year (particularly so for Al cans and PET bottles due to their light weight (if clean and empty)).

[85] Many shipments are mixed so not sure of the amount of CDP items in some of the shipments. For alcohol containers (beer, wine, spirits, ready-to-drink (RTDs)) the value of the import duty (higher due to contribution to the College of the Marshall Islands) was used to refine the estimates.

Table 19: Expected Quantities for Recyclables

Type	Import Data 2013	Waste Gen/Comp 2013	UNDP, 2005	Comments
Al cans	6 M (0.6)	34 M (3.4)	5 M (0.5)	MAWC and the private recycler both indicated 2-3 months for a full container load
PET bottles	2 M (0.2)	13 M (1.3)	1 M (0.1)	Import data figure for water only
Glass bottles	1 M (0.1)	2.0 M (0.2)	-	Import data estimate is for beer bottles only (not food bottles and jars).
ULABs	1,000	-	-	Actual figure likely to be at least 2,000.

Notes: Number in brackets () = the number of cans/bottles per person per day, useful as a check on the estimated quantities. M = million.
The import data does not differentiate between beer in bottles and cans. Based on observations while on Majuro a 50:50 split is assumed. A total of 2 M beer bottles/cans is estimated from the import data.
Import data is from April 2013 to March 2014 inclusive.

From the table above, the import data is understood to be the most reliable and has been used in the costed design calculations in Appendix G. The import data numbers correspond reasonably well to real data from existing CDPs in the Pacific as summarised below[86]. Note that Palau and FSM (Yap and Kosrae) have similar links to the USA as RMI (Compact of Free Association) and hence GDP per capita is similar, and approximately twice that of Kiribati.

- Palau – 23 million containers (population approximately 21,000)[87]
- Yap – 2.4 million containers (population approximately 11,200)
- FSM (Kosrae) – 8.1 million containers (population approximately 7,700)
- Kiribati – 3.7 million containers (population approximately 50,000 on South Tarawa)

More detailed numbers for Yap indicate that there are approximately 2.5 million Al cans, 400,000 PET bottles and 25,000 glass bottles being recycled through the CDP[88]. A survey in Palau in 2005 indicated that 11 million Al cans were imported

[86] Richards and Haynes, 2014.
[87] The much higher number of containers passing through the CDP in Palau is likely to be due, at least in part, to the much higher number of tourists visiting Palau (over 100,000 in 2013) compared to Kiribati, FSM and RMI.
[88] Fillmed, 2014.

annually[89]. In September 2012, a total of 2.7 million containers were received by the Redemption Centre in Palau during that month[90].

7.1.3 Markets and Rates

Advice has been sought from two leading recycling firms, CMA Recycling Ltd (a scrap metal dealer based in Auckland, New Zealand) and Visy (MRF operator with facilities in Australia and New Zealand). Both of these recycling firms have experience in the Pacific Islands. They have provided advice on current purchase rates for the materials as well as practical advice on pre-processing the materials on island and potential issues with contamination. Current markets and rates are presented in the table below.

There is also the possibility of exporting recyclables based on a Free Alongside Ship (FAS) arrangement with a buyer. In this case the buyer is responsible for all shipping and the seller (the MRF operator on Majuro) just has to load the container and transport it to Majuro port on the arranged day. The revenue to the CDP operator would be lower under this arrangement but it may be worth considering if the primary objective of the CDP is to export recyclables from Majuro Atoll. Visy have expressed interest in a FAS arrangement for recyclable materials from Majuro and other Pacific Islands. Visy recycle all of the types of material below so the CDP operator would only have to deal with one buyer rather than multiple buyers under other arrangements[91].

Table 20: Markets for Recyclables

Item	Type	Value	Market
1	Al cans	$1,200/tonne	Korea
2	PET bottles	$500/tonne	Australia, Thailand, China
3	Glass bottles/jars	None	None (crush and use on Majuro)
4	uLABs	$600/tonne	Korea, Philippines
5	Ferrous metal	$200/tonne	Indonesia
6	Non-ferrous metal	Various	China, Korea
7	Cardboard	$180/tonne	China, Indonesia

Notes: Values in mid-2014 (note that ferrous metal value had fallen to ~$75/t by May 2015).

[89] Hajkowicz et al, 2006.
[90] MPIIC, 2013.
[91] The deal with Metal Kingdom is understood to have been a FAS arrangement, although Metal Kingdom were only interested in Al cans and other high value non-ferrous metals.

The markets for recyclables and the value of scrap are subject to change based on a range of factors. The Global Financial Crisis (GFC) in 2008 resulted in a significant drop in scrap prices due to a reduction in demand for metals[92]. Korea has recently been the primary market for recyclables from the Pacific (Fiji)[93] and there is high demand for recyclables (particularly scrap metal) in China. The market value of recyclables is very dependent on how clean and pure the recyclables are, with mixed scrap being of very low value[94] [95].

7.1.4 Shipping

A significant amount of scrap metal from the Pacific has been exported to Australia and New Zealand for processing and subsequent export on to the primary markets in Asia. This is an option for countries in the South Pacific where there are established shipping routes and freight costs are not too high. A detailed analysis of reverse logistics (shipping from the Pacific Islands) has been completed as part of the J-PRISM project[96]. This project focussed on Fiji, Samoa, Tonga, Tuvalu and Vanuatu, but provides a useful reference document for understanding and planning shipping elsewhere in the Pacific.

The RMI however has closer ties to the USA (regular shipping route from the West Coast via Hawaii) and other Island states in the north Pacific. Guam is the main shipping hub for the region and there are regular links from Guam to the main recycling ports in Korea, China and other Asian countries.

The quoted cost of shipping for a 20ft container from Majuro to Ningbo, Hong Kong and Busan ranged from $1,200 to $1,400 (ocean freight + BAF)[97]. Shipping prices in the Pacific are relatively high due to low volumes and limited competition. Additional costs for land transport to Majuro Port, terminal handling, documentation, etc. also need to be allowed for and hence a shipping cost of at least $2,000 per TEU is used in the CDP costed designs in Appendix G.

7.1.5 CDP Costs

The costs associated with operating the CDP are summarised in the costed design spreadsheets included in Appendix G. A summary of approximate costs is presented in the table below. A deposit of $0.05 per container is assumed for Al cans, PET bottles and glass bottles, with a refund of $0.03 per container and the remaining $0.02 per container used to support the MRF. For uLABs a deposit of $5 per uLAB is proposed, with $3 per uLAB refund and $2 per uLAB used to support the MRF. Under this costing scenario an operating surplus of $125,000

[92] JICA (2013) attributed the drop in scrap price to a reduction in demand following the Beijing Olympics in 2008.
[93] Amano, 2014.
[94] Pers. Comm. Brett Howlett, General Manager, CMA Recycling Ltd.
[95] Minter, 2013.
[96] JICA, 2013.
[97] Quote from Mariana Express Lines. See Appendix G.

per year might be achievable (almost entirely due to Al cans with the other CDP items at cost recovery).

Table 21: CDP Cost Summary

Item	Capital Costs	Operating Costs	Operating Revenue	Operating Profit (Loss)
Al cans	$115,000	$300,000	$420,000	$120,000
PET bottles	$65,000	$120,000	$125,000	$5,000
Glass bottles/jars	$35,000	$40,000	$40,000	$0
uLABs	$30,000	$30,000	$30,000	$0
Total	$245,000	$490,000	$615,000	$125,000

Notes:
Establishment of an MRF is estimated to be $100,000 (buildings, administration, amenities, power) shared between the various CDP materials on the following basis (Al cans 50%; PET bottles 25%; Glass bottles 15%; ULABs 10%).
Capital costs for establishing the MRF in Palau were $200,000 for the building (constructed in stages as funds allowed) and $420,000 for the equipment (generally 2 of each piece of equipment to handle the number of containers and to reduce operational risk) (see MPIIC, 2013).
MAWC already have staff and equipment allocated to recycling activities, and (potentially) space at the landfill for an MRF. Hence it makes sense, at least initially, for MAWC to be involved in operating the MRF.

The cost to build a basic MRF on Majuro is $60 to $100 / ft^2 (warehouse with office and amenities)[98]. There may be other cheaper options such as a temporary structure on a closed part of the landfill (using 40 ft shipping containers for walls (3 sides) with a concrete floor and canopy roof), or leasing an existing building (if something suitable is available). A cheaper temporary facility may be more suitable in the short term until a CDP and recycling activities are established, and sufficient funds accumulate in the CDP account. Compact infrastructure funding could be accessed for the establishment of a MRF, although in the short term most or all of these funds will be going towards the establishment of a new landfill.

Recycling of materials and diversion from the landfill also results in an avoided cost based on the value of landfill airspace. Based on previous studies a landfill airspace value of $50/$m^3$ is assumed[99]. The avoided cost of saving landfill airspace has not been included in the calculations in the table above. Some of the profit from the CDP could be used to support other activities that divert waste from the landfill such as promoting home composting of organic waste, and provision of an organic waste collection and centralised composting operation.

[98] Pers. Comm. Steve Wakefield, Chief Engineer, MEC. Scott Howe, Jaemar Construction, indicated a build cost of approximately $100 per ft^2.
[99] Leney, 2005 and Beca, 2003 (scaled up based on the 10 years since these estimates were given. The current RFP for the proposed Jenrok landfill will provide a more up to date estimate.

7.1.6 Pilot Trial

A pilot trial would be beneficial to test the implementation of a CDP for Majuro, although there may be sufficient Pacific Island experience in implementing CDPs to forego a pilot trial[100]. A pilot trial should be restricted to a limited number of 'container' types, with Al cans, glass bottles and uLABs recommended. A pilot trial could be implemented by MAWC utilising existing landfill and recycling facilities, and staff, as summarised below. Refund rates of $0.02 per Al can, $0.01 per glass bottle and $2.00 per uLAB would provide a reasonable level of incentive for the public and would not be too expensive to fund. PET bottles should not be included in the Pilot CDP Trial as baling equipment is not currently available on Majuro. The CDP trial would ideally run for at least 1 year.

Drafting, consultation and Cabinet approval of container deposit legislation should commence in tandem with the CDP trial. Ideally the Pilot CDP Trial would continue until the container deposit legislation becomes law and the official CDP commences (if funding allows). Alternatively the CDP pilot trial could be run prior to drafting of the CDP legislation, with the information gathered during the CDP pilot trial used to ensure that an appropriate level of incentive is established to achieve good recovery rates (>80%) for the recyclable items. The CDP legislation could then be implemented and deposit funds accumulated for a period to guard against cash flow problems that may occur once refunds for returned containers commence[101]. There is often a stockpile of containers in the community which, if redeemed, can adversely affect the economics of the CDP in the first months/years of operation. Refer to Appendix G for further detail on the Pilot CDP Trial.

Table 22: Pilot CDP Trial

Item	Action	Cost
1	Set up MRF and systems for CDP for Al cans, glass bottles/jars and uLABs at the current landfill at Jable. To be operated by MAWC.	
	a. Organise secure receiving area and measuring equipment (use a wheelie bin or wire cage for measuring volume) for public drop off of CDP items.	$0
	b. Organise accounting and payment systems for handling money. A separate Pilot CDP Trial bank account is recommended. Seed funding required to start the Pilot	$96,000

[100] The CDP in Palau was started without a feasibility study (MPIIC, 2013)
[101] The CDP in Palau had a 6 month start-up period during which deposit funds were collected prior to the opening of the redemption centre. After a year of operation a monthly limit was imposed on the rate of redemption to ensure that the sufficient funds continued to be available (MPIIC & KSG, 2013).

Table 22: Pilot CDP Trial		
Item	Action	Cost
	CDP Trial (further replenishment will be required if the pilot trial is to be ongoing, but could just run for a fixed period).	
	c. The trial could utilise the existing Al can baler and MAWC recycling staff prior to purchase of a new RJ Midi baler[102].	$0
	d. Set up area for the storage of glass bottles (prior to crushing and use as sand replacement – crushing equipment not proposed for the Pilot Trial).	$0
	e. Buy shipping container (20ft) for storage of uLABs (handling and storage to be in accordance with Basel Convention recommendations).	$3,000
2	Advertise (radio, posters and MI Journal) and commence the Pilot CDP Trial.	$2,000
3	Receive CDP items and pay out refunds[103]. Use existing MAWC systems and staff that have been used for the $0.01/Al can refund previously offered by MAWC.	$0
4	Export Al cans and uLABs in accordance with regulations[104] as soon as full 20ft container loads have accumulated, with revenue from sale of Al cans and uLABs reinvested in the Pilot CDP.	$0
5	Keep records of all Pilot CDP Trial activities and audit accounts on a regular basis to monitor and evaluate the Pilot CDP Trial.	$0
6	Report on Pilot CDP Trial, including costs, on a quarterly basis.	$0
	Total	$101,000
Notes: Pilot CDP Trial should be funded in stages (say $25,000 per stage). The actual subsidy required will likely be significantly less given that MAWC has existing staff, equipment and facilities to undertake the Pilot CDP Trial (ie most operating costs covered by MAWC's existing funding).		

7.1.7 Full Implementation Plan

A detailed design of a CDP for Majuro was prepared by Mr Alice Leney under a UNDP funded project in 2005 (Leney, 2005). The design includes an implementation plan, work plan and budget. Key elements include drafting and adoption of CDP legislation, public awareness, setting up an MRF and setting up

[102] New ferrous baler scheduled to arrive on Majuro in March 2015 could possibly be used to further compact baled Al cans to achieve higher container weights prior to the procurement of an RJ Midi.
[103] To guard against abuse of the system, Al cans should be baled, glass bottles crushed/broken and uLABs marked with paint (or similarly identified) immediately on receipt at the MRF.
[104] Technical assistance may be required to set up environmentally sound storage and export of uLABs in accordance with Basel Convention and other relevant regulations.

the business, financial and administration systems. Other CDPs, similar to the one proposed by Leney, have been established in Kiribati, Yap and Kosrae.

The CDP established in Palau is slightly different in that a deposit fee of $0.10 per container is imposed, with the refund set at $0.05 and the other $0.05 split evenly between the CDP operator and the Government (deposited into a Recycling Fund). The design and implementation of the CDP system in Palau is summarised in a document titled 'Manual for Beverage Container Deposit Fee Program' (MPIIC, 2013). The purpose of the document is to educate and help those who wish to set up container deposit programmes, and hence it is a valuable resource for the implementation of a CDP in the RMI.

Presented below is a summary of the main tasks to be completed in setting up the CDP. An updated Container Deposit Programme Implementation Plan (based on the earlier work by Alice Leney (Leney, 2005) and data gathered during this project) is included in Appendix G.

7.1.7.1 Potential Operators

MAWC is responsible for waste management (collection and landfill management) on Majuro and this is its sole function (as opposed to the situation on Kiribati where waste collection remains the responsibility of the local governments). Hence there are good reasons for MAWC to be involved in any CDP that might be set up (existing facilities, equipment and personnel). The performance of MAWC could be evaluated during the Pilot CDP Trial (which should be undertaken by MAWC) to determine whether they should be the one to undertake the full CDP.

Private operators that might be interested in operating an MRF under contract as part of a full CDP include the RMI Recycling Company and RRE. Alternatively, as in Palau, the MRF could be operated by one party (possibly MAWC), and the compacted and baled scrap sold to local scrap dealers for export.

7.1.7.2 Management and Contractual Arrangements

One of the key management and contractual arrangements is control of finances. It is critical that CDP funds be kept in a separate account and used solely for CDP activities (payment of refunds to the public (via the MRF operator) and payment of refunds to the MRF operator on export of recyclable materials). Comprehensive accounting records should be kept and regular audits should be undertaken to ensure that the CDP is operating as it should and to identify where improvements could be made.

7.1.7.3 Markets for Recyclable Goods

Markets for recyclable goods are discussed in Section 7.1.3 above. In Palau the export of redeemed containers is undertaken by a private company under

contract to MPIIC. Under this arrangement the private company buys and picks up the compacted bales of redeemed containers and must export the materials within 6 months.

7.1.7.4 Recycling Equipment

The recycling equipment needed for the MRF to allow for the processing of recyclable materials is summarised in the table below. As the MRF gets established and as the CDP funds accumulate, additional equipment such as a forklift, counting machine and additional processing equipment can be procured.

Table 23: Materials Recovery Facility Equipment

Item	Equipment	Materials	Cost ($ CIF)
1	Al can baler (RJ Midi or similar)	Al cans	$55,000
2	Vertical baler (Miltek H500 or similar)[#]	PET and Cardboard	$30,000
3	Glass crusher *	Glass	$75,000
4	Ferrous baler (RJ100 or similar)[^]	Ferrous	$200,000

Notes:
Lifting and loading equipment may also be required if manual handling of the baled recyclables is not possible.
A ferrous baler is reportedly being donated by the Government of Japan (or JICA) and is due on Majuro in March 2015.
Costs based on quotes provided and estimated shipping costs. Subject to change.
[#] PET baler needs to achieve a minimum of 8t/TEU for efficient shipping.
** A smaller/cheaper glass crusher (available for under $10,000) may be more appropriate initially as the MRF and CDP are established. It should be noted however that a cheap glass crusher will not give a useful sand-like final product. The EPA currently has restrictions on the dredging of sand from Majuro lagoon and hence a sand replacement product could be a valuable commodity[105].*
[^] A ferrous baler has reportedly been donated by the Government of Japan and is due on Majuro in March 2015.

7.1.7.5 Other Resources

The MRF will also need an office, amenities and mechanisms for the handling of money for paying refunds to the public. Some CDPs use redeemable slips which are issued by the MRF to the person returning the containers. The redeemable slip can then be cashed in at the entity responsible for administering the CDP fund (refer to Palau CDP (MPIIC, 2013)).

[105] Pacific International Inc. indicated a price of $70/yd^3 in June/July 2014.

7.2 Additional Costed Recommendations

7.2.1 Organic Waste

The most significant opportunity for the diversion of waste from the landfill is in the separation of organic waste. A separate organic waste collection is undertaken by MAWC each Saturday and there is an existing small scale composting operation. Approximately 50% of the waste stream (12t/day) is compostable so there is a need to up scale the current organic waste collection and composting activities[106]. One of the front end loaders could be used to manage windrow composting but there is currently no space for increasing composting activities at the current landfill. Some of the profit from the CDP could be used to subsidise organic waste collection to supplement the avoided cost of landfilling.

Imported topsoil and compost sell for $4 to $8 per ft^3 at Do It Best (a local hardware store) so there is a market for compost. It can be difficult to get the right ingredient mix (NPK ratio) for making large amounts of good quality compost and hence the composting operation should be scaled to demand. Other organic waste could still be separated into composting windrows and used for cover material for the landfill (sand replacement at $70/$yd^3$). Large areas will be needed to handle the volume of organic waste. Alternatively, when a new landfill is built a cell could be used for the temporary storage of organic waste and used as required for compost, mulch or landfill cover (ideally kept above high tide level to avoid saturation with sea water, although that may not be a major issue if the organic waste is not going to be used for making compost).

Further information on the establishment of large scale organic waste composting facilities (2-20 t/day capacity) is available from the United Nations Economic and Social Commission for Asia and the Pacific (UN ESCAP)[107]. The composting system promoted by UN ESCAP uses compost boxes with perforated walls and floor to maintain aerobic conditions within the organic waste. On Majuro where construction materials such as bricks and concrete blocks are expensive, local materials should be used where possible if the compost box method is to be used (tyres tied together to form the walls of the compost boxes would be one way to reuse some of the old tyres on Majuro). A land area of up to 200 m^2 is required for the processing of 1 tonne of organic waste per day using the compost box system[108].

[106] Separation of organic waste by the public will be a challenge while the free collection of waste (particularly from the large wheelie bins which have ample space for the organic waste) continues.
[107] Refer to the Waste 2 Resource website at http://waste2resource.org/ which includes good information on how to set up and operate an Integrated Resource Recovery Center (IRRC).
[108] UN ESCAP (http://waste2resource.org/)

7.2.2 Ferrous Stockpile

As detailed in Section 5.6 there is a significant amount of ferrous metal stockpiled at the landfill in addition to the EOL vehicles spread across Majuro. A costed design for the ongoing of current and future EOL vehicles is included in Appendix H. In summary, the value of ferrous in baled vehicles is approximately $190/t[109] and container weights of up to 20t are achievable. Rental of a Sierra RB5000 for 2 months each year would is just feasible based on the costed design ($10,000 profit). However, a bi-annual (every 2 years) EOL vehicle recycling period would provide more margin based on twice the number of EOL vehicles ($40,000 profit). The costed design is based on the vehicle baler being located at the landfill while on Majuro and MAWC undertaking the vehicle baling operation. Additional costs would be incurred if the vehicle baling operation was to be done by an independent operator at a different site.

The economics of renting the Sierra baler are considerably improved if the current ferrous stockpile at the landfill is included (estimated to be at least 2,500t and including 500-1,000 EOL vehicles[110]). In this instance a profit of $140,000 could be realised. This would have the added benefit of freeing up space at the current landfill for an MRF.

7.2.3 uLABs

The collection, storage, packing and export of uLABs should be coordinated with MEC who are planning to allocate a uLAB storage area in the warehouse that is currently being built (construction delayed due in part to an EPA ban on dredging sand from the lagoon)[111]. Some technical assistance and capacity building may be required to ensure that the storage and export of uLABs complies with relevant regulations. The United Nations Environment Programme (UNEP) report from 2003 titled *Basel Technical Guidelines for the Environmentally Sound Management of Used Lead Acid Batteries (uLABs)* is a useful resource in this regard.

7.2.4 Paper and Cardboard

Paper and cardboard (dry waste) is often kept separate from wet waste by the supermarkets and possibly some other large waste producers. A shredder could be useful for shredding paper and cardboard for use as adsorbent material (for the storage and packing of uLABs, or in preparation for composting. Clean and dry cardboard could also be used to line the inside of shipping containers to minimise the chance of damage to containers containing scrap during transit.

[109] The value of ferrous scrap fell significantly between mid-2014 ($190-200/t) and May 2015 ($75/t).
[110] Approximately 180 EOL vehicles collected by MAWC in 2013 based on 2013 accounts.
[111] Pers. Comm. Steve Wakefield, Chief Engineer, MEC.

8.0 Summary of Recommendations

A summary of the recommendations from this baseline study are below.

1. Landfills (not part of the TOR but of critical importance)
    a. Priority should be given to addressing the landfill issue on Majuro. There is existing funding available under the Compact ($1.4 million from 2011 to 2014, and further Compact infrastructure funding available 2015 onwards). Technical assistance is recommended to prepare detailed spending plans and other documentation required to access these funds. A request for proposal for an Environmental Impact Assessment (EIA) and preliminary design for the proposed Jenrok landfill closed in August/September 2014 and it is understood that $500,000 of Compact infrastructure funding has been approved for release to support this work.
    b. Other potential landfill sites, including on the lagoon-side of the atoll, should be investigated. The cost of the proposed landfill at Jenrok was estimated to be $4.25 million in 2003 (Beca, 2003). The inlet immediately opposite the current landfill should be investigated as a possible landfill site.
    c. The current landfill should be closed and secured as soon as possible on opening of a new landfill.
    d. Space should be made available at the current and any new landfill for a MRF to allow for composting, recycling and other waste diversion activities (otherwise land rental costs of more than $3,000 per acre per year will be incurred).
    e. The proposed gate fee at the landfill for commercial waste should be implemented at the earliest opportunity (potential to generate revenue of $100,000+ per year).
    f. The landfill compactor should be repaired and used on a daily basis to compact the existing and incoming waste at the landfill.
    g. Repair of the two front end loaders and the Hyundai excavator should be costed and the repairs completed if financially viable. One front end loader should be used to manage an expanded composting operation. The other front end loader and the excavator could be leased out or used during the construction of a new landfill.

2. Collection
    a. The household collection system between Rita and the airport is currently working well and should be continued, although collection costs per tonne ($100/t) are relatively high. Two large rear loader trucks have sufficient capacity to service the entire atoll (Rita to Laura).
    b. A prepaid bag system could be phased in using the existing subsidised household collection service. Ideally an MRF should be set up prior to implementing the prepaid bag system and options for recycling and

diversion of organic waste offered. A long lead in time is recommended for the necessary consultation, Cabinet approval and phase in period (free bags for 1 month, subsidised bags for 6 months and then gradual price increases to breakeven point ($0.50 to $0.80 per bag)). The commencement of the prepaid bag system could coincide with expansion of the waste collection service from the airport to Laura. The prepaid bag system should be part of an integrated waste collection and management system so that household have disposal/recycling options for organic waste and recyclables.

c. It is understood that JICA/JOCV plan to consolidated wheelie bin collection points (one location per community/weto) to reduce collection time. Further analysis is needed to estimate the potential costs savings. There is spare collection capacity under the existing system with two large trucks operating, even with expansion of the collection system to include households from the airport to Laura.
d. Repair of the existing rear loader collection vehicles currently out of order (International and Sterling) should be costed and the repairs completed if financially viable.
e. All vehicles and equipment should be used on a regular basis so that they remain operational (disused equipment quickly becomes obsolete).
f. The existing commercial waste collection system is very high risk given that there is only one front loader truck capable of emptying the commercial front loader dumpsters. A second front loader truck would reduce the risk of failure of the collection system, but the existing front loader is only running at approximately 25% utilisation. There are several options to consider:
    i. Purchase 100-200 more front loader dumpsters and a second front loader truck (can be older, cheaper and smaller than the existing front loader truck), and expand the commercial waste collection service (currently only 15% coverage).
    ii. Use wheelie bins and rear load trucks to service smaller commercial waste producers.
    iii. Purchase 100-200 rear loader dumpsters and use the existing rear load trucks for collection of commercial waste (some rear loader trucks may need additional lifting equipment for dumpsters). Under this scenario the existing front loader truck and front loader dumpsters would eventually be phased out.
g. Further evaluation and costing of wheelie bins versus garbage bags should be completed prior to any purchase of additional wheelie bins (1 wheelie bin at $85 (CIF) = 570 prepaid bags at supply cost of $0.15/bag, (ie nearly 11 years of prepaid bags at a usage rate of 1 bag per week, with the cost spread over 11 years)).

3. Recycling
    a. Build or establish an MRF to accommodate recycling activities. The ideal location in the interim is on the existing landfill but there is currently not enough space due to stockpiles of waste, organic material and ferrous scrap.
    b. The existing stockpiles of ferrous scrap at the landfill should be baled and exported for recycling. A large baler is needed to enable this to occur, unless the scrap can be cut and manually loaded into shipping containers. Baling equipment could be purchased or leased. It is understood that a ferrous baler has been donated by the Government of Japan and is due to arrive on Majuro in March 2015.
    c. A deposit of $100 per vehicle (paid on import) could provide an incentive for the recycling of EOL vehicles (say $50 refund on delivery to the EOL vehicle facility and $50 to support recycling). Recycling will likely include stripping of valuable spare parts and non-ferrous metals, removal of engine and transmission, and further dismantling prior to baling or hand loading into shipping containers.
    d. Organic waste (garden, green, food, paper/cardboard) separation and composting should be a high priority (~50% of the current waste stream) to minimise waste to landfill. This will require a significant amount of space given the volume of organic waste (12t/day), and an organic waste collection service. Once the new landfill is operational some of the landfill space could be used temporarily for the storage and composting of organic waste.
    e. A CDP should be set up in the MRF to allow for the recycling of aluminium cans (baled and exported), PET bottles (baled and exported), glass bottles (crushed and used as sand replacement or as landfill cover) and uLABs (packed and exported). Funding for baling and crushing equipment, and for providing a refund for returned containers, is required prior to implementing a pilot CDP trial.
    f. A system for the collection, storage, packaging and export for recycling of uLABs should be set up. Funding is required for the collection of uLABs (either by MAWC or for refund for uLABs delivered to the MRF) and for technical assistance to set up the system and ensure that Basel Convention regulations are complied with (some training on the collection, handling, storage and export of uLABs is currently being organised by SPREP for the RMI and three other Pacific countries).
    g. Collection systems should be planned to ensure high recycling rates are achieved (ie need to make it easy), via separate recyclables collection if possible, or centralised recycling drop off points. Ongoing donor funding may be needed to subsidise recycling activities unless the CDP is set up to provide adequate funding (ie minimum of $0.02 per container for recycling activities).

4. There is an ongoing need for technical assistance over the next few years as the changes to SWM on Majuro are implemented (close/open landfills, establish MRF, implement CDP and prepaid bag).

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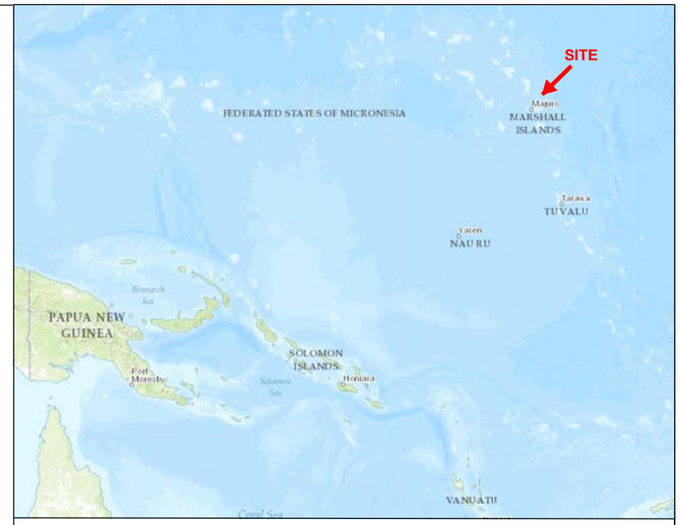
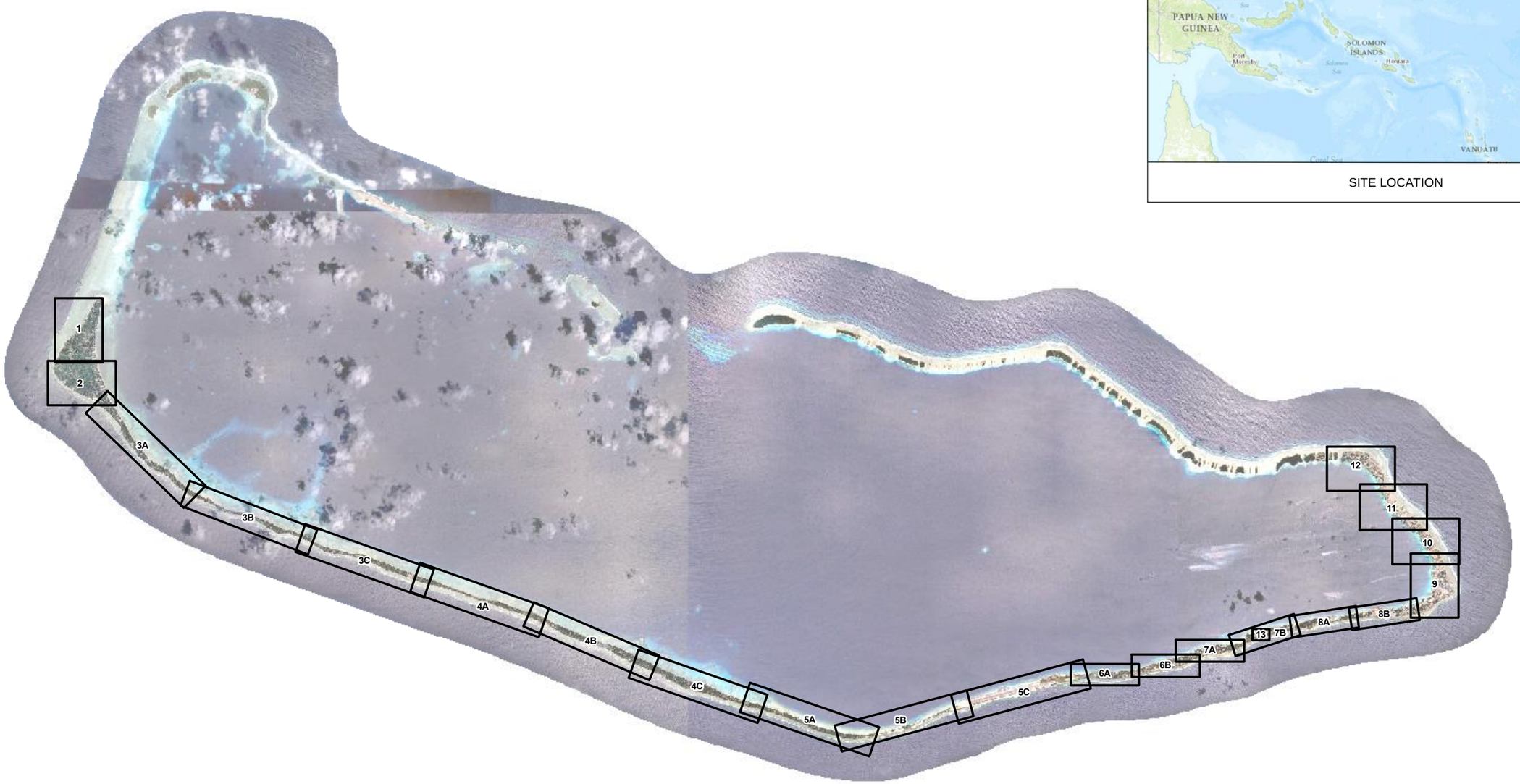
Appendix A

Majuro Atoll Plans



SITE LOCATION



SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

FIGURE 1 : MAJURO ATOLL OVERALL SITE LAYOUT PLAN

SCALE: 1:125,000 (A3)

0 1 2 4
KILOMETERS

A02753600Z001_Overall.mxd OCT 14 FINAL

LAURA BATTERY
LAURA'S END
LAURA BEACH RUBBISH
JOINLINE

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE).

EY :
- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- GARBAGE BIN
- FEATURE

SHEET 1 : SITE PLAN

SCALE : 1:5,000 (A3)

0 50 100 200
METRES

EY :

- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- FEATURE

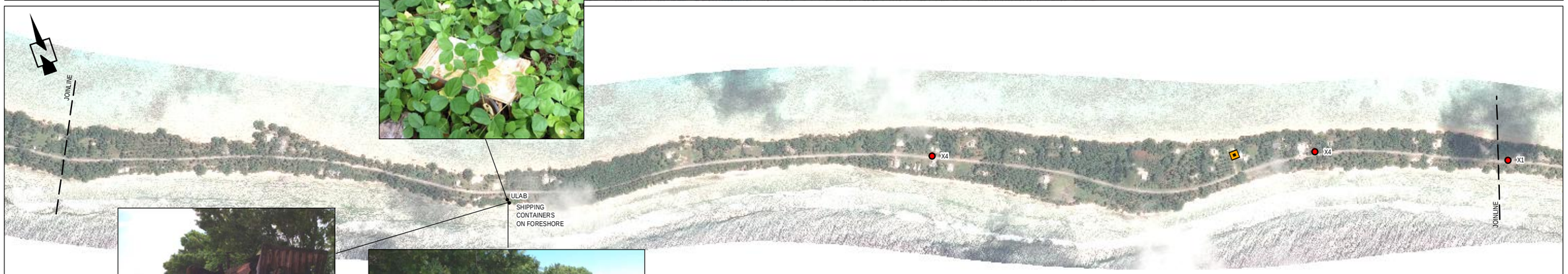
SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SCALE: 1:5,000 (A3)

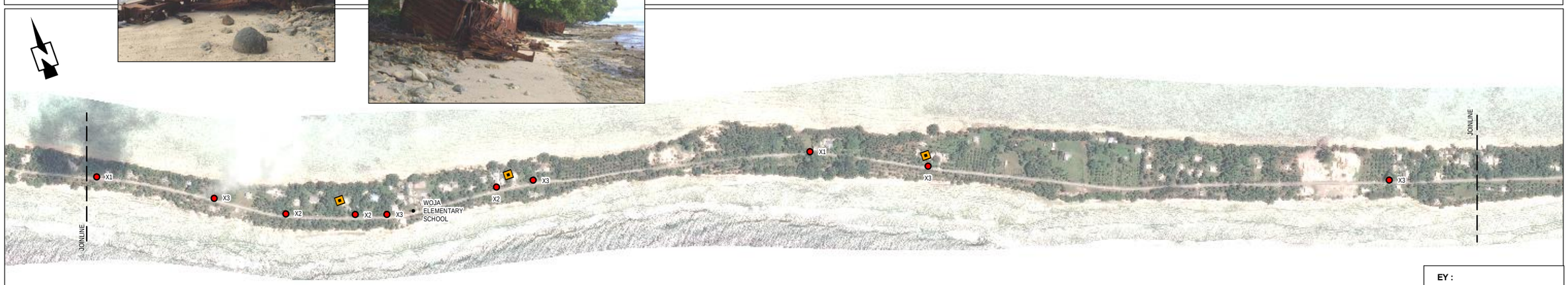
0 50 100 200
Meters

SHEET 2 : SITE PLAN

SHEET 3A



SHEET 3B



SHEET 3C

EY :

- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- FEATURE

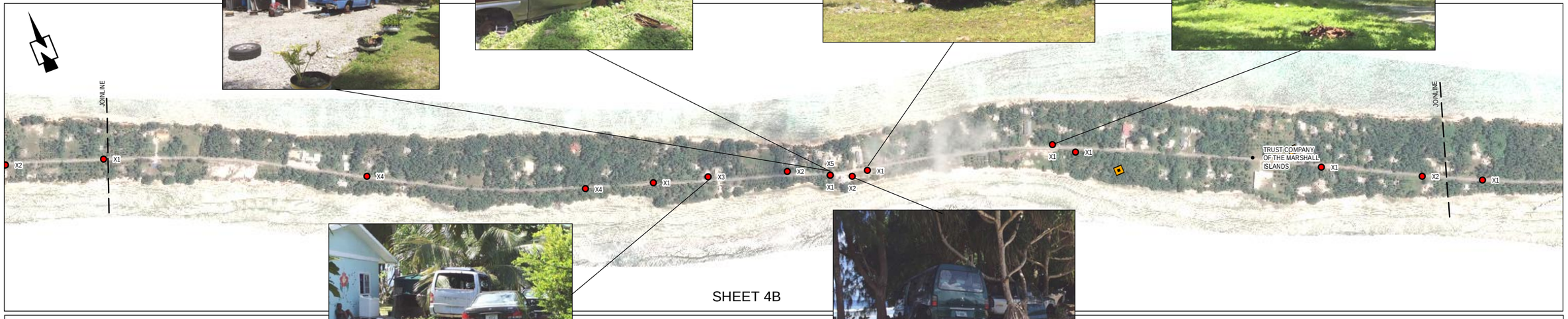
SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SCALE: 1:10,000 (A3)

0 50 100 200
Meters

SHEETS 3A, 3B AND 3C : SITE PLANS

SHEET 4A



SHEET 4B

SHEET 4C

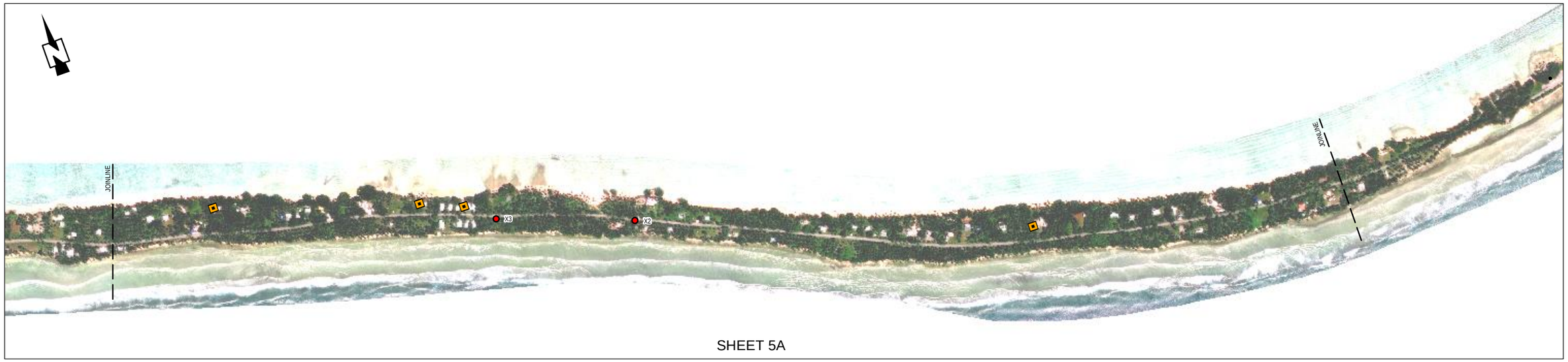
EY :
- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- FEATURE

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

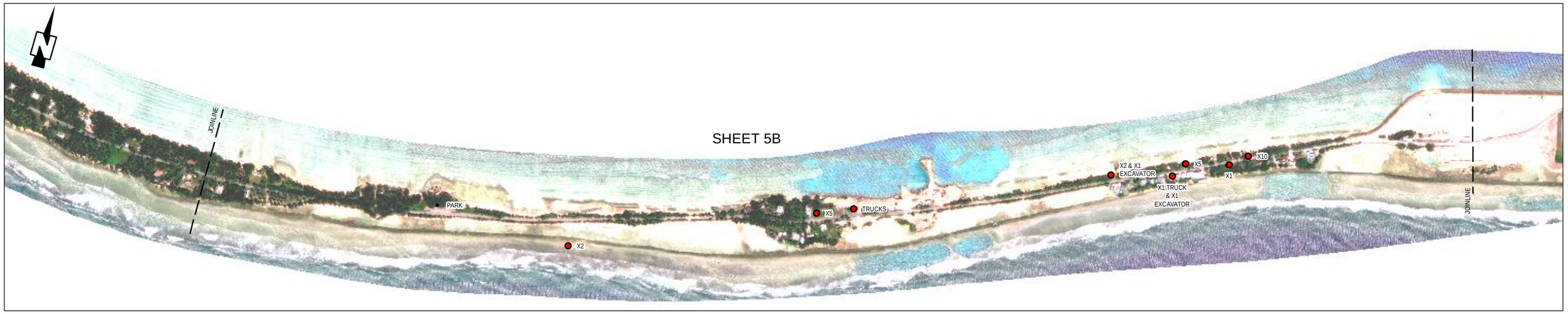
SCALE: 1:10,000 (A3)

0 50 100 200
Meters

SHEETS 4A, 4B AND 4C : SITE PLANS



SHEET 5A



SHEET 5B

SHEET 5C

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SCALE: 1:10,000 (A3)

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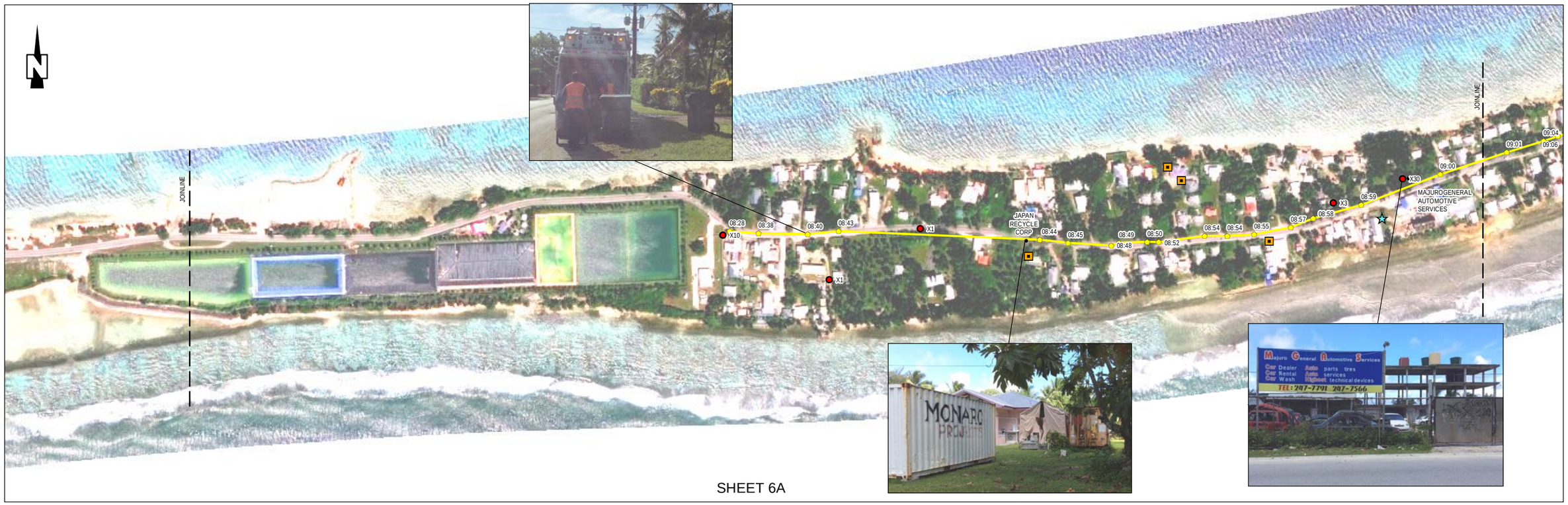
Meters

SHEETS 5A, 5B AND 5C : SITE PLANS



SHEET 6A

SHEET 6B

EY :

- DRUMS FOR RECYCLING
- DUMPSTER
- ESTABLISHMENT SURVEY
- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- FEATURE

TIME AND MOTION STUDY

- 08:28 COLLECTION RUN A (30/06/14) & TIME
- COLLECTION RUN A ROUTE (30/06/14)

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SCALE: 1:5,000 (A3)

0 25 50 100
Meters

SHEETS 6A, 6B : SITE PLANS

EMBASSY JAPAN AND CHINA

INTERIM DUMP SITE

JOINLINE

LDS

X1

X3

08:27 10:33 10:32 10:24 10:21 10:21 10:19 10:11 10:10 10:03 10:00 09:57 09:56 09:54 09:53 09:51 09:49 09:45 09:39 09:36 09:34 09:33

10:44 10:48 10:50 10:51 10:57 10:58 11:01 10:59 11:10 11:15 11:16 11:17 11:19 11:21 11:23 11:25 11:27 11:28 11:29 11:30 11:31 11:32 11:33

EY :

- DUMPSTER
- ESTABLISHMENT SURVEY
- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- FEATURE

TIME AND MOTION STUDY

- 09:51 COLLECTION RUN A (30/06/14) & TIME
- COLLECTION RUN A ROUTE (30/06/14)
- 10:24 COLLECTION RUN B (03/07/14) & TIME
- COLLECTION RUN B ROUTE (03/07/14)

SHEET 7A

SEE SHEET 13

JOINLINE

X5

13

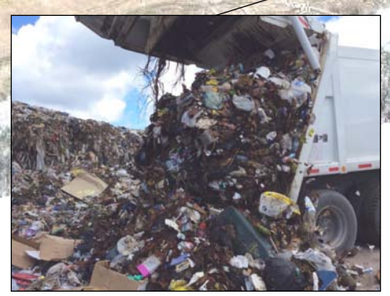
LANDFILL

08:16 08:30 11:42 10:24 11:38 11:36 11:33 11:32 11:31 11:31 11:30 11:29 11:28

X1

SCRAP

PALIMA



SHEET 7B

SOURCE:
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SCALE: 1:5,000 (A3)

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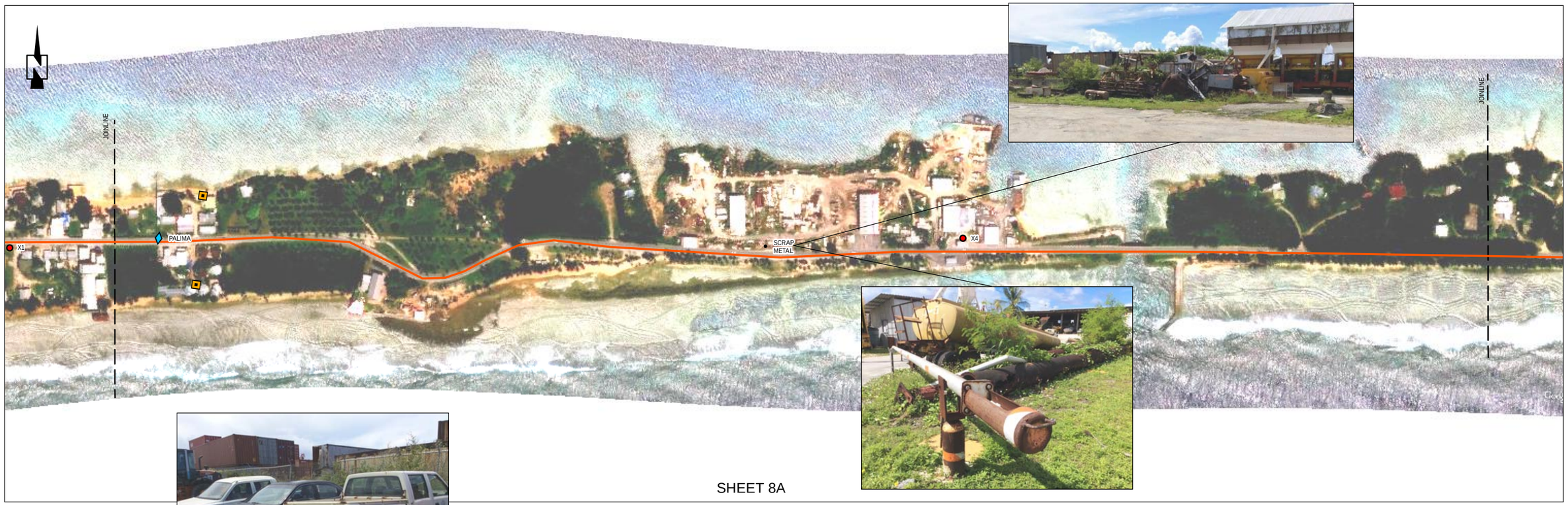
Meters

SHEETS 7A, 7B : SITE PLANS



SHEET 8A

EY :

- DUMPSTER
- ESTABLISHMENT SURVEY
- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- FEATURE

TIME AND MOTION STUDY

- COLLECTION RUN B ROUTE (03/07/14)

SHEET 8B

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SHEETS 8A, 8B : SITE PLANS

SCALE: 1:5,000 (A3)

0 25 50 100
Meters

JOINLINE
SMALL ISLAND 141
MOTHER KITCHEN
C STORE
SIGN
X3
X2
NTA
X1
DELAP AOG
09:18
SCRAP METAL DEALER
HOSPITAL
09:33
MINISTRY OF FINANCE
EPPSO
09:25
09:36
OFFICE OF THE CHIEF SECRETARY
DELAP PARK
K&K ISLAND PRIDE SUPERMARKET
WUTMI
FLAME TREE
ABC LAUNDRY
09:43
GONG
10:07
09:47
DO IT BEST
BULKY WASTE
LIKATU STORE

EY :

BIN TYPE

- DUMPSTER
- GARBAGE BIN
- END OF LIFE VEHICLE
- FEATURE
- ESTABLISHMENT SURVEY
- HOUSEHOLD SURVEY
- SWM COLLECTION EQUIPMENT SURVEY

TIME AND MOTION STUDY

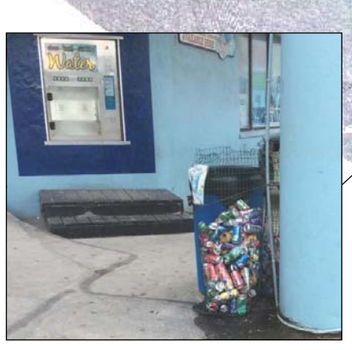
- 09:25 COLLECTION RUN B (03/07/14) & TIME
- COLLECTION RUN ROUTE B (03/07/14)

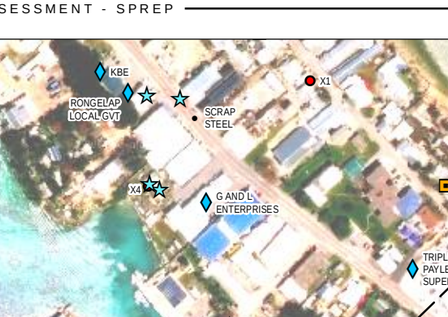
SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE).

SHEET 9 : SITE PLAN

SCALE : 1:5,000 (A3)

0 50 100 200
METRES





KBE
RONGELAP LOCAL GVT
SCRAP STEEL
X1
X4
G AND L ENTERPRISES
TRIPLE J PAYLESS SUPERMARKET
BEN CHUTARO
AL CANS
JOINLINE
X1
MGAS
X1
X20
X10
09:07
ACM
X5
X3
X1
CATHOLIC SCHOOL
X1
C STORE
JOINLINE
MOTHER KITCHEN
C STORE

EY :

- DUMPSTER
- GARBAGE BIN
- END OF LIFE VEHICLE
- FEATURE
- ESTABLISHMENT SURVEY
- HOUSEHOLD SURVEY

TIME AND MOTION STUDY

- 09:07 COLLECTION RUN B (03/07/14) & TIME
- COLLECTION RUN ROUTE B (03/07/14)

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SCALE: 1:5,000 (A3)

0 50 100 200
Meters

SHEET 10 : SITE PLAN

LOO ING NW

LOO ING SE

EY :

- DUMPSTER
- ESTABLISHMENT SURVEY
- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE
- FEATURE

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SHEET 11 : SITE PLAN

SCALE: 1:5,000 (A3)

0 50 100 200
Meters

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J&J STORE

LAURA STORE

JOINLINE

EY :

- DRUMS
- DUMPSTER
- ESTABLISHMENT SURVEY
- HOUSEHOLD SURVEY
- END OF LIFE VEHICLE

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SCALE: 1:5,000 (A3)

0 50 100 200
Meters

SHEET 12 : SITE PLAN

SORTING OF WASTE

DISCHARGE AREA

DISCHARGE OF WASTE

MOUNTAIN OF WASTE
(HIGHEST POINT ON THE ATOLL

LANDFILL COMPACTOR
(NOT CURRENTLY WOR ING

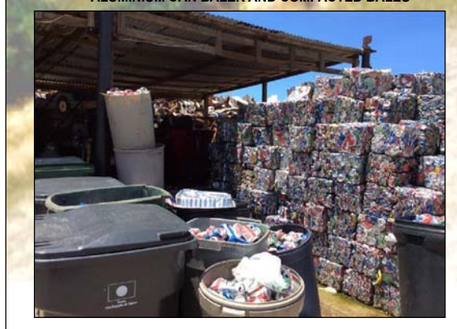
EXCAVATOR SORTING AREA AND LANDFILLING WASTE

OFFICES
WORKSHOPS
08:16
SCRAP METAL
08:30
ALUMINIUM CAN RECYCLING AREA
DISCHARGE & SORTING AREA
COMPOSTING AREA
SCRAP METAL
X5
11:38
11:42
10:24
ORGANIC WASTE
MOUNTAIN OF WASTE
SEA WALL

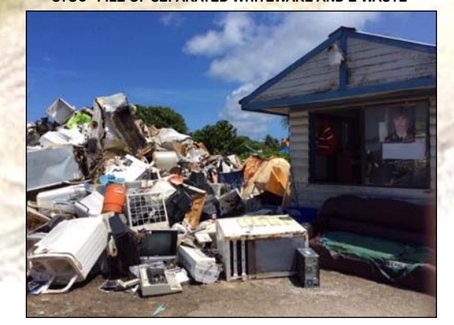
SEPARATED ORGANIC WASTE DISPOSAL

SEA WALL

ALUMINIUM CAN BALER AND COMPACTED BALES



STOC PILE OF SEPARATED WHITEWARE AND E-WASTE



STOC PILE OF SEPARATED SCRAP METALS

SMALL SCALE COMPOSTING OPERATION

KEY :

- END OF LIFE VEHICLE
- FEATURE

TIME AND MOTION STUDY

- GATE
- 10:24 COLLECTION RUN A (30/06/14) & TIME
- 11:42 COLLECTION RUN B (03/07/14) & TIME

SOURCE:
1. AERIAL IMAGERY (FLOWN MAR 14) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

SCALE: 1:1,250 (A3)

0 10 20 40
Meters

SHEET 13 : LANDFILL SITE PLAN

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Appendix B

Majuro Atoll Waste Company and Related Information

Majuro Atoll Waste Company

Statements of Revenue, Expenses and Changes in Net Assets

September 30, 2013

		Amount
Operating Revenues:		
Waste collection		
Bin income	$ 70,051	
Scrap car removal	9,575	$ 79,626
Recycling income		
Sale of compost	$ 9,452	
Sale of parts, reused and other recycles	11,291	
Sale of mixed metal exported	34,706	55,449
Miscellaneous		
Rental from equipment	$ 350	
Interest income	1,974	2,324
Total Operating Revenue		137,399
Less: Allowance for uncollectible accounts		(18,698)
Net Operating Revenue		$ 118,701
Expenses:		
Payroll		
Marshallese	$ 319,788	
Expatriates	44,324	
Benefits	55,761	419,873
Depreciation		
Office equipments	$ 2,197	
Recycling equipments	56,414	
Trucks and heavy equipments	111,527	
Commercial waste collection equipment	31,962	
Administration office	2,694	
Concrete Mixer	187	204,982
Fuel & Oil		
Gas	$ 11,138	
Diesel	53,765	
Lubricants	18,959	83,862
Repairs and maintenance		
Truck & equipment	$ 4,260	
Facilities	30,101	
Seawall	1,818	36,179
Recycling		
Cans and battery purchases	$ 25,310	
Materials for reused/recycled items	2,565	27,875

Utilities			10,501
Communication			6,279
Taxes and licenses			8,514
Office Supplies			8,756
Insurance			5,169
Professional			7,000
Contractual services			1,665
Travel			4,222
Advertising			678
Equipment rental			300
Miscellaneous			
Interests & penalties	$	3,734	
Sitting fee		4,600	
Employees drinking water		5,630	
Meetings		2,432	
Bank charges		163	
Handling & wharfage		1,430	
Donations		1,919	
Others		58	19,967
Total Operating Expenses			845,822
Operating Loss			(727,122)
Non-operating Revenues and Expenses:			
Contributions from RepMar			352,769
Loss before capital contributions			(374,353)
Capital grants from RepMar			557,894
Capital grants from Japan Government			114,733
Change in net assets			298,274
Net assets at beginning of the year			650,265
Net assets at end of the year			948,539

Note: Audited by Deloitte & Touche

Majuro Atoll Waste Company
Revised Spending Plan for Compact Capital Grant
FY2011 & FY2012

FY2011	Expenditures	Balance	Closure of Current Landfill Site		
650,000	423,581.15	226,418.85	Needed Items A		Cost
			1	Cement, re-bars, gravel & sand	30,000
			2	Sand cover	40,000
			3	Contractual services	80,000
			4	Long-bed diesel truck (used)	16,500
			5	Equipment parts	59,919
				Total	**226,419**
FY2012	Expenditures	Balance	New Landfill Site		
650,000	-0-	650,000	Needed Items B		Cost
			1	Front loading garbage truck	245,000
			2	Rear loading garbage truck	219,900
			3	Long-bed truck (new)	30,000
			4	Seawall preparatory works	3,200
			5	Equipment parts	52,033
			6	Import tax	39,592
			7	Site Plan assessment & development	46,855
			8	Consultation and meetings	12,500
			9	Equipment Insurance	920
				Total	**650,000**

Chart 1 below illustrates the organizational relationship of the MAWC Objective Areas and Outcomes.

Chart 6: Objective Areas and Outcomes MAWC FY14

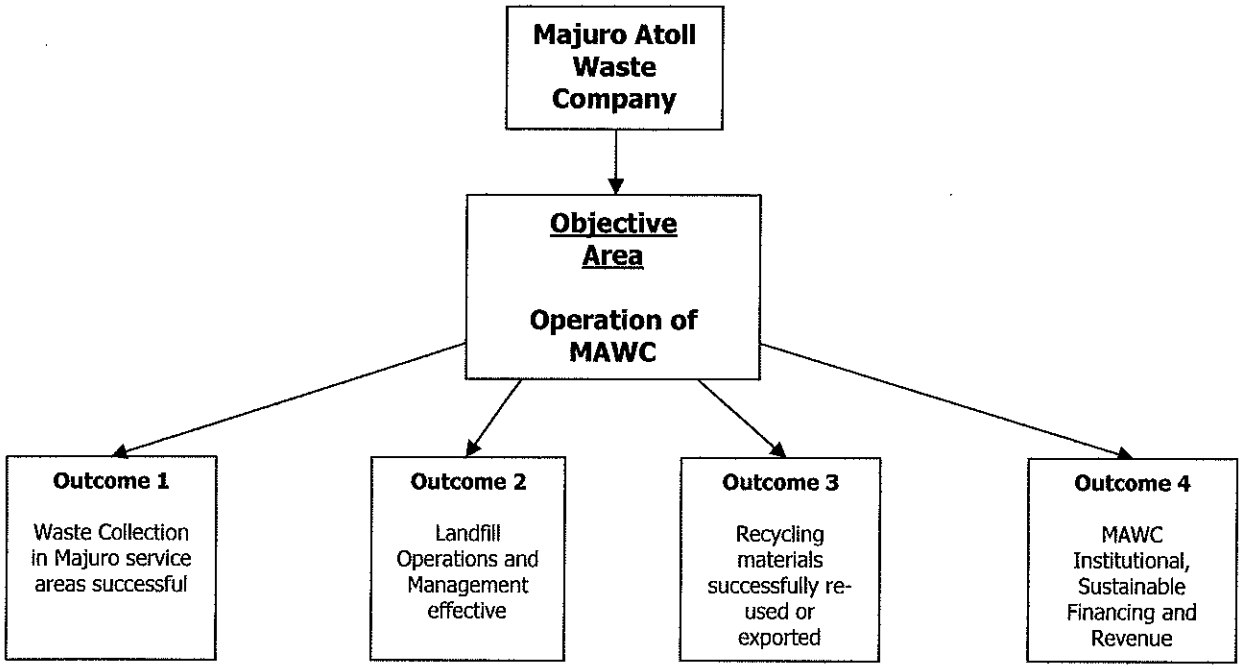


Table 1 below provides a breakdown of MAWC FY14 funding by source, as it will be applied to the MAWC Outcomes.

Table 1: Majuro Atoll Waste Company	Compact (Operation)	Special Revenue (SR)	Reimbursable	Compact (Infra/Cap.)	Total
Outcome 1: Waste Collection	99,206	78,345	0	0	177,551
Outcome 2: Landfill Operations and Management	93,260	92,181	0	600,000	785,441
Outcome 3: Recycling	62,769	82,939	52,262	0	197,970
Outcome 4: MAWC Institutional, Sustainable Financing and Revenue	69,765	31,020	0	0	100,785
tal	325,000	284,485	52,262	600,000	1,261,747

Table: MAWC Appropriations for FY14

I. Objective Area: Operation of MAWC

A. Outcome Area 1: Waste Collection

Matrix 1 provides details for MAWC Outcome 1 in FY14. The Outcome is broken down into Output Groups. Group is further broken down into specific Outputs.

Outcome Area 1: Waste Collection

Output Group 1.1: Waste collection in Majuro service areas successful

Output 1.1.1

All residential and commercial solid waste in Majuro service areas successfully collected in bins, bags or as bulk materials, and hauled to landfill for segregation, recycling or disposal.

Priority Activities

1. **Vehicles and trash bins.**
   - ✓ Weekly collected of residential and commercial garbage trucks as per schedule
   - ✓ Regular maintenance and repair of vehicles
   - ✓ Generating revenue by providing commercial bin services
   - ✓ Develop an equipment and trash bins replacement list.

2. **Recycling bins and collection system.**
   - ✓ Proper segregation of garbage collected from household, community, and commercial-recycling bins
   - ✓ Pick a location for a pilot project on recycling
   - ✓ Work with public relation division to develop an educational and public relation program to get the public to buy into recycling program and to initiate first stage of recycling program
   - ✓ Develop a plan in order to start phase-in transfer station in Laura.
   - ✓ Implementation the plan for phase-in Laura transfer station.

3. **Waste awareness.**
   - ✓ Develop a public education and awareness plan (consideration should be given to:
     - Design an education and public awareness courses/workshops/pamphlets/posters
     - Communication strategy (radio program, journal, public speeches, etc.)
     - Web Site
   - ✓ Implement the part of the plan that need to be carried out this year
   - ✓ Conduct community awareness program on effective household and commercial waste disposal, segregation, collection, and recycling through a pilot project program
   - ✓ Consider increasing capacity for awareness campaign.

4. **Hazardous and bulky wastes.**
   - ✓ Continue collection and segregation of bulky wastes (appliances, scrap cars)
   - ✓ Continue proper collection and segregation of hazardous materials (chemicals).
   - ✓ Proper store and safe disposal of hazardous waste.
   - ✓ Identify the safety equipment needed to handle hazardous waste.
   - ✓ Compile a

Responsibility for Activities/Coordination

General Manager
Mechanical supervisor
Preventative Maintenance supervisor

Internal Coordination

Board

Mini Line Item Budget

1.1.1	Compact	SR	Total
Personnel	48,507	51,386	**99,893**
Fringe	5,093	4,966	**10,059**
Sitting Fee	400	1,200	**1600**
Fuel & Oil	5,600	800	**6,400**
Utilities	3750	5250	**9000**
Insurance	5,353	2654	**8,007**
Foodstuff	400	1,000	**1,400**
Advertising	1214.8	0	**1,214**
Equipment Repairs and Maintenance	24,500	3,500	**28,000**
Supplies	2,520	1,500	**4,020**
Uniforms	864	2,500	**3,364**
Taxes	504	2,016	**2,520**
Recycling	500	1572.7	**2072.7**
Total	**99,206**	**78,344**	**177,551**

- Rollover FY11-FY12 Infrastructure carryover $300,000-fuel, engine parts and equipment parts. –
- Excavator needed to transport existing pile to interim site will take to at least 9 months to complete.

Expected Impacts

- ✓ Residential and commercial garbage bins collected for segregation
- ✓ Revenue generated
- ✓ Recycling and collection improved
- ✓ Initial recycling started by the community
- ✓ Increased community awareness of waste management
- ✓ Plan of action for education and awareness program
- ✓ Hazardous and bulky wastes safely collected
- ✓ Hazardous wastes safely stored and disposed

II. Objective Area: Operation of MAWC

B. *Outcome 2: Landfill operations and management*

Matrix 2 provides details for MAWC Outcome 2 in FY14. The Outcome is broken down into Output Groups, and each Output Group is further broken down into specific Outputs.

Outcome 2: Landfill operations and management

Output Group 2.1 – Effective landfill operations and management

Output 2.1.1

All segregated, non-recyclable waste from Majuro service areas effectively disposed of in semi-sanitary landfill

Priority Activities

Safety First!
- ✓ Ensure worker and public safety continues as top priority supported by effective staffing, training (with annual HAZWOPER updates)
- ✓ Determine as necessary proper work clothing
- ✓ Train personnel in first aid and operation of firefighting equipment
- ✓ Develop a written manual for handling and disposal of waste by class
- ✓ (Contractual services needed for development of new site.-within the $300,000 rollover FY12).

2. **Segregation.**
   - ✓ All waste materials received and segregated before going into the landfill.
   - ✓ Ensure that non-recyclable materials placed in landfill.

3. **Cover sand and compacted waste.**
   - ✓ Cover sand applied weekly and landfilled trash compacted creating new land, and removing/burying unsanitary waste away from public contact.
   - ✓ Maintain MAWC's EPA-permitted and compliant sand dredge operation to produce cover sand.

4. **EMP.** Environmental Management Plan (EMP) annually updated and EPA-approved.

5. **Leachate.**
   - ✓ Ensure that leachate (black toxic water) is properly air rated and remained in the landfill
   - ✓ Investigate opportunities to handle the leachate (Discussing with JICA)
   - ✓ Develop a monitoring to toxicity of black water before and after treatment

6. **Landfill closure.**
   - ✓ Implement Exit Strategy for closure of Batakan-Jable Site
   - ✓ Secure landowner agreements for decommissioned land and agreements for continued use of Recycling Center land
   - ✓ Put in place leachate treatment

7. **Landfill seawall.**
   - ✓ Construction of permanent seawall at current dumpsite

Responsibility for Activities/Coordination

General Manager
Landfill Supervisor

Internal Coordination

EPA and MOH
Board

Mini Line Item Budget

2.1.1	Compact	SR	Infra/Cap	Total
Personnel	44,109	50,713	0	**94,822**
Fringe	4,631	4,814	0	**9,445**
Housing	7,500	7,500	0	**15,000**
Sitting Fee	600	1,800	0	**2,400**
Contractual Services	17,500	11,802	0	**29,302**
Taxes & Licenses	672	2,688	0	**3,360**
Travel	2500	2,500	0	**5,000**
Fuel & Oil	5,600	800	0	**6,400**
Office Supplies	840	500	0	**1,340**
Uniforms	864	2500	0	**3,364**
Insurance	4,015	1,991	0	**6,006**
Foodstuff	1200	3,000	0	**4,200**
Advertising	2429	0	0	**2,429**
Bank Charges	300	0	0	**300**
Recycling	500	1,573	0	**2,073**
Seawall	0	0	300,000	**300,000**
New Landfill	0	0	300,000	**300,000**
Total	**93,260**	**92,181**	**600,000**	**785,441**

Note: Post FY14, additional equipment required to do sand mining and other earth moving activities. Daily sand coverage of disposal needed to limit health hazards. Additional sand mining sites need to be identify.

Expected Impacts
- ✓ Safety first
- ✓ Recycle materials identified
- ✓ Environmental standards improved
- ✓ Black toxic water controlled and de-toxiced by 50%
- ✓ Seawall completed
- ✓ New commissioned and operated semi- sanitary landfill
- ✓ Required landfill infrastructure identified
- ✓ Fee structure reviewed with recommendations
- ✓ Monitoring of medical wastes
- ✓ Energy conservation and renewable energy examples for rest of the country

- ✓ Tender for a contractor to do the permanent seawall

8. **New dumpsite commissioned.**
   - ✓ Develop a plan, have the design completed, taking into account a plan for proper handling and control of future leachate, and the use of the landfill after it's decommissioned
   - ✓ approval, landowner agreements, funding-needs and all commissioning for new dumpsite completed

9. **New dumpsite operational.**
   - ✓ New dumpsite contained, fenced, sea walled, staffed, opened and operating under optimal (RMI EPA-approved) semi-sanitary procedures and conditions

10. **Landfill equipment.**
    - ✓ Landfill infrastructure and equipment is identified, purchased, maintained, and operated on site
    - ✓ Identify additional sand mining sites and ensure EPA regulations compliance

11. **Fees.**
    - ✓ Dump fee structure is reviewed and updated accordance with sustainable financing plan by revising the legislation to include more ability to set fees and leafy fines

12. **Medical wastes monitoring.**
    - ✓ Maintain monitoring and inspection system (100% coverage and contents) for all regular black, trash bag wastes from Majuro hospital and dispensaries to ensure no hazardous or infectious medical wastes are illegally and inadvertently disposed of in the dump, thereby contravening EPA cease-and-desist orders. Coordinate with EPA and MoH.
    - ✓ Liaise EPA and MOH to ensure that no medical wastes go into the dump site

13. **Waste monitoring.**
    - ✓ Update and continue periodic waste stream analyses initiated by JICA senior volunteer.

I. **Energy conservation and renewable energy**
   - ✓ Continue implement policies and procedures to ensure energy use is minimized, and fuel and power conserved (shutting of engines, using people-power where possible)
   - ✓ Assess the potential and begin introduction of renewable energy sources for powering recycling equipment, including wind, solar, and biogas

III. Objective Area: Operation of MAWC

C. Outcome 3: Recycling

Matrix 3 provides details for MAWC Outcome 3 in FY14. The Outcome is broken down into Output Groups Group is further broken down into specific Outputs.

Outcome: Recycling

Output Group 3.1: Recyclable materials successfully re-used or exported

Output 3.1.1

All segregated, recyclable waste from Majuro service areas processed for local reuse or exportation.

Priority Activities

1. **Recycling equipment.**
   - ✓ Identify the equipment needed to implement the pilot recycling plan
   - ✓ Seek funding source for housing the new recycling equipment
2. **Re-use facility.**
   - ✓ Re-use facility staffed, operating, selling and donating locally re-usable materials (such as parts for washing machines, TVs, vehicles, wood).
   - ✓ Improvement of resale workshop facility.
3. **Compost sales.**
   - ✓ Green waste segregation and composting facility producing and locally marketing soil amendment; value-added horticultural products; and home composting promotion
   - ✓ Increase capacity for compost production
   - ✓ Consider reducing price to increase public use of compost produce at site.
4. **Recycled materials sales.**
   - ✓ Export container shipments and sales of marketable recyclable materials expanded and continued (currently all scrap metals, e-waste, some PET plastic).
   - ✓ Increase production capacity and sales of recycle metals in anticipation of new machine from Japan Government.
5. **Potential recyclables and value adding.**
   - ✓ Identify, evaluate and prepare business plans for potentially recyclable materials such as cardboard, tires, plastics and glass, and value adding processing (such as recycled plastics re-extruding/re-molding).

Responsibility for Activities/Coordination

1,3,5 General Manager
2 Construction & Maintenance Supervisor
4 Part & Shipping Supervisor

Internal Coordination

Board

Mini Line Item Budget

3.1.1	Compact	SR	Reimburse.	Total
Personnel	38,987	57,415	47,296	**143,698**
Fringe	4,094	5,599	4,966	**14,659**
Sitting Fee	400	1200	0	**1,600**
Supplies	2520	1500	0	**4,020**
Taxes & Licenses	504	2,016	0	**2,520**
Fuel & Oil	1,400	200	0	**1,600**
Equipment Repairs and Maintenance	10,500	1,500	0	**12,000**
Recycling	3,500	11,009	0	**14,509**
Uniforms & PPE	864	2,500	0	**3,364**
TOTAL	**62,769**	**82,939**	**52,262**	**197,970**

Expected Impacts

- ✓ Identified equipment needed
- ✓ Reduced waste stream
- ✓ Generated revenue

IV. Objective Area: Operation of MAWC.

D. Outcome 4: MAWC Institutional, Sustainable Financing and Revenue Arrangements

Matrix 4 provides details for MAWC Outcome 4 in FY14. The Outcome is broken down into Output Groups, and each Output Group is further broken down into specific Outputs

Outcome 4: MAWC Institutional, Sustainable Financing and Revenue Arrangements

Output Group: 4.1. Administration

Output 4.1.1

MAWC's operations and development guided by effective Strategic Plan and governance of Board of Directors-with manager

Priority Activities

1. **Governance.**
   - ✓ Quarterly meeting of MAWC Board of Directors and Manger and additional meetings when needed.
   - ✓ Consider adopting US 501.c3 charity status, and revolving loan funds to assist in MAWC financing.
   - ✓ Updated 3 Year Rolling Strategic Plan
   - ✓ Performance audit to be conducted and to consider +
2. **3 Year Rolling Strategic Plan**
   - ✓ Reworking the present 5 year Strategic Static Plan developed by MAWC Board of Directors into a 3 Year Rolling Strategic Plan
3. **Accounts and financial management.**
   - ✓ Continue with daily with financial accounting and financial management
   - ✓ Annually update policies and procedures manual: compiled and providing guidance.
4. **Management team.**
   - ✓ Ongoing daily management to ensure smooth operating corporation.
   - ✓ Review membership of Management team.
   - ✓ Hold weekly staff meeting of MAWC management team
5. **Legislation, sustainable financing and revenue.**
   - ✓ Reviewing and revising legislation with recommendations to reflect changes
   - ✓ Develop and begin to implement a sustainable financing component of the MAWC strategic plan, including gate fees and vigorously expanding and promoting commercial bin system and contracts to include all schools, offices, stores, industries and ships (probably benefiting from legislation) and MoH dispensary and hospital-medical waste disposal contracts[1].
   - ✓ Follow up on Board Resolution to Cabinet for new legislations for import tax on certain items in order to have the capacity to subsidize export of such items i.e. pet bottles, batteries and others.
   - ✓
6. **Grant writing.**
   - ✓ Liaise with Ministry of Finance for identifying possible donors that can fund projects to assist in implementing MAWC's Strategic Plan and to boosting revenue
   - ✓ Liaise with Grand Writing Office to seek funding for needed equipment.
   - ✓ Seek grant for trainers of preventive

Responsibility for Activities/Coordination

1,2,4,5,6 General Manager
3 Accountant

Internal Coordination

Board

Mini Line Item Budget

4.1.1	Compact	SR	Total
Personnel	36,186	5,410	**41,596**
Fringe	3,800	2,239	**6,039**
Sitting Fee	600	1,800	**2,400**
Contractual Services	7500	5058	**12,558**
Supplies	2,520	1500	**4,020**
Travel	2,500	2500	**5,000**
Fuel & Oil	1,400	200	**1,600**
Utilities	3,750	2,250	**6,000**
Insurance	4,014	1,990	**6,005**
Foodstuff	400	1,000	**1400**
Advertising	2,429	0	**2,429**
Facility Repairs and Maintenance	3,000	3,000	**6,000**
Uniforms	864	2,500	**3,364**
Bank Charges	300	0	**300**
Recycling	500	1,573	**2,073**
Total	**69,764**	**31,020**	**100,784**

Expected Impacts

- ✓ 3 Year Rolling Strategic Plan
- ✓ Updated procedures manual for accounting and financial management
- ✓ Updated legislation
- ✓ New funding possibility identified

[1] There are 56 dispensaries in the RMI and 2 major hospitals on Majuro and Ebeye without adequate disposal systems producing daily infectious and hazardous medical wastes.

maintenance to conduct courses on island.	

VII. MAWC Line Item Budget by Funding Type FY14

Table 2: MAWC FY14 Line Item Budget

Table 2: Line Items Budget for FY14	Compact (Operation)	Special Revenue	Reimbursable	Compact (Infra/Cap)	Total
PERSONNEL-RELATED EXPENSES	**192,907**	**190,042**	**52,262**	-	**435,211**
Personnel	167,789	164,924	47,296	-	**380,009**
Personnel Benefits	17,618	17,618	4,966	-	**40,202**
Housing Expense	7,500	7,500	-	-	**15,000**
OPERATING EXPENSES	**132,093**	**94,443**	**-**	**-**	**226,536**
Fuel	14,000	2,000	-		16,000
Equipment Maintenance	35,000	5,000	-	-	40,000
Facility Maintenance	3,000	3,000	-	-	6,000
Communication & Utilities	7,500	7,500	-	-	15,000
Supplies	8,400	5,000	-	-	13,400
Travel	5,000	5,000	-	-	10,000
Recycling	5,000	15,727	-	-	20,727
Uniforms & PPE	3,456	10,000	-	-	13,456
Sitting Fee	2,000	6,000	-	-	8,000
Contractual Services	25,000	16,860	-	-	41,860
Taxes and Licenses	1,680	6,720	-	-	8,400
Insurance	13,383	6,636	-	-	20,019
Foodstuff	2,000	5,000	-	-	7,000
Advertising	6,074	-	-	-	6,074
Bank Charges	600	-	-	-	600
DEVELOPMENT AND CAPITAL EXPENDITURES	**-**	**-**	**-**	**600,000**	**600,000**
Completion of Seawall	-	-		300,000	300,000
Opening new dump site	-	-		300,000	300,000
GRAND TOTAL	**325,000**	**284,485**	**52,262**	**600,000**	**1,261,747**

Chart 1 below illustrates the organizational relationship of the MAWC Objective Areas and Outcomes.

Chart 6: Objective Areas and Outcomes MAWC FY15

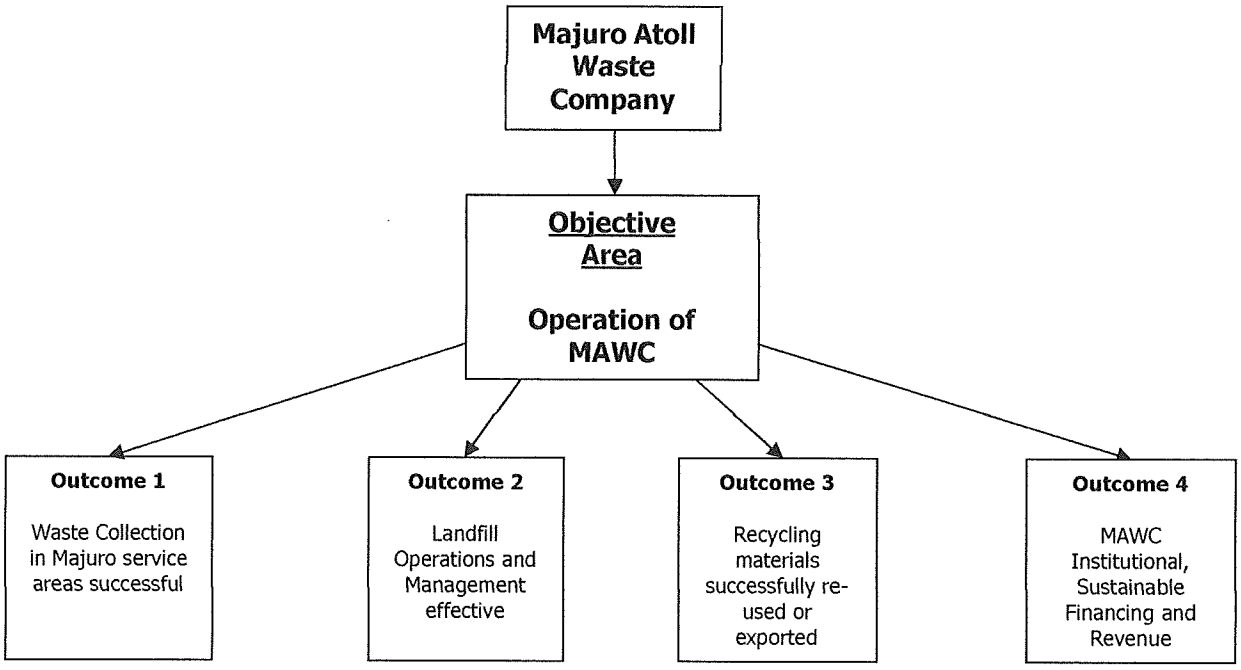


Table 1 below provides a breakdown of MAWC FY15 funding by source, as it will be applied to the MAWC Outcomes.

Table 1: Majuro Atoll Waste Company	**Compact (Operation)**	**Operating Revenue (OR)**	**Additional Operating Fund Required**	**Compact (Infra/Cap.)**	**Total**
Outcome 1: Waste Collection	**117,837**	**89,775**	**46,146**	0	**253,757**
Outcome 2: Landfill Operations and Management	**71,487**	**54,392**	**29,527**	**600,000**	**755,406**
Outcome 3: Recycling	**75,793**	**57,669**	**31,306**	**0**	**164,768**
Outcome 4: MAWC Institutional, Sustainable Financing and Revenue	**59,883**	**45,563**	**24,733**	**0**	**130,180**
Total	**325,000**	**247,399**	**131,712**	**600,000**	**1,304,111**

Table: MAWC Appropriations for FY15

I. Objective Area: Operation of MAWC

A. Outcome Area 1: Waste Collection

Matrix 1 provides details for MAWC Outcome 1 in FY15. The Outcome is broken down into Output Groups. Group is further broken down into specific Outputs.

Outcome Area 1: Waste Collection

Output Group 1.1: Waste collection in Majuro service areas successful

Output 1.1.1

All residential and commercial solid waste in Majuro service areas successfully collected in bins, bags or as bulk materials, and hauled to landfill for segregation, recycling or disposal.

Priority Activities

1. **Vehicles and trash bins.**
   - ✓ Weekly collected of residential and commercial garbage trucks as per schedule
   - ✓ Regular maintenance and repair of vehicles
   - ✓ Generating revenue by providing commercial bin services
   - ✓ Develop an equipment and trash bins replacement list.

2. **Recycling bins and collection system.**
   - ✓ Proper segregation of garbage collected from household, community, and commercial-recycling bins
   - ✓ Pick a location for a pilot project on recycling
   - ✓ Work with public relation division to develop an educational and public relation program to get the public to buy into recycling program *and to initiate first stage of recycling program*
   - ✓ Develop a plan in order to start phase-in transfer station in Laura.
   - ✓ Implementation the plan for phase-in Laura transfer station.

3. **Waste awareness.**
   - ✓ Develop a public education and awareness plan (consideration should be given to:
     - Design an education and public awareness courses/workshops/pamphlets/posters
     - Communication strategy (radio program, journal, public speeches, etc.)
     - Web Site
   - ✓ Implement the part of the plan that need to be carried out this year
   - ✓ Conduct community awareness program on effective household and commercial waste disposal, segregation, collection, and recycling through a pilot project program
   - ✓ Consider increasing capacity for awareness campaign.

4. **Hazardous and bulky wastes.**
   - ✓ Continue collection and segregation of bulky wastes (appliances, scrap cars)
   - ✓ Continue proper collection and segregation of hazardous materials (chemicals).
   - ✓ Proper store and safe disposal of hazardous waste.
   - ✓ Identify the safety equipment needed to handle hazardous waste.
   - ✓ Compile a

Responsibility for Activities/Coordination

General Manager
Mechanical supervisor
Preventative Maintenance supervisor

Internal Coordination

Board

Mini Line Item Budget

1.1.1	Compact	Op. Revenue	Add'l Op. Fund Req.	Total
Personnel	68,954	52,580	25,955	**147,489**
Fringe	6,812	5,183	2,814	**14,809**
Fuel & Oil	26,740	20,346	11,044	**58,130**
Equipment Repairs and Maintenance	8,308	6,321	3,432	**18,061**
Contingecies	1,380	1,050	570	**3,000**
Taxes & Licences	783	596	324	**1,703**
Foodstuff	1,483	1,129	613	**3,225**
Insurance	1,932	1,470	798	**4,200**
Uniforms	1,061	808	438	**2,307**
Contractual Services	383	292	158	**833**
Total	**117,837**	**89,775**	**46,146**	**253,757**

- Rollover FY11-FY12 Infrastructure carryover $300,000-fuel, engine parts and equipment parts. –
- Excavator needed to transport existing pile to interim site will take to at least 9 months to complete.

Expected Impacts

- ✓ Residential and commercial garbage bins collected for segregation
- ✓ Revenue generated
- ✓ Recycling and collection improved
- ✓ Initial recycling started by the community
- ✓ Increased community awareness of waste management
- ✓ Plan of action for education and awareness program
- ✓ Hazardous and bulky wastes safely collected
- ✓ Hazardous wastes safely stored and disposed

II. Objective Area: Operation of MAWC

B. *Outcome 2: Landfill operations and management*

Matrix 2 provides details for MAWC Outcome 2 in FY15. The Outcome is broken down into Output Groups, and each Output Group is further broken down into specific Outputs.

Outcome 2: Landfill operations and management

Output Group 2.1 – Effective landfill operations and management

Output 2.1.1

All segregated, non-recyclable waste from Majuro service areas effectively disposed of in semi-sanitary landfill

Priority Activities

Safety First!

- ✓ Ensure worker and public safety continues as top priority supported by effective staffing, training (with annual HAZWOPER updates)
- ✓ Determine as necessary proper work clothing
- ✓ Train personnel in first aid and operation of firefighting equipment
- ✓ Develop a written manual for handling and disposal of waste by class
- ✓ (Contractual services needed for development of new site.-within the $300,000 rollover FY12).

2. **Segregation.**
   - ✓ All waste materials received and segregated before going into the landfill.
   - ✓ Ensure that non-recyclable materials placed in landfill.

3. **Cover sand and compacted waste.**
   - ✓ Cover sand applied weekly and landfilled trash compacted creating new land, and removing/burying unsanitary waste away from public contact.
   - ✓ Maintain MAWC's EPA-permitted and compliant sand dredge operation to produce cover sand.

4. **EMP.** Environmental Management Plan (EMP) annually updated and EPA-approved.

5. **Leachate.**
   - ✓ Ensure that leachate (black toxic water) is properly air rated and remained in the landfill
   - ✓ Investigate opportunities to handle the leachate (Discussing with JICA)
   - ✓ Develop a monitoring to toxicity of black water before and after treatment

6. **Landfill closure.**
   - ✓ Implement Exit Strategy for closure of Batakan-Jable Site
   - ✓ Secure landowner agreements for decommissioned land and agreements for continued use of Recycling Center land
   - ✓ Put in place leachate treatment at current site.

7. **Landfill seawall.**
   - ✓ Construction of permanent seawall at current dumpsite.

Responsibility for Activities/Coordination

General Manager
Landfill Supervisor

Internal Coordination

EPA and MOH
Board

Mini Line Item Budget

2.1.1	Compact	Op. Revenue	Add'l Op. Fund Req.	Total
Personnel	37,706	28,690	15,574	**81,970**
Fringe	3,648	2,776	1,507	**7,930**
Fuel & Oil	17,827	13,564	7,363	**38,754**
Equipment Repairs and Maintenance	5,539	4,213	2,288	**12,040**
Contingecies	2,760	2,100	1,140	**6,000**
Taxes & Licences	1,175	894	485	**2,554**
Foodstuff	1,483	1,129	613	**3,225**
Insurance	966	735	399	**2,100**
Contractual Services	383	292	158	**833**
Total	**71,487**	**54,392**	**29,527**	**155,406**

Note: Post FY14, additional equipment required to do sand mining and other earth moving activities. Daily sand coverage of disposal needed to limit health hazards. Additional sand mining sites need to be identify.

Expected Impacts

- ✓ Safety first
- ✓ Recycle materials identified
- ✓ Environmental standards improved
- ✓ Black toxic water controlled and de-toxiced by 50%
- ✓ Seawall completed
- ✓ New commissioned and operated semi- sanitary landfill
- ✓ Required landfill infrastructure identified
- ✓ Fee structure reviewed with recommendations
- ✓ Monitoring of medical wastes
- ✓ Energy conservation and renewable energy examples for rest of the country

- ✓ Tender for a contractor to do the permanent seawall.

8. **New dumpsite commissioned.**
   - ✓ Develop a plan, have the design completed, taking into account a plan for proper handling and control of future leachate, and the use of the landfill after it's decommissioned.
   - ✓ Approval, landowner agreements, funding-needs and all commissioning for new dumpsite completed.
   - ✓

9. **New dumpsite operational.**
   - ✓ New dumpsite contained, fenced, sea walled, staffed, opened and operating under optimal (RMI EPA-approved) semi-sanitary procedures and conditions.
   - ✓ New site for sand mining is operational.

10. **Landfill equipment.**
    - ✓ Landfill infrastructure and equipment is identified, purchased, maintained, and operated on site
    - ✓ Identify additional sand mining sites and ensure EPA regulations compliance

11. **Fees.**
    - ✓ Dump fee structure is reviewed and updated accordance with sustainable financing plan by revising the legislation to include more ability to set fees and leafy fines

12. **Medical wastes monitoring.**
    - ✓ Maintain monitoring and inspection system (100% coverage and contents) for all regular black, trash bag wastes from Majuro hospital and dispensaries to ensure no hazardous or infectious medical wastes are illegally and inadvertently disposed of in the dump, thereby contravening EPA cease-and-desist orders. Coordinate with EPA and MoH.
    - ✓ Liaise EPA and MOH to ensure that no medical wastes go into the dump site

13. **Waste monitoring.**
    - ✓ Update and continue periodic waste stream analyses initiated by JICA senior volunteer.

14. **Energy conservation and renewable energy**
    - ✓ Continue implement policies and procedures to ensure energy use is minimized, and fuel and power conserved (shutting of engines, using people-power where possible)
    - ✓ Assess the potential and begin introduction of renewable energy sources for powering recycling equipment, including wind, solar, and biogas

III. Objective Area: Operation of MAWC

C. Outcome 3: Recycling

Matrix 3 provides details for MAWC Outcome 3 in FY15. The Outcome is broken down into Output Groups Group is further broken down into specific Outputs.

Outcome: Recycling

Output Group 3.1: Recyclable materials successfully re-used or exported

Output 3.1.1

All segregated, recyclable waste from Majuro service areas processed for local reuse or exportation.

Priority Activities

1. **Recycling equipment.**
   - ✓ Identify the equipment needed to implement the pilot recycling plan
   - ✓ Seek funding source for housing the new recycling equipment
2. **Re-use facility.**
   - ✓ Re-use facility staffed, operating, selling and donating locally re-usable materials (such as parts for washing machines, TVs, vehicles, wood).
   - ✓ Improvement of resale workshop facility.
3. **Compost sales.**
   - ✓ Green waste segregation and composting facility producing and locally marketing soil amendment; value-added horticultural products; and home composting promotion
   - ✓ Increase capacity for compost production
   - ✓ Consider reducing price to increase public use of compost produce at site.
4. **Recycled materials sales.**
   - ✓ Export container shipments and sales of marketable recyclable materials expanded and continued (currently all scrap metals, e-waste, some PET plastic).
   - ✓ Increase production capacity and sales of recycle metals in anticipation of new machine from Japan Government. Not decided yet. March 2015
5. **Potential recyclables and value adding.**
   - ✓ Identify, evaluate and prepare business plans for potentially recyclable materials such as cardboard, tires, plastics and glass, and value adding processing (such as recycled plastics re-extruding/re-molding).

Responsibility for Activities/Coordination

1,3,5 General Manager
2 Construction & Maintenance Supervisor
4 Part & Shipping Supervisor

Internal Coordination

Board

Mini Line Item Budget

3.1.1	Compact	Op. Revenue	Add'l Op. Fund Req.	Total
Personnel	53,952	41,051	22,285	**117,288**
Fringe	5,353	4,073	2,211	**11,638**
Recycling	10,258	7,805	4,237	**22,300**
Contingecies	1,380	1,050	570	**3,000**
Utilities	966	735	399	**2,100**
Taxes & Licenses	783	596	324	**1,703**
Travel	1,380	1,050	570	**3,000**
Facility Repairs & Maintenance	1,398	1,064	577	**3,039**
Insurance	322	245	133	**700**
Total	**75,793**	**57,669**	**31,306**	**164,768**

Expected Impacts

- ✓ Identified equipment needed
- ✓ Reduced waste stream
- ✓ Generated revenue

IV. Objective Area: Operation of MAWC.

D. Outcome 4: MAWC Institutional, Sustainable Financing and Revenue Arrangements

Matrix 4 provides details for MAWC Outcome 4 in FY15. The Outcome is broken down into Output Groups, and each Output Group is further broken down into specific Outputs

Outcome 4: MAWC Institutional, Sustainable Financing and Revenue Arrangements

Output Group: 4.1. Administration

Output 4.1.1

MAWC's operations and development guided by effective Strategic Plan and governance of Board of Directors-with manager

Priority Activities

1. **Governance.**
   - ✓ Quarterly meeting of MAWC Board of Directors and Manger and additional meetings when needed.
   - ✓ Consider adopting US 501.c3 charity status, and revolving loan funds to assist in MAWC financing.
   - ✓ Updated 3 Year Rolling Strategic Plan
   - ✓ Performance audit to be conducted and to consider +
2. **3 Year Rolling Strategic Plan**
   - ✓ Reworking the present 5 year Strategic Static Plan developed by MAWC Board of Directors into a 3 Year Rolling Strategic Plan
3. **Accounts and financial management.**
   - ✓ Continue with daily with financial accounting and financial management
   - ✓ Annually update policies and procedures manual: compiled and providing guidance.
4. **Management team.**
   - ✓ Ongoing daily management to ensure smooth operating corporation.
   - ✓ Review membership of Management team.
   - ✓ Hold weekly staff meeting of MAWC management team
5. **Legislation, sustainable financing and revenue.**
   - ✓ Reviewing and revising legislation with recommendations to reflect changes
   - ✓ Develop and begin to implement a sustainable financing component of the MAWC strategic plan, including gate fees and vigorously expanding and promoting commercial bin system and contracts to include all schools, offices, stores, industries and ships (probably benefiting from legislation) and MoH dispensary and hospital-medical waste disposal contracts[1].
   - ✓ Follow up on Board Resolution to Cabinet for new legislations for import tax on certain items in order to have the capacity to subsidize export of such items i.e. pet bottles, batteries and others.
   - ✓
6. **Grant writing.**
   - ✓ Liaise with Ministry of Finance for identifying possible donors that can fund projects to assist in implementing MAWC's Strategic Plan and to boosting revenue
   - ✓ Liaise with Grand Writing Office to seek funding for needed equipment.
   - ✓ Seek grant for trainers of preventive

Responsibility for Activities/Coordination

1,2,4,5,6 General Manager
3 Accountant

Internal Coordination

Board

Mini Line Item Budget

4.1.1	Compact	Op. Revenue	Add'l Op. Fund Req.	Total
Personnel	25,766	19,604	10,642	**56,012**
Fringe	2,394	1,821	989	**5,204**
Recycling	2,565	1,951	1,059	**5,575**
Housing	6,900	5,250	2,850	**15,000**
Contingecies	1,380	1,050	570	**3,000**
Utilities	3,864	2,940	1,596	**8,400**
Office Supplies	4,028	3,065	1,664	**8,757**
Taxes & Licenses	1,175	894	485	**2,554**
Foodstuff	742	564	306	**1,612**
Travel	3,220	2,450	1,330	**7,000**
Communication	2,888	2,198	1,193	**6,279**
Facility Repairs & Maintenance	1,398	1,064	577	**3,039**
Uniforms	1,061	808	438	**2,307**
Sitting Fee	2,116	1,610	874	**4,600**
Advertising	312	237	129	**678**
Bank charges	75	57	31	**163**
Total	**59,883**	**45,563**	**24,733**	**130,180**

Expected Impacts

- ✓ 3 Year Rolling Strategic Plan
- ✓ Updated procedures manual for accounting and financial management
- ✓ Updated legislation
- ✓ New funding possibility identified

[1] There are 56 dispensaries in the RMI and 2 major hospitals on Majuro and Ebeye without adequate disposal systems producing daily infectious and hazardous medical wastes.

maintenance to conduct courses on island.	

VII. MAWC Line Item Budget by Funding Type FY15

Table 1: MAWC FY15 Line Item Budget

Table 2: Line Items Budget for FY15	Compact (Operation)	Operating Revenue	Add'l Op. Fund Required	Compact (Infra/Cap)	Total
PERSONNEL-RELATED EXPENSES	**211,486**	**161,028**	**84,827**	**0**	**457,341**
Personnel	186,379	141,925	74,456	-	**402,760**
Personnel Benefits	18,207	13,853	7,520	-	**39,581**
Housing	6,900	5,250	2,850	-	**15,000**
OPERATING EXPENSES	**113,514**	**86,371**	**46,885**	**0**	**246,770**
Fuel	44,567	33,910	18,407		96,884
Equipment Maintenance	13,847	10,534	5,720	-	30,101
Recycling	12,823	9,756	5,296	-	27,875
Contingencies	6,900	5,250	2,850	-	15,000
Utilities	4,830	3,676	1,995	-	10,501
Office Supplies	4,028	3,064	1,664	-	8,756
Taxes & Licenses	3,916	2,980	1,618	-	8,514
Foodstuff	3,708	2,822	1,532	-	8,062
Travel	4,600	3,500	1,900	-	10,000
Communication	2,888	2,198	1,193	-	6,279
Facility Repairs & Maintenance	2,796	2,128	1,154	-	6,078
Insurance	3,220	2,450	1,330	-	7,000
Uniforms	2,122	1,616	876	-	4,614
Sitting fee	2,116	1,610	874		4,600
Contractual Services	766	583	316	-	1,665
Advertising	312	237	129		678
Bank charges	75	57	31	-	163
DEVELOPMENT AND CAPITAL EXPENDITURES	-	-	-	**600,000**	**600,000**
Completion of Seawall	-	-		-	-
Opening new dump site	-	-		600,000	600,000
GRAND TOTAL	**325,000**	**247,399**	**131,712**	**600,000**	**1,304,111**

Republic of the Marshall Islands

National Waste Management Strategy 2012-2016 and Action Plan

Foreword

The Government of the Republic of the Marshall Islands acknowledged that poor waste management poses a serious threat to our health, environment, livelihoods to the people and affects our future development. As a small developing island nation in the Pacific, the Marshall Islands have very limited landmass and is highly vulnerable to the impacts of climate change.

Continue….

Acronyms

AG	Attorney General
CDL	Container Deposit Legislation
CMI	College of the Marshall Islands
COC	Chamber of Commerce
EIA	Environment Impact Assessment
EPA	Environmental Protection Authority
EPPSO	Economic Policy Planning & Statistics Office
GEF	Global Environmental Facility
ILO	International Labor Organization
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JPRISM	Japan Promotion of Regional Initiative on Solid Waste Management
MALGov	Majuro Atoll Local Government
MAWC	Majuro Atoll Waste Company
MEC	Marshalls Energy Company
MICS	Marshall Islands Conservation Society
MIMRA	Marshall Islands Marine Resource Authority
MIVA	Marshall Islands Visitors Authority
MOE	Ministry of Education
MOH	Ministry of Health
MOF	Ministry of Finance
MPW	Ministry of Public Works
NIP	National Implementation Plan
OEPPC	Office of Environmental Planning & Policy Coordination
ODS	
PET	
POPs	Persistent Organic Pollutants
PVC	
SPREP	Secretariat of the Pacific Regional Environmental Programme
UNEP	United Nations Environmental Programme
USP	University of the South Pacific
YTYIH	Youth to Youth in Health
WARM	Work Adjustment for Recycling Management

Executive Summary

This is the RMI's National Waste Management Strategy (NWMS) which has been in development since 2008 by a wide range of stakeholders to help provide vision, guidance and a coordinated, "living" process for solid waste management improvements in the RMI over a five year period 2012-2016. Key participating stakeholders included the 2008 inception workshop participants and neighboring atoll mayors, who are identified in Appendix 1.

The overall goal of this Solid Waste Management Strategy is to develop, implement, and maintain a system of solid waste management in the RMI which is appropriate to the conditions in RMI and which minimizes the negative impacts of poor waste management on both the health of the RMI people and their environment.

Vision

A sustainable Republic of Marshall Islands where public health is protected and the environment is preserved for future generations.

Mission

To reduce solid waste generation and effectively manage solid waste in order to protect the public health and environment of the Republic of Marshall Islands through the cooperation of everyone residing within the country.

Scope

The strategy is for the Republic of the Marshall Islands and covers all types of solid waste, from residential to commercial, institutional and industrial sources, and medical waste from the hospitals and dispensaries. It also covers scrap metal, used oil, used lead acid batteries, and E-waste. However, the strategy does not address liquid waste such as sewage and gaseous waste, except Ozone depleting gases. This report addresses both local and national waste issues, including neighboring atolls within the RMI.

Objectives

- To minimize the unnecessary, untimely, and uncontrolled generation of waste
- To progressively ensure the sustainable financing and operation of waste management facilities
- To ensure compliance with national and international conventions and legal requirements
- To maximize coordination of waste management activities
- To build capacity of stakeholders to promote effective waste management

Thematic Priorities

The objectives will be achieved by implementing improvements across the 8 thematic areas agreed by stakeholders:

Education and Communication: Appropriate school programs at primary and secondary levels must be developed and implemented, such as the inclusion of waste matters in the curricula. We would also seek the involvement of parents through the CLUSTER PTA scheme (empowering and giving ownership of schools to parents). We must improve coordination amongst national partners regarding the promotion of SWM issues. NATIONAL clean up could be established to further promote awareness of existing laws, regulations and environmental issues. Additionally, we should not forget traditional cultural awareness and possible issues and solutions.

Policy, Legislation, and Enforcement: We hope to review and update all laws, regulations, and ordinances, and seek to enforce them more thoroughly and aggressively than in the past.

Sustainable Financing: We hope to achieve economic self-reliance.

Equipment and Infrastructure (including land issues): We must address a lack of adequate long-term disposal site, and proper equipment and facilities while pursuing the sustainable collection of waste and proper management of sanitary landfill sites throughout RMI.

Capacity building and Development: We aim to ensure that everyone in population centers and neighboring atolls are aware of the implications of waste management issues in the RMI. We strive to make everyone responsible and proactive in addressing SWM issues, and to have the capacity to properly deal with whatever waste issues may arise in the future.

Waste Minimization: We must expand recycling programs, improve the recycling system in Majuro, and periodically review recycling data.

Hazardous Waste Management: We need to (NIP). Strengthen national involvement on addressing chemical and hazardous waste. Put disposal management plans into place for national agencies and Ministries that handle chemical and hazardous waste.

Medical Waste Management: Our primary goal is to have ALL medical waste be properly disposed, including on Ebeye and outer islands, with the possibility of establishing a collection system or installing incinerators to address medical waste where other disposal options are not feasible (I.e., for each atoll and outer islands). Additionally, we intend to train and equip MOH staff to properly handle medical waste.

The National Waste Management Strategy and Action Plan has two main chapters - Background and the Way Forward. The Background provides information about the RMI and the strategic context for solid waste management.

A Way Forward outlines the vision, mission, objectives, scope and eight thematic priorities. For each of priority, the current situation is examined ("where are we now?"), realistic goals are set ("where do we want to be?"), and a strategic plan to achieve the goals is outlined ("how will we get there?"). Detailed actions plans are outlined in "Action Plans".

Time Frame

This strategy covers the 5-year period of 2012-2016. It will be monitored, reported on (template in Appendix 2), and evaluated annually, by the Office of Environmental Planning and Policy Coordination (OEPPC), and updated as necessary.

Key Performance Indicators

Key Performance Indicators	Baseline Value	Source
Amount of waste generated per capita	0.9 kg/person/day	Waste characterization studies
Amount of total waste landfilled	20.3 tons/day	MAWC records
Percentage of total waste diverted from landfill (includes 4R activities)		MAWC records
Percentage of population receiving at least once per week collection service	66% (20,000)	Majuro 2011 Infrastructure Survey Report
Number of unauthorized dumpsites		MAWC, community inspections, EPA reports
Number of pollution incidents and license breaches at authorized waste handling, storage, treatment and disposal facilities.		EPA reports

Contents

Background

Country Information

Population

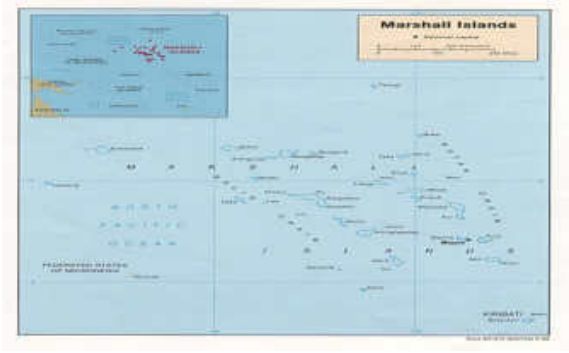
The RMI 2011 Census of Population and Housing provided a national population count of 53,158 persons, comprising of 27,243 males and 25,915 females. This represents an increase of 2,318 residents since 1999, reflecting an annual population growth rate of 0.4% over the past twelve years. Comparing this growth rate to previous years, the population growth has slowed down considerably compared to the high population growth rate between the late 1950s and 1980s, where the RMI population tripled in 30 years, increasing from 13,928 in 1958, to 43,380 in 1988, an average annual growth rate of 3.8%.

These different growth rates also affect the varying population densities across the Marshall Islands. Majuro, with a total land area of 3.75 square miles (or 9.71 square kilometers) is home to 27,797 residents, which translates into a population density of 7,413/m^2, or 2,860/km^2.

The highest population density in the Marshall Islands is on Ebeye island in Kwajalein Atoll, where 9,614 people live in an area of 0.12 m^2 (0.31 km^2), resulting in a population densities of 80,117/m^2 or (31,013/km^2).

Geography and climate

The RMI consists of 5 single islands and 29 atolls (urban centers are Majuro and Kwajalein), each made up of many islets. The RMI is in the central Pacific Ocean, between 4 - 14 degrees north, and 160 - 173 degrees east. The total number of atolls and islets in the whole RMI complex is approximately 1,225; they are spread across a sea area of over 750,000 square miles (1.9 million square kilometers). The total land area is about 70 square miles (181 square kilometers). The mean height of the land is about 7 feet above sea level (approx. 2 meters).



Trade winds prevail throughout the year in Majuro and tropical storms are rare. Minor storms of the easterly wave type are quite common from March to April and October to November. The trade winds are frequently locally interrupted during the summer months by the movement of the zone of inter-tropical convergence across the sea. Rainfall is heavy, with the wettest months being September, October and November. Precipitation is generally of the shower type; however continuous rain is not uncommon. The RMI has an extremely consistent temperature spread, ranging less than 2 degrees.

Generally, The RMI's climate is hot and humid, with a wet season from May to November. The islands occasionally suffer from typhoons. Many Pacific typhoons start in the Marshall Islands region and grow stronger as they move west toward the Mariana Islands and the Philippines.

Administration

The government of Marshall Islands operates under a mixed parliamentary presidential system, which includes a head of state, the President, and a bicameral parliament the Council of Iroiji (the upper house) and Nitijela (the elected low house). Executive power lies with the President, who is elected by the Nitijela, and the Presidential Cabinet. The President appoints cabinet ministers to lead in government departments with the approval of the Nitijela.

Legislative power resides in the Nitijela, which consists of 33 senators elected by 24 electoral districts by universal suffrage of all citizens above 18 years of age. The electoral districts correspond roughly to each atoll of the RMI. Although no legal restrictions exist against the formation of political parties, no formal parties exist. Two *ad hoc* parties have existed since the mid-1990s. The Council of Iroij is comprised of 12 tribal chiefs who advise the Presidential Cabinet and review legislation regarding customary law and traditional practice.

Strategic Context for Solid Waste Management

There are several international, regional, national and sectoral policies and strategies, which must be considered in the development of this National Waste Management Strategy. These policies and strategies include those summarized in the table below.

Policy or Strategy	Commitments or objectives with implications for this National Waste Management Strategy
Stockholm Convention on Persistent Organic Pollutants (POPs) **RMI became a Party on* 27th January 2003	• Implement measures to reduce and eliminate releases of dioxins and furans from unintentional sources (uPOPs), which are generally from the open burning of organic waste (kitchen and yard waste) and other materials containing chlorine (e.g. PVC plastic). (*Ref. Article 5).* • Promote the use of best available techniques (BAT) and best environmental practices (BEP), for sources of uPOPs, specifically open burning of waste on landfills and dumpsites, and waste incinerators. BAT and BEP include using low-waste technology, promoting recovery and recycling of waste, and considering alternatives to incineration. *(Ref. Article 5)*
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal **RMI became a Party on* 27th January 2003	• Prohibit transboundary movements of hazardous wastes to non-parties, which are destined for disposal operations, and reduce permitted movements to a minimum. *(Ref. Article 4)* • Reduce generation of hazardous wastes.*(Ref. Article 4)* • Comply with notification and movement procedures for permitted transboundary movements. *(Ref. Article 6)*
Montreal Protocol…	•
Strategic Development Plan Framework 2003-2018 (Vision 2018)	• Accountability and transparency in implementing policies and programs involving the expenditure of public funds and collection of public revenues at all levels (ref. pg 40). • Existence of a statistical database for planning, implementation and monitoring of sustainable policies and programs (ref. pg 40). • Minimize under utilized land for agricultural purposes (ref. pg 40). • Increase number of tourists by at least 15,000 by the year 2018. • Sustainable and continuous maintenance program for all infrastructure (ref. pg 40) • Efficient and secure land tenure framework for the smooth development of infrastructure(ref. pg 40). • Maximize benefits from global Environmental Conventions (ref. pg 43). • Enhance awareness and commitment levels to minimize environmental degradation (ref. pg 43). • Compliance with environmental laws and regulations (ref. pg 43) • Reinvigorate traditional environmental conservation practices (ref. pg 43).
National Waste Management Policy 2012 (Draft)	• Minimize the unnecessary, untimely, and uncontrolled generation of waste. • Those responsible for contributing to waste generation should pay the costs of managing that waste. • Management of waste to comply with relevant national and international conventions and legal requirements. • Maximize coordination of waste management activities. • Build capacity of stakeholders.
RMI Biodiversity Strategy and Action Plan, 2000.	• Research and develop effective use of local materials for country's needs (ref. pg 10). • Support policies that reduce dependency on imported food and materials (ref. pg 11). • Strengthen awareness for clean environment and to reduce dependence on imported food, non-disposable packaging and other pollutants (ref. pg 12). • Strengthen current initiatives in the major urban areas to improve solid waste management (ref. pg 12). • Allocate adequate resources to regulatory agencies to enforce legislation on pollution and

	waste disposal (ref. pg 12). • Public and private sectors to work together to promote "reduce, reuse, recycle" (ref. pg 12). Responsibilities assigned to: MIMRA, IA, Mobile Team, EPA, local governments, NGOs, and NTC.

General Waste Management Situation

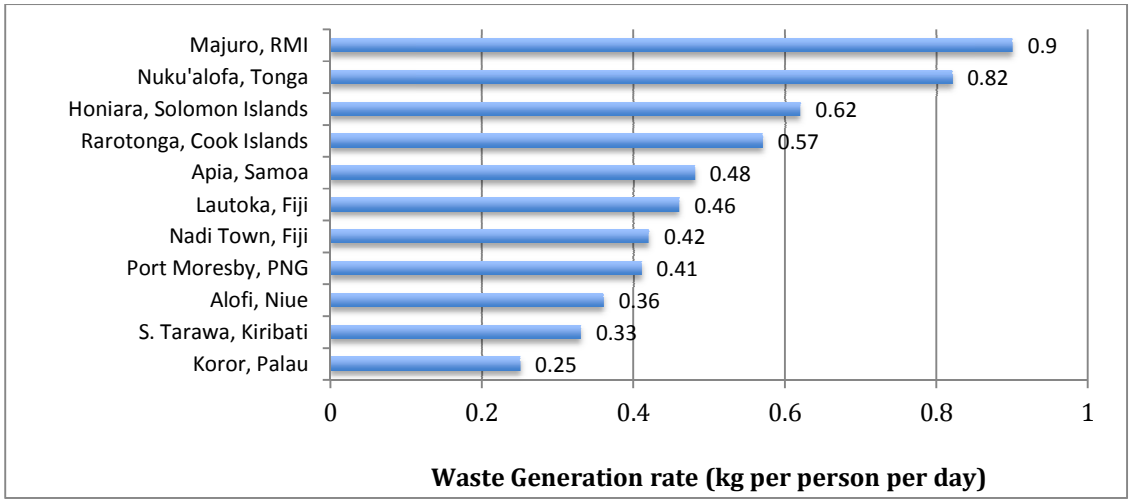
Waste management is among one of the top priorities for action in the RMI. As the RMI develops, the amount of waste generated will likely increase and the nature of the waste will change and will include increasing quantities of toxic elements such as electrical and electronic wastes, chemical wastes, and used oil.

As an atoll nation, the RMI lacks the suitable land space to accommodate environmentally sound disposal facilities for these changing waste streams and simply cannot afford to increase its waste generation. Any suitable and available land requires large investment in infrastructure and environmental protection systems to preserve the integrity of the coastal marine environment and potential underground water resources.

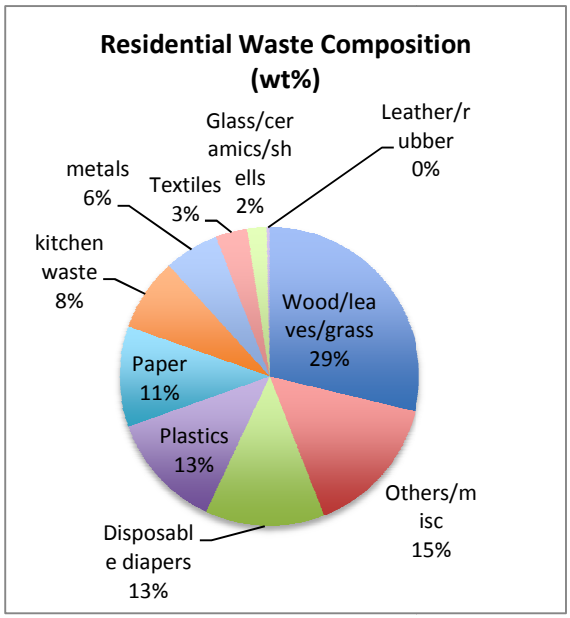
There are several waste management initiatives which have been started in recent years, and which demonstrate the potential for keeping RMI's waste management issues under control. These include the composting operation, scrap metal recycling, production of paper fuel briquettes, reusable bag campaign, and community-based waste separation. The challenge is to scale-up these initiatives and introduce additional complementary measures to reduce the quantity of solid waste that has to be managed and disposed of to land. Human and institutional capacity to manage these programs is also essential and must be addressed if the programs are to be successful and sustainable.

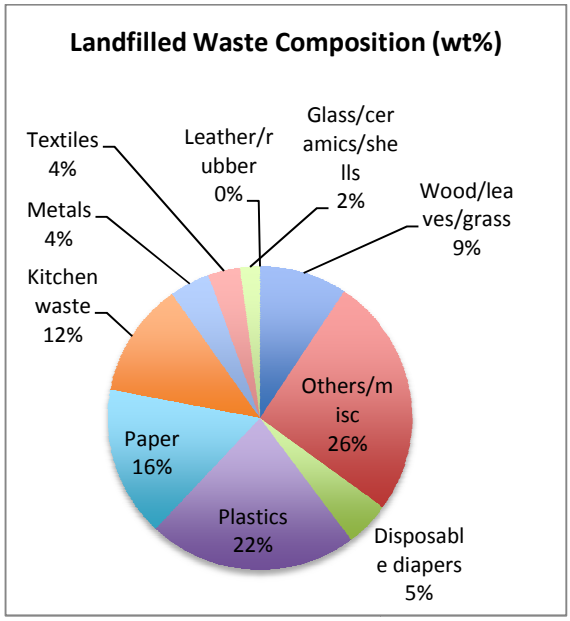
Waste Composition in Majuro

A waste characterization study was completed for Majuro in 2010 through a JOCV. The results showed that about 20.4 tons of waste was disposed of every day, with each person generating an average of 0.9 kilograms per day. This is the highest generation rate among several Pacific Islands urban centers as shown in the figure below.



Residential waste accounted for 7.2 tons per day, with commercial waste amount to 13.2 tons per day. The composition of residential waste (household) and landfilled waste are shown in the charts below. Significant waste types that must be addressed are organic wastes, diapers, plastics, paper, and metals.





Stakeholder group

Major Stakeholders for Waste Management in RMI are in shown in the table below.

Major Stakeholders	Involvement in Waste Management
Ministry of Public Works (MPW)	
Office of Chief Secretary (OCS)	
Office of Environmental Planning and Policy Coordination (OEPPC)	
Ministry of Education (MOE)	
Ministry of Health (MOH)	Medical waste generators and managers
Environmental Protection Authority (EPA)	Environmental quality regulation
Marshall Islands Visitors Authority (MIVA)	
Municipal Government	
Majuro Atoll Waste Company (MAWC)	
Terrestrial Program, Marshall Islands Conservation Society (MICS)	
Tourism and Hospitality Community Association (TAHCH)	
Communities	
Schools	

A Way Forward

Guiding Principles

Implementation of this National Waste Management shall adhere to the following policy principles:

Transparency

All waste management activities shall be conducted in an open and transparent manner and Marshall Islanders shall have access to information regarding waste management where this does not infringe on the rights of individuals or private businesses.

Sound decision-making

Decision-making shall be based on scientific information and risk analysis from national, regional and international sources and shall promote the optimization of resources.

Precautionary approach

Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation

Adherence to Regional/International Conventions

Marshall Islanders shall abide by their obligations to regional and international waste conventions to which they are a Party.

Vision

A sustainable Republic of the Marshall Islands where public health and the environment are preserved for future generations.

Mission

To reduce the solid waste generation and effectively manage solid waste in order to protect the public health and environment of the Republic of Marshall Islands through the cooperation of everyone residing within the country.

Scope

The strategy is for the Republic of the Marshall Islands and covers all types of solid waste, from residential to commercial, institutional and industrial sources, and medical waste from the hospitals and dispensaries. It also covers scrap metal, used oil, used lead acid batteries, and E-waste. However, this mission does not address liquid waste such as sewage and gaseous waste (except ozone depleting gases). This report addresses both local and national waste issues, including neighboring atolls within the RMI.

Objectives

- To minimize the unnecessary, untimely, and uncontrolled generation of waste
- To progressively ensure the sustainable financing and operation of waste management facilities
- To ensure compliance with national and international conventions and legal requirements
- To maximize coordination of waste management activities
- To build capacity of stakeholders to promote effective waste management

Priority Areas

The priority areas for waste management in the RMI were identified and developed through national consultations workshops (12th-15th August 2008, and 19th June 2012). The eight priorities identified in no particular order of importance are: (1) Education and Communication; (2) Policy, Legislation, and Enforcement; (3) Sustainable Financing; (4) Equipment and Infrastructure; (5) Capacity Building; (6) Waste Minimization; (7) Hazardous Waste Management; and (8) Medical Waste Management. Within each priority area, the current situation is assessed ("Where are we now?"), realistic goals are set ("Where do we want to be?"), and strategic actions to achieve the goals are identified ("How will we get there?").

Education and Communication

Where are we now?

The EPA and the MICS undertake school visits in Majuro, Ebeye and neighboring islands to promote the 4R's concept and increase community awareness of solid waste management (SWM) issues. In addition, MAWC and the EPA conduct weekly national radio spots with V7AB and local FM stations on Majuro and on outer islands that discuss waste management and recycling. MIVA has conducted several public campaigns to help clean up Majuro with the EPA, YTYIH, MAWC and MICS, MIMRA conducts an annual clean up on Majuro with the MOE on World Oceans Day.

Where do we want to be?

- Public information and awareness on waste management coordinated through the J-PRISM Joint Coordinating Committee (JCC) and commenced by 2013.
- Education and communication materials are introduced annually to all primary and secondary schools by 2013.
- Community participation in waste management activities promoted by local government and landowners commencing in 2013.
- Commercial and industrial sectors (including tourism and fisheries) are active contributors to improved waste management practices in RMI by 2014.

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe	Estimated Budget
1. Conduct annual coordination workshop to update the Education and Communication section of the NWMS, devise short-term action plans, and develop a communication strategy.	J-PRISM JCC	Churches, NGOs, Family Units, National women's organizations, youth groups, Ministry of Internal Affairs, EPA, MAWC	Annually	$2,500
2. Develop and implement annual coordinated activities focusing on better national waste management and home-based recycling.	EPA, MAWC	Public Service Commission, MOE, private sector, Local governments, OEPPC, MIVA	Commenced by 2013	$800
3. Develop and implement an accreditation program in sustainable waste management practices for communities and other sectors including education, commercial, industrial, tourism, and fisheries.	OEPPC	MOE, MIVA, Fisheries, COC, CMI, USP	Developed by 2014	$18,000

Policy, Legislation and Enforcement

Where are we now?

There is no comprehensive policy and regulatory framework for solid waste management in the Marshall Islands, and existing legislation is not enforced. In some cases this is because the laws are outdated. Laws that can be enforced for improper disposal, accumulation of waste or littering in the Republic of the Marshall Islands include:

1. National Environmental Act 1984
2. Solid Waste Regulation 1989
3. Marine Water Quality Regulation 1992
4. Ozone Layer Depleting Substances Regulation 2004
5. Marshall Islands Public Health, Safety and Welfare Act [year?] (MOH responsibility)
6. Marshall Islands Littering Act 1982 (empowers National Police and Local Government to enforce this act)
7. MAWC Charter/Bi-laws
8. Majuro Atoll Local Government Ordinances (Nos.: 1986-16, 1986-17, 1986-20, and 1988-3)

Where do we want to be?

- Laws, regulations, and ordinances pertaining to solid and hazardous wastes and chemicals management in all sectors (schools, commercial, fishing, etc) are updated and strengthened by 2015, and enforced regularly.
- Updated National Implementation Plan (NIP) for POPs completed by 2015.

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe	Estimated Budget
4. Conduct a review of relevant laws, regulations and ordinances pertaining to solid waste and hazardous substances management, including a review of RMI's obligations under relevant regional and international multilateral environmental agreements.	OEPPC, EPA	AG Office, SPREP, MALGov, MOH, MAWC	2014	$30,000
5. Strengthen the enforcement and compliance capacity within the country.	EPA	AG Office	2013-2014	$20,000

Sustainable Financing

Where are we now?

The main source of funding for waste management operations comes from the 20-year, Amended Compact of Free Association Agreement (Compact II) between the Republic of the Marshall Islands and the United States of America, which expires in 2023. The Majuro Atoll Waste Company receives $325,000 annually, while the RMI EPA receives $242,893 to support activities and programs on Ebeye.

RMI has no major sustainable financing initiatives to support solid waste management. However, the provision of waste collection services to the private sector, and minor services such as the sale of compost and paper fuel briquettes generate an estimated $150,000 in annual revenue to supplement the grant from the Compact II. The total waste management budget is therefore currently $475,000, of which 31.6% is recovered through sustainable means.

Where do we want to be?

- An increased proportion of the annual MAWC budget is recovered through sustainable measures including user-pay charges by 2015.

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe	Estimated Budget
6. Broaden the scope of the J-PRISM JCC to maintain a comprehensive overview of the waste situation, and competently advise of progress and barriers to implementing the RMI National Waste Management Strategy	MPW, OEPPC	J-PRISM JCC	2014	$5,000
7. Develop and implement container deposit legislation (CDL) for beverage and alcohol containers, lead-acid batteries, and other selected waste items, which will encourage their return and provide revenue for their export and recycling.	OEPPC, MAWC	AG Office	2014	$15,000
8. Develop and implement affordable, and socially-equitable waste collection fees and landfill tipping fees on Majuro Atoll.	MPW, MAWC	AG Office	2014	$8,000
9. Select and commission a new landfill site as a matter of priority	MAWC	JCC	2014	

Equipment and Infrastructure (including land issues)

Where are we now?

The main source of funding for waste management operations comes from the 20-year, Amended Compact of Free Association Agreement (Compact II) between the Republic of the Marshall Islands and the United States of America, which expires in 2023. Under this Agreement, the Republic of Marshall Islands will be granted $1,209 million over the duration to assist in education, health care, the environment, public sector capacity building, and private sector development, or in other mutually agreed areas.

Between 30 and 50 percent of the annual grant ($18.81M – $31.35M from 2013 onwards) is available for public infrastructure assistance, with highest priority given to primary and secondary education capital projects and projects that directly affect health and safety, including water and wastewater projects, solid waste disposal projects, and health care facilities. Secondary priority is given to economic development-related projects, including airport and seaport improvements, roads, sea walls, and electrical power expansion that cannot be funded through the rate structure. Education remains the priority sector targeted by Compact infrastructure assistance and has also received the largest portion of infrastructure development and maintenance funding over the past three years.

During the 2012 financial year, it was reported that $650,000 was available for waste management capital, including the creation of a new landfill site, and the safe closure of the existing site. This must be expended prior to October 2012.

In 2011, the EPA received an allocation of $242,893 to support their activities and programs on Ebeye. MAWC also received $325,000 to support operational needs.

Approximately 20.3 tons of rubbish is produced and dumped at the Majuro landfill per day. There is only one waste disposal site in Majuro. Development of the site has involved land filling a former reef inlet over a 4-acre area. It is estimated that over 2 million cubic feet of rubbish has been disposed of at the site. The disposal site is subject to flooding and there are no controls or management of the leachate generated by the site. The site is currently at full capacity and a new site is urgently required along with stabilization and remediation of the current disposal site.

The existing dumpsite was closed by the EPA temporarily in 2011, but was forced to re-open due to lack of other waste disposal options and an increase in littering. One temporary landfill site with a 9-month capacity (1547.11 m^3) has been identified and approved in Rankan, Rairok, Long Island in a swamp area, which the community wants filled in due to mosquito breeding to eliminate the dengue fever risk.

Two (2) other long-term landfill sites have also been tentatively identified in the vicinity of Jenrok, for which MAWC has finalized the land negotiations, however MAWC needs submit application and scoping study for using the site to EPA. It is estimated that an area of approximately 13 acres is necessary to provide a landfill lifespan of at least 10 years.

A closure plan including ongoing monitoring for the existing site is yet to be submitted to the EPA for approval.

The equipment available for waste collection on Majuro includes 2 garbage trucks (a third truck is in-operable), which must cope with a daily collection load of about 8 tons, and which provides once-per-week collection services to each community on Majuro Atoll between Rita and the airfield. Collection of solid waste and green waste is carried out separately.

The equipment available for dumpsite maintenance and recycling activities on Majuro includes: 2 front-end loaders, 1 excavator, 1 compactor, 1 tire shredder, 1 aluminum can crusher, 1 baler for plastics, and 1 wood chipper. An additional

front-end loader has been inoperable for over 8 months, and the auto-tie function of the plastic baler (which keeps the bales in-tact) does not work. This equipment must cope with over 20 tons of residential and commercial waste daily.

Where do we want to be?

- Residential waste collection service (once-per-week) extended to include each community on Majuro Atoll by 2014.
- Adequate numbers and appropriate types of well-maintained waste management equipment secured by 2014.
- A new landfill site is selected and commissioned by 2013 in Majuro.
- The existing landfill site is decommissioned and secured by 2014 in Majuro.

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
10. Select and commission new landfill site as a matter of priority	MAWC	Land-owners	2014	$10,000
11. Decommission and secure the existing dumpsite	MAWC	EPA, MPW, Land-owners	2014	$300,000
12. Conduct a time-motion study of the waste collection service to identify inefficiencies and areas for improvement.	MAWC	EPA, JPRISM	2014	$3,000
13. Develop and implement a preventive maintenance program for all waste management equipment.	MAWC	MPW	2014	$1,000
14. Prioritize funding in the Compact budget for expansion of waste collection services in Majuro (including procurement of additional equipment) in collaboration with the private sector where practical.	CSO, MAWC, Appropriation Committee	MOF	2014	$1,000

Capacity Building

Where are we now?

The main Agencies involved in solid waste and hazardous substances management are shown in the table below:

Agency	Role
Office of Environmental Planning & Policy Coordination (OEPPC)	Waste Management Policy and Strategy Coordination
RMI Environmental Protection Agency	Environmental regulation of waste management facilities
Department of Public Works	Oversight of waste disposal
Majuro Atoll Waste Company	Provision of waste collection, recycling, and disposal services
Ministry of Health	Management of medical wastes
Majuro Atoll Local Government	Provision of waste collection services (provided by MAWC in reality)
Majuro Energy Company	Management of waste oil
Kwajalein Atoll Local Government	Management of wastes on Kwajalein Atoll
Local Government on each Atoll	Management of wastes on each atoll

While there is separation of powers between OEPPC, EPA and Public Works/MAWC, an effective mechanism for communication, coordination, and collaboration seems to be lacking. The J-PRISM JCC established in 2011 is a potential mechanism for improving these deficiencies.

The numbers and levels of staff involved in solid waste and hazardous substances management within the various agencies are shown below:

Agency	Staff involved	Level of training	Comments
OEPPC	1 staff	Certificate in Solid Waste Mgmt	Provided by JICA
RMI EPA	3 staff including Chief of Division	Associate Degree	Funding being sought for additional TA position
Dept. of Public Works	See MAWC	---	---
MAWC	38 Staff, 1 JICA Volunteer	Nil	---
Ministry of Health	1 Infection Control Officer, 2 waste management staff	Hazmat	Annual training by US
MALGov	2	Nil	
Majuro Energy Company	3	Nil	Waste oil management, used lead acid battery recycling

Basic training has been provided for medical waste incinerator staff and for dumpsite staff in the past, but is now overdue. The major issues include a lack of funding, a lack of information, a lack of communication and coordination, and shortage of human resources.

Where do we want to be?

- Better coordination and communication between the main agencies responsible for solid waste and hazardous substances management
- An integrated and on-going training schedule for all workers involved in waste management activities

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
15. Prioritize waste management training at the national level and improve engagement with local and regional higher learning institutions and instructors.	CSO, MOE, NTC	MAWC, EPA, MPW, OEPPC	2014	$1,000
16. Prioritize vocational waste management training at the local government level, with priority emphasis for Majuro, Ebeye, Wotje, and Jaluit.	Local Govt, IA, NTC	MAWC, OEPPC	2014	$500
17. Implement training in occupational health and safety for all workers engaged in waste management activities – reference ILOs WARM manual.	MAWC, MOH	Local Govt	2014	$1,000
18. Develop and implement waste minimization and management plans for each populated atoll - immediate priorities are Ebeye, Wotje, Jaluit Atolls.	IA	JCC, MIMA, OEPPC	2014	$20,000

Waste Minimization (Reduce, Reuse, Recycle, Refuse)

Where are we now?

Waste reduction initiatives on Majuro include the limited promotion of reusable shopping bags in order to reduce usage of plastic bags. At least nine local supermarkets participate by offering paper bags (instead of plastic) or by offering cash back (between $0.03 and $0.05) for each plastic bag refused. This is a collaborative effort involving shop-owners and OEPPC, MAWC, MOE, EPA, and JICA.

Several initiatives have been trialed for reusing certain types of wastes, including converting tires and propane tanks into flower pots, and converting paper and cardboard into fuel briquettes using a simple locally-made machine. These paper fuel briquettes take about 1 week to make and are sold at $0.25 per briquette. Each briquette burns for about 45 minutes and a set of 10 briquettes are sufficient to meet the cooking needs of a typically Marshallese family for 1 week. About 800 pieces were sold in June 2012, and sales are expected to increase as awareness grows.

Recycling initiatives on Majuro Atoll are led by MAWC and include separation on site of aluminum cans, ferrous and non-ferrous components from bulky wastes (e.g. appliances and vehicles). These materials are typically exported to Hong Kong, through an arrangement brokered with a New Zealand-based agent, who works on a 5% commission of the gross container cost. In the last 8 months, six (6) 20-foot containers of scrap have been exported, however, there is still a large backlog of scrap metal (mainly ferrous metal) on the current dumpsite, which will require significant resources to clear.

Up to 13 recycling points have been established in various communities to encourage the segregation of aluminum cans, PET plastics, and organic waste (or paper, depending on location of the bins). However, additional bins (more than 50) are needed to extend the recycling program throughout the entire atoll.

The composting program commenced in 2010, and involves the separation of organic waste, which is shredded on site using a wood-chipper, mixed with fish waste and/or copra cake, and composted. Finished and mature compost is typically produced after 1 month, sorted into 2 grades and sold to the public. Rough grade compost is sold at $7.50 for 15 gallons, while the finer grade is sold at $15 per 15 gallons. The quality of the compost has not been tested.

Used lead acid batteries (ULABs) were previously collected/accepted at the dumpsite, but none have been exported. The resulting lack of safe storage space means that ULABs are no longer collected and accepted at the dumpsite. MAWC staff also require training in Basel Convention requirements for ULAB export and additional information about likely ULAB receivers. The MEC collects ULABS arising from solar power generation and it is anticipated that up to 1,500 batteries will need to be disposed of with the next 2 years. Stockpiles of ULABs are present around Majuro in industrial areas.

PET plastics have been baled and the processing/shipment costs subsidized by exporting with the higher-valued metals. However, the auto-tie function for the bales (which keeps the bales intact) has ceased, which in turn has suspended the baling operation. The auto-tie function has not been repaired due to other funding limitations and other activities taking priority.

Tires are shredded into large chunks using a tire shredder and buried in the dumpsite. However, there is a large stockpile of un-shredded tires, which is a potential breeding ground for disease-carrying mosquitoes. MAWC and EPA have identified a potential market (re-treading) for the waste tires in Vietnam, which will be pursued further in the near future. Stockpiles of used tires are also present along the length of the atoll.

Where do we want to be?

Ongoing waste minimization programs implemented that reduce the amount of waste going to landfill.

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
19. Develop and implement a plan for an integrated waste minimization system encompassing the 4Rs.	MAWC	MOE, EPA, JICA, MIVA	2014	$2,000
20. Scale-up the reusable bag promotion campaign and assess other options for reducing plastic bag usage.	COC	OEPPC, EPA	2014	$5,000
21. Scale-up the manufacture of paper briquettes.	MAWC	JICA	2014	
22. Scale-up the existing composting program.	MAWC	JICA	2014	$8,000
23. Collect, process, and export of legacy scrap metal in the Marshall Islands in conjunction with the private sector.	MAWC	COC MPW MALGov, EPA	2014	$25,000
24. Expand the community recycling initiative in Majuro by providing at least an additional 10 recycling points each year (to be accompanied by public awareness).	MAWC	MALGov, MOE, Landowners, SPREP, EPA	2014	$5,000
25. Prioritize the repair of the PET plastic bailing machine and re-commence export of PET plastics.	MAWC	MPW	2014	$10,000
26. Prioritize the export of used lead acid batteries, and re-commence the collection/acceptance of batteries.	MAWC	MICS, EPA	2014	$5,000
27. Maintain and issue suitable personal protective equipment and deliver annual worker training to operational staff at the dumpsite.	MAWC	EPA	2014	$12,000
28. Collect and report data on all recycling programs in RMI to track recycling rate and annual progress towards achieving the goals.	EPA,	JICA, EPPSO, MALGov	2014	$1,000

Hazardous Waste Management

Where are we now?

Whilst there is limited data available, it is believed that chemical and hazardous waste are being illegally dumped and are likely to be adversely affecting the environment in the Marshall Islands. Buried chemicals (1000kg) are reported to be present at Place Arno Coconut Research Farm (GHD 2007) and 100 drums of bitumen have been reported to be present on Kwajalein Atoll (Country Report 2003). There are conflicting reports about the number of transformers contaminated with PCBs remaining in RMI. The estimates range from 1 in Jaluit (S. Wakefield) to 8 in Ebeye (Roney Arelong). There are no reports of significant quantities of asbestos present in RMI. E-waste is currently collected at the landfill and separated and stored for eventual export. Decanted refrigerant (ODS) gas bottles are also collected at the landfill. Residual refrigerant gas is currently allowed to escape to the atmosphere. OCO, and APTC will be conducting training in RMI in 2012 to train locals in capture of refrigerant gases.

It is an EPA arrangement that all waste oil generated in Majuro is received and stored by the Majuro Energy Company (MEC). There are 176,000 gallons of waste oil currently stored in Majuro at MEC. This volume has been reduced from 300,000 gallons over the last 2 years by burning it in the power generating engines to produce electricity. It is dewatered prior to mixing with diesel and injection into the generator motor. The MEC site has the capacity to store 750,000 gallons of waste oil and waste oil has not been incinerated at the site since 2006. All oil storage tanks at the MEC will have to be inspected and tested within the next 2 years (they are 33 years old) and this will require disposal of accumulated oiled sludge in the tanks (3-6 inches of sludge in each 42-ft diameter tank). There are currently no oil testing facilities in Majuro and it is difficult to transport oil samples out of the country for testing (as there is an airline ban in place).

The EPA has provisions under the National Environmental Protection Act (NEPA), Solid Waste Regulations and Water Quality Regulations concerning chemical and hazardous waste management that need to be reviewed to incorporate and mainstream best environmental practices. There are no hazardous waste disposal and management plans developed by the MOH, MPW (MEC, MWSC) MR&D, MIMRA, MTC, Public Safety or the MOE. RMI is a party to the Basel convention, but not a Party to the Waigani Convention.

Where do we want to be?

- National chemical and waste oil management plan developed and implemented by relevant Agencies.
- Quantities of existing chemicals and hazardous waste stockpiles confirmed.

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
29. Integrate POPs National Committee into Waste Management Steering Group	EPA	MEC, JCC	2014	$1,000
30. Secure funding to complete National Implementation Plan review from UNEP/GEF-5.	EPA	OEPPC	2014	$2,000
31. Implement NIP review recommendations	EPA	Other stakeholders	2013 - 2014	$7,000
32. Analyze the relative cost-benefits of RMI becoming a party to the Waigani Convention	OEPPC	MOFA, OEPPC, SPREP, EPA	2014	
33. Complete the Marshall Islands Waste Oil Management	EPA and	Waste oil	2014	$1,000

	Plan	MEC	stakeholders		
34.	Negotiate safe and permitted transport by the regional airline of waste oil samples for analysis	OEPPC	EPA	2014	
35.	Complete National E-waste and ODS management policies and strategies	EPA OEPPC	MAWC	2014 (ODS) 2014 (E-waste)	
36.	Incorporate best practice disposal or recycling practices for ODS and E-waste into routine landfill operations	EPA and MAWC	OEPPC	2014	

Medical Waste Management

Where are we now?

Health care wastes are collected daily from Majuro hospital and transported in a dedicated open trailer to a high temperature incinerator facility located on a leased site near the airport. A private contractor is retained on an annual basis through a sole-source tender process to undertake incinerator operations. The contract price for 2012 is $100,000. All costs associated with medical waste incineration including incinerator fuel and incinerator parts and maintenance are currently provided for by the hospital. The incineration site is not secured and there are stockpiled medical wastes including syringes in unlocked site shipping containers and lying around the site. The incinerator ash is currently buried in multiple cement-lined pits sealed with concrete lids at the site.

The hospital has no infection control plan and workers handling medical waste are provided with protective equipment. There is no management plan for medical waste management. The EPA undertakes basic monitoring of the medical waste incinerator facility, but there is no environmental monitoring plan for the hospital waste, and monitoring data is not made available on a regular basis. Monitoring data has not been cited from the EPA.

Health care wastes from Ebeye are incinerated in pits in the local landfill. Money has been secured from the US to purchase and commission a high temperature incinerator on Ebeye by the end of 2012. The majority of the outer islands' medical wastes are incinerated (at low temperature) in 55-gallon drums near their respective Medical Centers.

Where do we want to be?

- Best practice is routinely used to manage infection control and medical waste disposal in Majuro by 2013.
- Medical waste management brought under the complete control of the hospital by 2013.
- Medical waste incineration data is collected annually and reported to government and the community by 2014.
- Best practical options for medical waste management in RMI established by 2013.

How will we get there?

Action	Lead Agency	Partner Agencies	Timeframe	Estimated Budget
37. Incorporate integrated medical waste management into Hospital operational plans and budgets	MOH	EPA	2014	
38. Relocate high temperature incinerator to new secure disposal site and commission it.	MOH	EPA, MAWC	2014	$20,000
39. Establish controlled and licensed medical incinerator ash disposal site.	MOH	EPA	2014	
40. Regulate and license hospital incinerator operation	EPA	MOH	2014	
41. Implement annual refresher training for all Orderlies and incinerator operators	MOH	NTC	2014	$10,000
42. Monitor medical waste management performance	MOH	EPA	2014	$5,000
43. Review best options (including cost-effectiveness) for atoll medical waste management, as a component of the review	MOH	EPA, MAWC	2014	

of atoll waste management.				

Measuring and Reporting Our Progress

The following Key Performance Indicators will be used to track and report progress in implementing the RMI National Waste Management strategy.

Key Performance Indicators	Baseline Value	Source
Amount of waste generated per capita	0.9 kg/person/day	2010/2011 waste characterization study
Amount of total waste landfilled	20.3 tons/day	MAWC records for 2011/2012
Percentage of total waste diverted from landfill (includes reuse, recycling, composting, and other waste minimization activities)	See RMI-EPA and MAWC	MAWC records
Percentage of population receiving at least once per week collection service	66% (20,000)	Majuro 2011 Infrastructure Survey Report
Number of unauthorized dumpsites	See RMI-EPA	MAWC, Community inspections, EPA reports
Number of pollution incidents and license breaches at authorized waste handling, storage, treatment and disposal facilities.	See RMI-EPA	EPA reports

Each Agency tasked to lead the implementation of activities identified in the National Waste Management strategy, shall be required to report progress on an annual basis using the template provided in Appendix 2 as a minimum. OEPPC shall coordinate and compile individual reports to provide an annual overview of national progress.

Action Plans

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
Education and Communication				
1. Conduct annual coordination workshop to update the Education and Communication section of the NWMS, devise short-term action plans, and develop a communication strategy.	**J-PRISM JCC**	**Churches, NGOs, Family Units, National women's organizations, youth groups, Ministry of Internal Affairs**	**Annually**	**$2,500**
a. Identify and allocate resources to develop awareness and educational materials	OEPPC	EPA, MOE, MOH	Annually	
b. Identify resource materials to conduct workshops with expert technical input from MOE	MOE	EPA	Annually	
c. Conduct two week-workshops for selected teachers as trainers in the schools	MOE	EPA	Annually	$2,500
2. **Develop and implement annual coordinated activities focusing on better national waste management and home-based recycling**	**EPA, MAWC**	**Public Service Commission, MOE, private sector, Local governments, OEPPC, MIVA**	**Commenced by 2013**	**$1,600**
a. Conduct quarterly awareness campaigns (radio, newspapers) promoting household waste management, and promoting awareness of littering fines and relevant regulations.	MAWC	EPA, MIVA, MALGov, NGOs	Commenced by 2012	
b. Promote 4Rs through tourism operators, and large waste generators on a quarterly basis	EPA, MIVA	EPA, MIVA, MALGov, NGOs	Commenced by 2012	
c. Conduct annual poster and/or essay competition, including a schools poster contest.	EPA, MOE	MALGov, OEPPC	Commenced by 2013	**$300**
d. Hold an Annual National Environment Day celebration with a waste-management theme.	EPA, MOE	OEPPC, MIVA, MIMRA	Commenced by 2013	**$300**
e. Hold an Annual National Clean-up Day	EPA & MIMRA	MALGov, MOE, MPW	Commenced by 2012	**$800**
f. Conduct annual school visits to all RMI schools	EPA, MIVA, MICS	MALGov, MOE	Quarterly	**$200**

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
3. Develop and implement an accreditation program in sustainable waste management practices for communities and other sectors including education, commercial, industrial, tourism, and fisheries.	**OEPPC**	**MOE, MIVA, Fisheries, COC**	**Developed by 2014**	**$18,000**
a. Prepare school curriculum materials on waste management with expert technical input from MOE, EPA, MAWC, and MEC.	MOE, EPA	MAWC, MEC, MIVA, USP, CMI, SPREP	Prepared by 2013	
b. Develop teacher training and training-of-trainers program	MOE	OEPPC, EPA, CMI, USP, SPREP	Developed by 2013	
c. Convene meeting to establish and agree on accreditation criteria, incentives, guidelines, funding (from local business sector), etc., as well as roles/responsibilities in implementing the accreditation program.	OEPPC	MOE, MIVA, Fisheries, COC, CMI, USP	2013	
d. Promote the accreditation program through flyers, posters, informational sessions, and other awareness means.	OEPPC, EPA	MOE, MIVA, Fisheries, COC, CMI, USP	2013	
e. Implement the accreditation program, and monitor annually.	OEPPC, EPA	MOE, MIVA, Fisheries, COC, CMI, USP	2014	
Policy, Legislation and Enforcement				
4. **Conduct a review of relevant laws, regulations and ordinances pertaining to solid waste and hazardous substances management, including a review of RMI's obligations under relevant regional and international multilateral environmental agreements.**	**OEPPC, EPA**	**AG Office, SPREP, MALGov, MOH, MAWC**	**2014**	**$30,000**
a. Recruit appropriate experts and conduct a participative review of relevant laws, regulations and ordinances, obligations under agreements, institutional arrangements, and make recommendations.	OEPPC, EPA	AG Office, SPREP, MAWC, MALGov	2014	
b. Conduct cycle of public hearings of the legislative review outcomes, and incorporate public feedback as appropriate	EPA	OEPPC, MAWC	2014	
c. Submit updated laws and regulations to the Cabinet (and ordinances to the Ministry of Local Government) for endorsement	EPA	AG Office	2014	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
5. Strengthen the enforcement and compliance capacity within the country.	**EPA**	**AG Office**	**2013-2014**	**$20,000**
a. Conduct an assessment of the training needs of local and national enforcement agencies, communities, NGOs, Alabs, etc	EPA	**OEPPC**	**2013-2014**	
b. Conduct training for enforcement to all groups according to assessment outcomes, and coordinate this training at the community and national level.	EPA	**OEPPC, MALGov Local governments**	**2013-2015**	
c. Empower Alabs and landowners to enforce solid waste management laws, regulations and ordinances	EPA, AG Office	Alabs, landowners	2014	
d. Conduct public awareness campaigns on the enacted laws and regulations	EPA	**OEPPC, MALGov, Local governments**	**2013-2014**	
e. Empower EPA to enforce by recruiting legal counsel to prosecute outstanding cases at EPA following grace period	EPA	AG Office	2013-2014	
Sustainable Financing				
6. Broaden the scope of the J-PRISM JCC to maintain a comprehensive overview of the waste situation, and competently advise of progress and barriers to implementing the RMI National Waste Management Strategy	**MPW, OEPPC**	**J-PRISM JCC**	**2012**	**$5,000**
a. Draft TOR and circulate to JCC for review	OEPPC	JCC Members	2013	
b. Conduct JCC meeting to adopt TOR	OEPPC	JCC Members	2012	
c. Prepare six-monthly reports on the implementation of the National Waste Management Strategy (template provided in Appendix 2).	OEPPC		2012	
d. Disseminate reports to SPREP and the donor community.	OEPPC		Annually	
7. Develop and implement container deposit legislation (CDL) for beverage and alcohol containers, lead-acid batteries, and other selected waste items, which will encourage their return and provide revenue for their export and recycling.	**CSO**	**AG Office, MAWC, EPA, OEPPC, MOF**	**2013**	**$20,000**
a. Establish a Project Management Unit (PMU) within MAWC/EPA with J-PRISM JCC to oversee and direct the implementation of the CDL program.	CSO	MPW, OEPPC, MAWC	2012	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
b. Recruit appropriate experts or technical assistance to design the container deposit-refund operation and management system, and to draft the appropriate legislation in consultation with local industries and other key stakeholders.	PMU	OEPPC, EPA, MAWC	2013	
c. Conduct a public hearing of the container deposit-refund system including the legislation.	EPA	PMU	2013	
d. Submit CDL to Cabinet for endorsement.	EPA	PMU	2013	
e. Implement the endorsed CDL program.	MAWC	EPA	2014	
f. Investigate and compare other appropriate economic incentives to encourage good waste management practices in RMI (e.g. duty-free import on waste management equipment, and environmentally-friendly products such as reusable bags, paper bags, diapers, etc).	OEPPC	EPA, Ministry of Finance	2014	
8. Develop and implement affordable, and socially-equitable waste collection fees and landfill tipping fees on Majuro Atoll.	**MPW**	**AG Office, MAWC, EPA, OEPPC**	**2014**	**$15,000**
a. Seek technical advice and support to develop a pay-as-you-throw waste collection system using pre-paid garbage bags or another appropriate measure.	MPW	SPREP, JICA	2014	
b. Conduct a public hearing on the proposed waste collection system, and take feedback on board.	MAWC	SPREP, EPA	2013	
c. Implement the pay-as-you-throw waste collection system.	MAWC	Chamber of Commerce	2014	
d. Develop a disposal fee schedule for waste disposal on Majuro Atoll, based on the costs of operating the dumpsite, and the amount of waste disposed. The fee schedule should offer incentives for people who segregate waste, and should be gradually introduced following a period of public awareness.	MAWC, MPW	EPA	2013	
e. Conduct public hearing on the disposal fee schedule.	EPA, MAWC		2013	
f. Conduct extensive public awareness campaign on the disposal fees before implementation.	MAWC, EPA	JCC Members	2013	
g. Implement the waste disposal fees.	MAWC	EPA	2014	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
9. Select and commission a new landfill site as a matter of priority	**MAWC**	**MAWC, AG, JCC**	**2014**	**$1,000**
a. Consultation with appropriate stakeholder	MPW	AG, JCC	2014	
b. Develop plan and submit to Cabinet for endorsement	MPW	JCC	2014	
c. Implement plan and report periodically to Cabinet on progress	MAWC	JCC	2014	
Equipment and Infrastructure (including land issues)				
10. Select and commission a new landfill site as a matter of priority	**MAWC**	**Landowners, OEPPC, EPA, MoIA**	**2014**	**$10,000**
a. Undertake consultations with traditional landowners for the new site.	MAWC	OEPPC, EPA	2014	
b. Submit application to EPA for permit to use the new site			2014	
c. Undertake EIA of the new site and submit report to EPA to review	MAWC	EPA	2014	
d. Conduct public awareness and devise an engagement strategy for surrounding community, such as giving local residents priority for landfill jobs.	MAWC	EPA	2014	
e. Develop and implement an operational plan for new landfill, which includes an environmental monitoring program.	MAWC	EPA, OEPPC	2014	
f. IA to consult with local governments on designation of landfill sites in populated atolls	MoIA	MAWC, Landowners	2014	
11. Decommission and secure the existing dumpsite	**MAWC**	**EPA**	**2014**	**$300,000**
a. Complete the development of the closure plan for the existing dumpsite taking into account different land options available to enable safe closure.	MAWC	EPA	2014	
b. Complete the land negotiations required to implement the closure plan	MAWC	EPA	2014	
c. Develop monitoring criteria, and conduct regular environmental monitoring of the closed landfill site for 2 years after closure and publish the collected data.	MAWC, EPA	EPA	2014	
12. Conduct a time-motion study of the collection service to identify inefficiencies and areas for improvement.	**MAWC**	**EPA, J-PRISM JCC**	**2013**	**$3,000**

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
a. Seek technical information and advice on how to conduct the time-motion study and analyze the results.	MAWC	JICA, SPREP	2012	
b. Recruit students from the local colleges (USP, CMI) to assist in conducting the time-motion study.	MAWC	CMI, USP, EPA, YTYIH, MALGov	2013	
c. Interpret results and make recommendations for waste collection equipment, and requirements for the public.	MAWC	CMI, USP, EPA, YTYIH, MALGov	2013	
d. Disseminate interpreted results to Cabinet and public.	MAWC	EPA, OEPPC	2013	
13. Develop and implement a preventive maintenance program for all equipment.	**MAWC**	**MPW**	**2012**	**$1,000**
a. Review operational manuals for all equipment in service and identify the maintenance points and frequencies.	MAWC	MPW	2012	
b. Identify additional maintenance requirements unique to RMI (e.g. washing or covering equipment to minimize corrosion).	MAWC	MPW	2012	
c. Create a spreadsheet/checklist with all information and make a mandatory part of daily operation.	MAWC	MPW	2012	
d. Seek assistance to train maintenance staff in equipment maintenance procedures, and provide annual refresher courses.	MAWC	CMI, USP	Annually	
14. Prioritize funding in the Compact budget for expansion of waste collection services in Majuro (including procurement of additional equipment) in collaboration with the private sector where practical.	**CSO, MAWC, Appropriation Committee**	**MOF**	**2014**	**$1,000**
a. Prepare cost-estimates for waste collection service expansion in Majuro	MAWC		2014	
b. Prepare long-range estimates for implementation of the 5-yr NWMS and present to cabinet.	J-PRISM JCC		2014	
Capacity Building				
15. Prioritize vocational waste management training at the national level and improve engagement with local and regional higher learning institutions and instructors	**CSO, MOE NTC**	**MAWC, EPA, MPW, OEPPC**	**2014**	**$1,000**

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
a. Make waste management a priority/special area of study in the national scholarship program. Ensure this is reflected in the human resource development plan.	NTC	MOE, EPA, OEPPC, MPW	2014	
b. Improve engagement with higher learning institutions to train students in related fields (e.g. environmental science), such as through coordinated student projects involving MAWC, EPA	MAWC	EPA	2014	
c. Participate in scholarship programs on waste management (such as those to be offered by JICA, AFD/SPREP). Each agency will be responsible for identifying donors for scholarships.	All	All	2014	
16. Prioritize vocational waste management training at the local government level, with priority emphasis for Majuro, Ebeye, Wotie, and Jaluit.	**Local Govt, IA, NTC**	**MAWC, MOE**	**2014**	**$500**
a. Organize local training for local government personnel on atolls (in collaboration with MAWC)	IA, MIMA	MAWC, MOE	2014	
17. Implement training in occupational health and safety for all workers engaged in waste management activities – reference ILOs WARM manual.	**MAWC, MOH**	**Local Govt, EPA**	**2014**	**$1,000**
a. Conduct in-house training with all staff.	MOH	MAWC, EPA	2014	
b. Invite experts to conduct more advanced on-site training	MOH	MAWC, EPA	2014	
c. Incorporate training as a mandatory requirement of the induction process of new employees.	MOH	EPA	2014	
18. Develop and implement waste minimization and management plans for each populated atoll - immediate priorities are Ebeye, Wotje, and Jaluit	**IA**	**JCC, MIMA**	**2014**	**$20,000**
a. Include waste management item on agenda of annual Mayor's meeting (leadership conference)	IA	MIMA	2014	
b. Develop monitoring and reporting template for each atoll to report on progress in waste management at the Mayor's meeting.	IA	JCC	2014	
c. Develop a generic Waste Management Plan (template) and circulate to local governments	IA	OEPPC, MAWC, EPA	2014	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
d. Present draft Waste Management Plans during MIMA meeting	IA	OEPPC	2014	
Waste Minimization (Refuse, Reduce, Reuse, Recycle)				
19. Develop and implement a plan for an integrated waste minimization system encompassing the 4Rs.	**MAWC**	**MOE, EPA, JOCV, MIVA**	**2014**	$2,000
a. Conduct stakeholder consultation and develop plan for an integrated waste minimization system	MAWC	JCC	2014	
b. Incorporate plan into JCC committee to oversee its implementation	MAWC	JCC	2014	
20. Scale-up the reusable bag promotion campaign and assess other options for reducing plastic bag usage.	**COC**	**OEPPC, EPA**	**2014**	$5,000
a. Conduct meeting with COC and identify way forward on scaling up options	COC	JCC	2014	
b. Introduce scaling up options to JCC for implementation	EPA	JCC	2014	
c. Implement public awareness on "refuse bag" campaign	EPA	JCC	2014	
21. Scale-up the manufacture of paper briquettes	**MAWC**	MPW, Women's group	2014	
a. Engage the local colleges (CMI, USP) to investigate/research the potential health impacts of using paper fuel briquettes, and methods of reducing any such negative impacts, and also to investigate effects of different paper combinations on briquette quality.	MAWC	MPW	2014	
b. Interpret and disseminate the research results widely to Cabinet and the public.	MAWC	MPW	2014	
c. Establish and support a cooperative group with community groups, women's groups, youth groups, etc., for the production of paper briquettes. This is an opportunity to increase waste management awareness in the community and support livelihoods, while reducing operational costs for MAWC.	MAWC	Women's group	2014	
22. Scale-up the existing composting program	MAWC	JICA	2014	**$8,000**
a. Identify scaling up options and introduce to JCC to implement	MAWC	JCC	2014	
b. JCC to implement and report periodically on progress	JCC		2014	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
23. Collect, process, and export of legacy scrap metal in the Marshall Islands in conjunction with the private sector.	**MAWC, EPA**	**COC, MPW, MALGov**	**2012**	**$25,000**
a. Draft TOR and invite proposals for collection, processing, export of legacy scrap metals	MAWC	COC,, EPA, MALGov, MPW	2012	
b. Evaluate tenders through multi-stakeholder evaluation committee.	MAWC		2012	
c. Award tender and monitor program.	MAWC			
24. Expand the community recycling initiative in Majuro by providing at least an additional 10 recycling points each year (to be accompanied by public awareness).	MAWC, EPA, MIVA	MALGov, MOE, Landowners, SPREP	2012	**$5,000**
a. Conduct promotion campaigns with local communities	MAWC	MALGov, Landowners	2012	
b. Prepare recycling bins for approved distribution points	MAWC	MPW	2012	
c. Document the collected items for data	MAWC	MPW	2012	
25. Prioritize the repair of the PET plastic bailing machine and re-commence export of PET plastics.	**MAWC**	**MPW**	**2014**	**$10,000**
a. Re-assess repairs needed	MAWC		2014	
b. Canvass local partners for financial support	MAWC		2014	
c. Report to JCC on progress	MAWC	JCC	2014	
26. Prioritize the export of used lead acid batteries, and re-commence the collection/acceptance of batteries.	**MAWC, EPA**		**2014**	**$5,000**
a. Conduct training on Basel/Waigani procedures	OEPPC	SPREP	2014	
b. Identify markets for used lead acid batteries	MAWC		2014	
c. Report progress to JCC	MAWC		2014	
27. Maintain and issue suitable personal protective equipment and deliver annual worker training to operational staff at the dumpsite.	MAWC	EPA	2014	**$12,000**
a. Include OHS issues (e.g. PPE usage) in monitoring parameters by EPA and include in permitting criteria of relevant waste management facilities.	EPA, MOH		2014	
b. Conduct stocktake of existing equipment and procure appropriate quantity	EPA, MOH		2014	
c. Develop periodical reports and circulate to JCC	EPA, MOH	JCC		

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
28. Collect and report data on all recycling programs in RMI to track recycling rate and annual progress towards achieving the goals.	**EPA,**	**EPPSO, MALGov**	**2014**	**$1,000**
a. Develop and implement management information system in collaboration with Economic Policy Planning and Statistics Office (EPPSO)	EPA	EPPSO	2014	
b. Incorporate waste management reporting as mandatory component of business license or permit conditions.	EPA	MALGov,	2014	
Hazardous Waste and Chemical Management				
29. Integrate POPs National committee into Waste Management Steering Group	**EPA**	**MEC, JCC**	**2014**	**$1,000**
a. Develop appropriate Terms of Reference relating to POPs to be included in overall ToR for Waste Management Steering Group.	**EPA**	**MEC, JCC**	**2014**	
b. Identify and invite appropriate stakeholders to be members of the Steering Group	**EPA**	**MEC, JCC**	**2014**	
c. Activate the Steering Group and begin implementing priority national actions.	**EPA**	**MEC, JCC**	**2014**	
30. Secure funding to complete National Implementation Plan review from UNEP/GEF-5.	**EPA**	**OEPPC**	**2014**	**$2,000**
a. Prepare and submit application for NIP update to UNEP and GEF Secretariat	**EPA**	**OEPPC**	**2014**	
b. Complete NIP review using appropriate expertise	**EPA**	**OEPPC**	**2014**	
c. Submit revised NIP to SPREP and UNEP/GEF	**OEPPC**	**EPA**	**2014**	
31. Implement NIP review recommendations	**EPA**	Other stakeholders	2013 - 2014	
a. Conduct stakeholder consultation to review NIP recommendations – and implement the NIP accordingly	**EPA**	**JCC**	**2014**	
b. Provide periodical reports to JCC	**EPA**	**JCC**	**2014**	
32. Analyze the relative cost-benefits of RMI becoming a party to the Waigani Convention.	**OEPPC**	**MOFA,, SPREP, EPA**	**2014**	
a. Consult with SPREP in regards to the benefits of joining the Waigani Convention, make recommendations.	**OEPPC**	**SPREP**	**2014**	
b. Discuss findings with JCC and plan way forward	**OEPPC**	**JCC**	**2014**	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
33. Complete the Marshall Islands Waste Oil Management Plan	**EPA and MEC**	**Waste oil stakeholders**	**2014**	**$1,000**
a. Prepare draft Plan and circulate for comments	OEPPC	EPA, OEPPC, SPREP	2014	
b. Develop waste oil management manual	MEC	SPREP	2014	
c. After consultation workshop to finalize Plan, submit to Cabinet for endorsement	OEPPC	Waste Oil Stakeholder	2014	
34. Negotiate safe and permitted transport by the regional airline of waste oil samples for analysis	**OEPPC**	**EPA, JCC**	**2014**	
a. Conduct meeting with UA officials	OEPPC	EPA	2014	
b. Report to JCC on progress	OEPPC	JCC	2014	
35. Complete National E-waste and ODS management policies and strategies	**EPA**	**JCC**	**2014 (ODS) 2015 (E-waste)**	
a. Complete review of National ODS regulations	EPA		2014	
b. Conduct training in international best practice in ODS recovery	EPA	JCC	2014	
c. Conduct annual national E-waste Day collection	EPA	JCC	2014	
d. Conduct training in International convention requirements for export of E-waste and ULABs	EPA	JCC	2015	
36. **Incorporate best practice disposal or recycling practices for ODS and E-waste into routine landfill operations**	**EPA**	**JCC**	**2014**	
a. Adopt and enforce E-waste and ODS handling guidelines	EPA	JCC	2014	
e. Conduct training of E-waste workers	EPA	JCC	2014	
f. Enforce PPE worn by all E-waste workers	EPA	JCC	2014	
g. Implement medium-term secure storage arrangements for collected E-waste	EPA	JCC	2014	
h. Export E-waste, ULABs and ODS stockpiles	EPA	JCC	2014	
Medical Waste Management				
37. Incorporate integrated medical waste management into Hospital operational plans and budgets	**MOH**	**EPA**	**2014**	
a. Develop waste management schedule and budget	MOH	EPA	2014	
b. Adopt improved health care waste management system and responsibilities and communicate to all staff	MOH	EPA	2014	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
c. Audit system after 6 months to ensure all parties are fulfilling their allocated roles	MOH	EPA	2014	
38. Relocate high temperature incinerator to new secure disposal site and commission it.	**MOH**	**JCC**	**2014**	**$20,000**
a. Complete land tenure negotiations of new site	MOH	JCC	2014	
b. Conduct safe transfer of incinerator to new site	MOH	JCC	2014	
c. Through bidding process, appoint agency to operate incinerator and manage site	MOH	JCC	2014	
39. **Establish controlled and licensed medical incinerator ash disposal site.**	**MOH**	**EPA**	**2014**	
a. Develop guidelines for proper ash disposal	MOH	EPA	2014	
b. Canvass budgetary support for incinerator	MOH	EPA	2014	
c. Identify suitable site for incinerator	MOH	EPA	2014	
40. Regulate and license hospital incinerator operation	**EPA**	**MOH**	**2014**	
a. Maintain and enforce minimum operating temperature	EPA	MOH	2014	
b. Enforce maximum load of waste burnt per hour	EPA	MOH	2014	
c. Implement routine incinerator maintenance schedule	EPA	MOH	2014	
d. Maintain site security	EPA	MOH	2014	
41. Implement annual refresher training for all Orderlies and incinerator operators	**MOH**	**NTC**	**2014**	**$10,000**
a. Develop system for separation of hazardous and non-hazardous (infectious) waste	MOH	NTC	2014	
b. Remove all mercury and PVC from waste before incineration	MOH	NTC	2014	
c. Implement site management and OH&S procedures	MOH	NTC	2014	
42. Monitor medical waste management performance	**MOH**	**EPA**	**2014**	
a. Incinerator operation meets or exceeds EPA license conditions	MOH	EPA	2014	
b. Stockpiles of accumulated medical waste disposed of by 2014.	MOH	EPA	2014	

Action	Lead Agency	Partner Agencies	Timeframe (months)	Estimated Budget
43. Review best options (including cost-effectiveness) for atoll medical waste management, as a component of the review of atoll waste management.	**MOH**	**EPA**	**2014**	
a. Assess the following options at a minimum: (1) collection by boat and transport to Majuro; (2) purchase and installation of incinerator for each atoll.	MOH	EPA	2014	
b. Implement recommendations based on assessment outcomes.	MOH	EPA	2014	

Appendix 1: Stakeholders consulted

Name	Affiliation	Contact information
Jorelik Tibon	MAWC	
Roney Arelong	EPA	
Julian Alik	EPA	
Morina Mook	EPA	
Steve Why	OEPPC	
Daniel Hone	MOH	
Kanchi Hosia	MOE	
Asena Ketedromo	MOE	
Wilbur Allen	MPW	
Mark Stege	Martina	
Albon Ishoda	MICS	
Gary Ueno	MOE	
Lowell Alik	EPA	
Bruce Kijiner	OEPPC	
Ned Lobwij	OEPPC	

Appendix 2: National Waste Management Strategy Reporting Form

Reporting Period: From _____ to _____

Actions (as written in the RMI National Waste Management Strategy)	**Describe Progress, Barriers, etc.**	**DATE OF PROGRESS**
Reviewed by JPRISM committee on		

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EXIT STRATEGY FOR THE BATKAN-JABLE DUMP SITE

Introduction

Majuro Atoll Waste Company (MAWC) was established in 2007 for in order to provide a dedicated waste collection and management services for Majuro Atoll. In existence already was the Batkan-Jable Dump site. At the time there was no program in place to segregate wastes to isolate hazardous and toxic waste from the common household and industrial waste. After its establishment the area was fenced off to prevent uncontrolled public access and scavenging from people and animal alike. Full time management and staff were hired to provide the necessary oversight responsibilities. Some equipments were transferred from the Ministry of Public Works to be used at the dump.

Funding support to operate and manage the dump has been appropriated from Environment Sector Grant under the Compact. A $325,000 is allocated each year since 2007 for the waste collection and management services provided by MAWC. Approximately $140,000 is being generated yearly through collection services fees and sales of recyclable, re-use and composting materials. This is the whole operation budget of MAWC. Another grand is also available for MAWC from the Compact for capital projects only.

Current Situation

When the dumpsite was first opened and used there was no formal environmental impact assessment process undertaken. As it turned out there were a number of serious social as well as environmental, health and sanitation concerns raised. Assessments have to be carried out so that the conditions of the dump and its impact on the immediate surrounding is better understood. The first attempt to build a seawall in 2008 failed. Wall had collapsed and trash was washed out to sea. A new wall was put in place later on and until now it remains in place. Currently the leach aide is a remaining issue to address.

Leach aide seeping into the environment, in particular the coastal area, will continue to be a major challenge. A technique developed by the Fukuoka University and introduced in RMI by JICA aims to help reduce the toxins from the leach aside from the landfill area. MAWC continues to seek assistance to deploy this method at the current site and also at the new site when works there begin.

Necessary sand cover to prevent garbage from being blown away by the wind is a major issue and rodent infestation is another. For the current site the sand can be mined from the lagoon area right across from the dump. At this stage landowners consent is being sought. An Earthmoving Permit application will soon be submitted for this activity.

Increased in staff capacity is needed to help overcome the current challenges confronting the current dump site. New staff will also play the vital role in the closing of the current site before moving to the new site at Jenrok area.

The dumpsite had reached its filling capacity in 2009. Garbage collected now are being stacked horizontally and vertically to what available space is left. The recent effort to clean up the island in preparation for the upcoming Forum Countries Meeting brings in more garbage faster than ever before. It is estimated that the amount of daily waste entering the landfill has surpassed the 20.3 ton for the survey conducted by JICA in 2010.

current site at Batkan-Jable

In order to help reducing the waste materials entering into the landfill, the 3R concept is being promoted and used at MAWC. Waste materials are segregated at the site to separate compostable from non-decomposable wastes. Tree branches, leaves, grass and other green wastes are mix with copra cake

and fish waste and turned into composting soil. Recyclable materials such as steel, aluminum, batteries are processed and exported.

Relocation

MAWC has started the process to relocate the landfill to a new site because the current site has exceeded its capacity. There were five alternate sites identified through an ADB funded TA that was concluded in 2009. These sites were carefully assessed and guided by a set of criteria. The criteria were aimed to come up with the best location considering distance After reviewing and considering the alternate sites MAWC Board decided on the ocean side of Jenrok, Tur and Na area. This area could provide an area of 12.5 acres.

proposed new site

Before the new site is ready and to reduce the amount of to the current landfill, an interim site will be used. This interim site is located at Rankan Weto on Rairok island, about one mile westward from the Batkan-Jable Site. A Waste Disposal Site Permit had been obtained in January this year from EPA for its use. The RMI HPO had also made its determination that the interim site constitutes no cultural significant.

It is estimated that the Interim Site can be used for seven to nine months at the current waste generation level.

interim site is a swamp area that has been used by the community

The new land fill works will start at the northwest end of the new site beginning at Jenrok. It is estimated that this new site could be used for 20 years at the current waste generation rate. Landowners consent to the new site has been obtained. What actions remain to be done are the engineering design and the environmental impact assessment works.

When the time comes for MAWC to start at the new site, several actions have to take place so that the new land fill area created at the Batkan-Jable site can be returned to the landowners in a condition in accordance with RMI environmental guidelines. These actions are included but not limited to those laid out in the table below.

Actions to be taken

	Action Item	Timeframe	Responsibility	Cooperating Partner(s)
1	Exit Strategy approved in principle by landowners and EPA	Aug 2013	MAWC	EPA, MOPW
2	The "mountain of garbage" is reduced and lowered to a level acceptable by landowners	Nov 2013 - Aug 2014	MAWC	EPA, MOH
3	A planned schedule to allow environmental monitoring and assessment (EMP)	Nov 2013 - Dec 2018	MAWC	EPA, MalGov
4	Removal of all tires and scrap metal from Batkan-Jable site	Dec 2013 - Sep 2014	MAWC	MOPW
5	Sand cover is available for Batkan - Jable site	Nov 2013 - Jan 2014	MAWC	EPA, MOPW, MalGov
6	Agreement with landowners for the continued use of current site	Dec 2013 - Jan 2014	MAWC	MOPW, EPA, Attorney General
7	New Site at Jenrok, Tur and Na is ready to take waste	Mar - Apr 2014	MAWC	MOPW, EPA

Closure

By December 2013 households and commercial waste in bins will stop entering the current dump. Instead they will be disposed off at the interim site at Rankan. The estimated time for the Interim Site use is seven to nine months provided Segregation of waste activities will also be conducted at the interim site. What remaining activities that will continue at the current site will be scrap metal segregation and export and landscaping works. Environmental monitoring program and schedule will be put in place in order to ensure sanitary conditions are adhered at all sites.

MAWC will continue to consult with landowners and the public to address any issues that may come up during the closure stage. This will be done through a series of meetings and workshops. It is anticipated that future issues that may arise from the consultation processes will be properly dealt with.

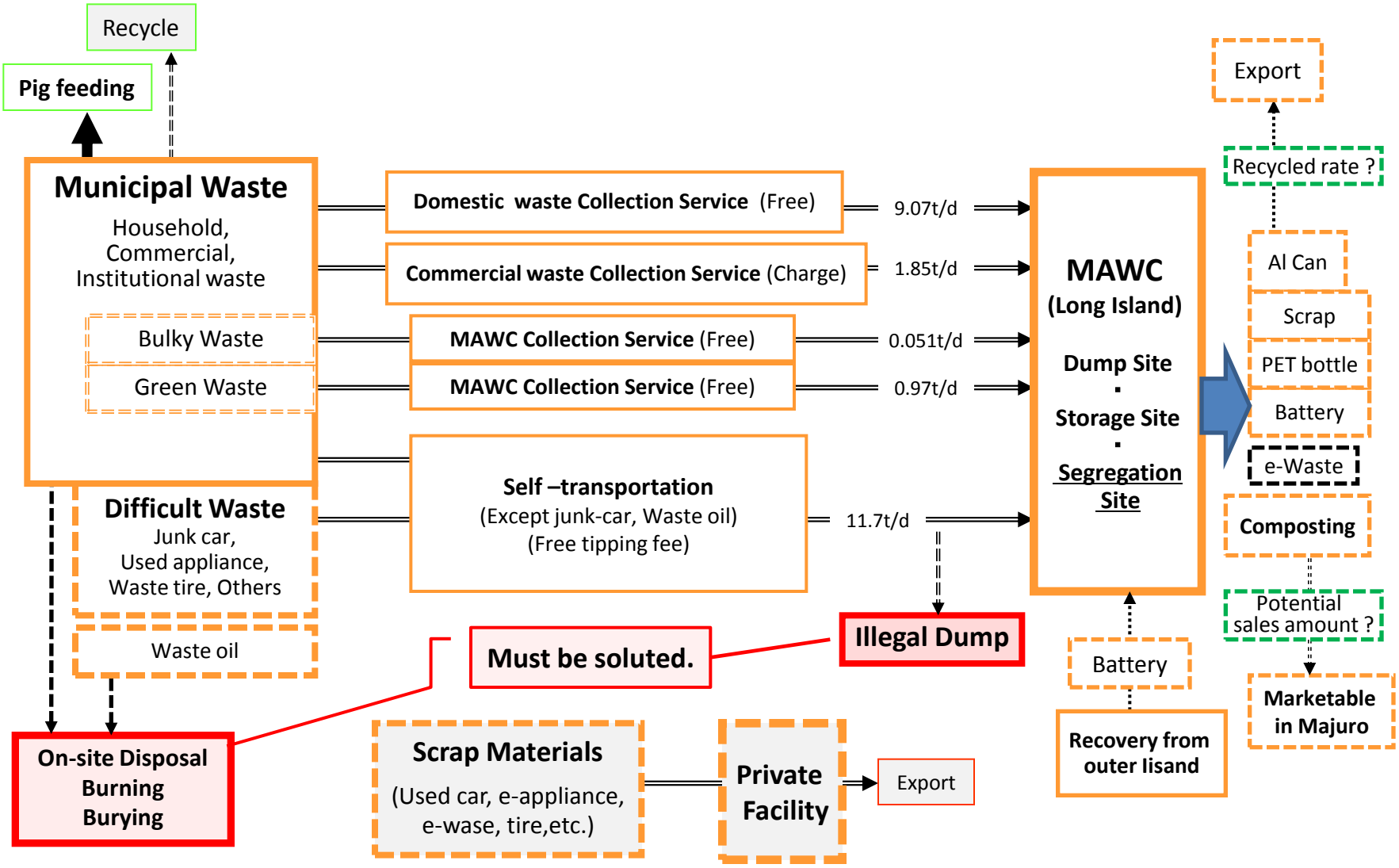
Recyclable wastes classification

	Recyclable Item	Source	Midterm handling	Final handling
1	Aluminum	Come with general wastes; collection bins at schools recycling points; selling cans at site	Segregation	Export
2	Copper	Separate from incoming bulky wastes; sellers at site	Segregation	Export
3	Battery	Collect from community; selling at site	Segregation	Export
4	Heavy steel metal	old disposed equipments	Segregation	Export
5	High grade Steel	Construction sites; heavy equipments	Segregation, cut into containerized sizes	Export
6	E-waste	From residential and commercial wastes		
7	Green waste	Bussnes; offcs; hotels; homes; land clean-ups; new house constructions	Segregation Mix with fish waste and copra cake	Sells as compost; beautification/gardening projects
8	Paper	Schools, homes, gov offc,	Segregation and process	Paper Fuel Briquette
9	PET bottle / other plastic products	Commercial and residential; fishing boats/ships garbage	Segregation	Storage for export/future project
10	Glass bottle	Commercial and residential	segregation	Storage; mix with concrete blocks
11	Kitchen wastes	Restaurants, parties and homes; hotels	Collect, segregate, put into containers	Feed for pig, Composting

Conclusion

The current dump site is full. A new landfill site at Jenrok area will be opened by November 2014. Current site will continue be used as a recycling station until such time all the scrap metal and tires are removed and the area is covered with sand and leveled to a condition acceptable by landowners and EPA. Between now and when the new site opens the Interim Site at Rankan Weto will be utilized. Site monitoring will be conducted jointly by MAWC and EPA to determine the long term impacts to the environment both the Batkan-Jable site as well as at the interim site at Ran Kan Weto. The Division of Sanitation at MalGov will be invited to participate in the monitoring program as well. Programs for the Jenrok, Tur and Na site will be included with the assessments and consultations now in progress with the Permit Application at EPA.

WASTE STREAM in Majuro



JICA in Marshall Islands

JICA (Japan International Cooperation Agency) is an implementation agency of the Official Development Assistance (ODA) of the Government of Japan

Volunteer Program

JICA volunteer consists from Japan Overseas Cooperation Volunteers (JOCV) and Senior Volunteers is designed to optimize the volunteers' knowledge, technical skills and valuable experience for the benefit of the locals while being amongst them through fields in Education, Health, Environment, IT, Fisheries and so on.

Technical Assistance

Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries

Technical cooperation is a people-people cooperation that supports developing countries in enhancing their comprehensive capacities to address development challenges by their own efforts. JICA is implementing the Japanese Technical Cooperation Project for Promotional of Regional Initiative on Solid Waste Management in Pacific Islands Countries (J-PRISM)and the Project on the Formulation of Self-Sufficient Energy Supply System to reduce the nation's dependency on fossil fuels.

And a training program in Japan on various worked fields is one of the important schemes of JICA's technical cooperation. JICA is accepting 15 to 20 RMI officials every year as the participants in the training programs and expects them to be key players for the development of RMI..

Grant Aid

Grant aid is financial cooperation for building living foundations for the future of developing countries. Aside from Grant Aid extended by Ministry of Foreign Affairs of Japanese Government, JICA is responsible for providing Grant Aid and handling related operations, including preparatory survey, advice and guidance for project implementation, and post-project management. Examples of such are: MV Majuro and MV Kwajalein, Outer Islands Fish Market Center (OIFMC) and the Solar Plant on Leroij Atama Medical Center (also known as Majuro Hospital).

Solar Power Plant on Leroij Atama Medical Center (Majuro Hospital).

Outer Islands Fish Market Center (OIFMC)

MV Kwajalein

MV Majuro

Annex I: List of Counterpart Committee Members by Outputs in J-I

In charge of	Output	Project Positon	Organizat
All		National Project Director	Ministry of Public Works (MPW)
			Majuro Local Government (MALGO) (Added)
			Ministry of Foreign Affaires (MOF) (Added)
		National Project Manager	Majuro Atoll Waste Company (MAWC)
Output 1	The NSWMS is implemented	(Authority for Endoresement)	Office of Chief Secretary (OCS)
		(Facilitator/Organizer)	Office of Environmental Plannning and Policy C
		(Drafter)	Ministry of Public Works (MPW) (Added)
			Waste Pollution Division, Environmental Protec
			Majuro Local Government (MALGO) (Added)
			Majuro Atoll Waste Company (MAWC) (Added)
Output 2	Recycling system is improved in Majuro	(Initiator/Operator)	Majuro Atoll Waste Company (MAWC)
		(Facilitatorr)	Office of Environmental Planningn and Policy C
		(Facilitaror/Colaborator)	Waste Pollution Division, Environmental Protec
Output 3	Composting System is improved in Majuro $2.5 per bag	(Initiaoor/Operator)	Majuro Atoll Waste Company (MAWC) (Added)
		(Facilitator)	Office of Environmental Planningn and Policy C
		(Facilitator)	Waste Pollution Division, Environmental Protec
		(Facilitator/Colaborator)	Ministry of Resource and Development (R&D)
		(Colaborator)	Terrestrial Program, Marshall Islands Conservat
Output 4	School-based recycle system is introduced in Majuro 1 JOCV EPA	(Potential Operator)	Majuro Atoll Waste Company (MAWC)
		(Colaborator/Initiator)	Ministry of Education (MOE)
		(Initiatorr)	Educatoin and Awareness Division, Environmen (EPA)
		(Colaborator/Potential Operator)	Terrstrial Program, Marshall Islands Conservatic
Output 5	SWM system is improved in Ebyeye	(Initiator/Operator)	Kwajalein Atoll Local Government (KAL Gov)
		(Facilitator)	Ministry of Health (MOH)
		(Colaborator)	Terrstrial Program, Marshall Islands Conservatic
		(Facilitator)	Majuro Atoll Waste Company (MAWC) (Added)

Note: Couterpart personel will be added as the need arises for the smooth and effective implementation of the Project

Phase 1 → 2016 January then

Phase 2 of JPRISM
– Not decided yet the scope

Pay slashed, CMI staff mad

GIFF JOHNSON

Current and former College of the Marshall Islands staff expressed their anger to the Journal over substantial pay cutbacks and what they described as unprofessional treatment by the college.

CMI President Carl Hacker, however, said that he has been charged with bringing CMI back from the brink of bankruptcy and the college board approved salary reductions that were required as part of CMI's recovery plan. CMI also came under pressure from Nitijela members in recent years to align the salary structure for staff with the salary system for the Public Service Commission.

But CMI staff members say the college is not being honest with legislators and their own staff.

While college officials in recent months told the Nitijela and local banks that the salary reductions would range from two-to-10-percent, in actuality for some of the long-term staff members, the cuts are 40-60 percent of their salaries. These reductions in pay mean they cannot meet loan requirements at local banks.

One staff member who had worked at CMI for nearly 10 years received a renewal contract in early November on a Thursday that offered her a four-year contract at a 48 percent cut in salary. Tracy Alfred, who worked in the GED office, said the huge salary reduction surprised her, so the next day she sent a letter of complaint back questioning the salary reduction. On Tuesday the following week, she received a letter terminating her the same day. "I was expecting an explanation in response to my letter," she said. Alfred has since taken a job with the RMI government and has refused to accept CMI's offer of two months pay and pay for accumulated leave as she considers her legal options in response to the termination. "They ruined my reputation by the termination," she said.

Kimiko Keju's situation may be the most extreme at the school. After working at CMI for more than 20 years, her salary is over $27,000 as a result of incremental salary increases each year. Now, to bring her salary into line with the PSC's classification of the "secretary" position, the school wants to slash it back to under $9,000. She said 10 or 15 percent would be an acceptable reduction, but she is expected to absorb over 60 percent reduction in pay over two years. Keju makes the observation that although her job title is "secretary," over the years her job has changed to include many tasks beyond that of a typical secretary position.

She is upset that CMI, in presenting salary reduction information to a Nitijela budget hearing recently misrepresented the cutbacks to her and a number of staff as only "2 percent" or "3 percent" when in fact the cuts listed on the spreadsheet ranged as high as 60 percent.

"We want fairness and for the college to follow what it says," Keju said. When they offer a staff member a one-year contact with 30-to-50 percent cuts from their salaries, it causes havoc with bank loans, with no way to solve the loan situation without hurting employees, she said. Keju said President Hacker advised local banks that the cuts wouldn't be over 10 percent. The administration said it would help, "but they're not," she said.

Both Keju and Bella Ankin, a library assistant, are in similar situations, though Ankin, who also has worked at CMI for over 20 years, is facing a less draconian cut than Keju, at 20 percent. They are among CMI's longest-working staff and are both on one-year contracts that expire in May next year.

Keju and Ankin are supported by Bonitha Lard, a financial aid counselor, who has a four-year contract. She said CMI should be providing draft contracts to existing employees at least six months in advance for review — not the day before they expire and demanding that the employees immediately sign the contracts, which was Keju's situation earlier this year.

Keju contested her one-year draft contact earlier this year and took the matter to CMI's grievance committee. After reviewing the complaint and interviewing people involved in contracts at CMI, the grievance committee chaired by CMI Vice President Diane Myzaoe-deBrum, issued a series of recommendations to the CMI administration back in June. These included:

- There needed to be "clear communications between supervisors and employees in regards to the salary reduction plan."
- "Kimiko's current title is Secretary, but she is doing more than what is in her job description. Her supervisor needs to revise Kimiko's title and job description to reflect her current work duties."
- Human Resources office "needs to explain to Kimiko thoroughly her new contract scheme."
- Human Resources Director Robert Willson "needs to write Kimiko a written apology for being disrespectful to her."
- "President (Carl Hacker) needs to be courteous and control anger."

The grievance committee recommended that the Human Resources office, which handles all contracts, explain the pay scale and how it works to all employees "as soon as possible."

Keju said she didn't get a response from the CMI administration until after her lawyer, Gordon Benjamin, sent a letter to President Hacker in November. In his letter to Hacker, Benjamin called the 34 percent cut in Keju's salary — from $27,490 to $18,223 per year — "unreasonable, unwarranted and unjustified, especially since she and all other employees were notified that the maximum decrease in their salaries would be no more than 10 percent."

Lard said CMI's employees' manual has been rewritten repeatedly over the past several years. "When you complain, next week the manual is changed," she said. In a conversation with a CMI administrator as to whether a 60-day notice period for termination, she said they argued back and forth, with the administrator saying the 60-day period applied. "I said, 'no, it's not in the manual.' We went back and forth, no, yes, no, yes." Then they checked the manual and found there is now no reference to a 60-day period prior to termination.

The group of current and former CMI staff members said CMI should apply higher standards of transparency and accountability when dealing with its own employees.

'One staff member who had worked at CMI for nearly 10 years received a renewal contract in early November on a Thursday that offered her a four-year contract at a 48 percent cut in salary.'

Hacker defends salary cuts

Responding to criticism of CMI's administration and its implementation of salary cutbacks, CMI President Carl Hacker defended the college's work over the past year.

"I have helped bring the national college back from the brink of insolvency precipitated by very questionable and long-standing budgetary practices, along with a noticeable lack of transparency in finance and budgetary matters by previous college administrations," he said in a November 18 memo to CMI board of regents Chairman Gerald Zackios. "Unfortunately, there has been some individual unhappiness because of the financial measures required to put the college back on solid fiscal ground." Part of the current problem surrounding the need for heavy salary cuts is that — in contrast to the Public Service Commission that has not had an across-the-board step increase for RMI workers for many years — "CMI consistently increased salaries as a matter of practice with little or no apparent thought concerning the budget, administration or finances of the school, significantly harming future operations," Hacker said.

Hacker said bluntly that no individual is more important than the mission of CMI to serve the nation. "If there has been some individual unhappiness with the decisions I made to restore the college's financial situation, this situation should be expected," he said.

In regards to specifics related to the grievance process initiated by CMI staff member Kimiko Keju, Hacker said many meetings were held with the her and the staff senate on the subject of CMI's salary reduction policy. In addition, there was email communication and individual meetings between Human Resources office Director Robert Willson and Keju, as well as with Hacker, on the subject. "The record reflects all of these attempts to explain the salary reduction," Hacker said. She "expressed her unhappiness and refused to accept that she should receive a reduction in salary."

Appendix C

Household and Establishment Survey

ASSESSMENT OF SOLID WASTE MANAGEMENT ON MAJURO ATOLL

HOUSEHOLD SURVEY QUESTIONNAIRE

COMMUNITY AWARENESS AND PREFERENCES

ABILITY AND WILLINGNESS TO PAY

Date	Interviewer	Location	Survey No
			HH

A. INTRODUCTION:

"I would like to ask you some questions to assess how best to improve the solid waste collection service on Majuro. These questions usually take about 10-15 minutes. We are interviewing a sample of 160 of the households and establishments on Majuro, so your input is considered very valuable to this survey." Ij konan kajitok jet kajitok ko non bukot kijkan ad kokmanman lok wawen ain jokbej ko ilo Majuro in. Kajitok kein remaron bok 10-15 minute aitokier.

"Are you able to answer a few questions now?" komaron ke uaki kajitok kein? ○ Yes ○ No

"Let me first ask you a few questions about this house and you. This survey information will be held strictly confidential" inaj mokta kajitok kon mwiin im kwe.

Code	Question	Options	Response
A1	Name of Respondent	Etam	
A2	Gender of Respondent	Male or Female, kora ke emman	
A3	Position of Respondent	Head of household, Jeban eo an mwiin	
		Spouse of head of household, etan leo ibbam	
		Other , please describe, komelele ne jet	
Ro A4	Number of people in household, jete rej jokwe imwiin	Adults (employed), ritto ro rej jerbal	
		Adults (not employed) ritto ro rej jab jerbal	
		People with a disability, ro eor jorren enbwinnier	
		Children (under 18 years old) eor ke ro ilal in 18 aer yio	
A5	Types of employment Kain jerbal rot		
A6	Highest education level of adults in household, Kokar kamoj ke am jikul	College, eor ke rej jikul ilo college	
		High School, high school	
		Elementary School, Elementere	
A7	Household annual income, jete wonaan rijerbal ro ilo mwiin	Less than US$5,000, eor ke ej jerbal im wonaan e$5,5000	
		US$5,000 – US$10,000	
		US$10,000 – US$15,000	
		US$15,000 – US$20,000	
		Greater than US$20,000	
		Don't know, kojaje	

B. COMMUNITY AWARENESS LEVELS FOR SOLID WASTE MANAGEMENT:

"I would like to ask some questions regarding the collection of solid waste from your household."

Code	Question	Option	Response
B1	In your opinion, how serious is the problem of solid waste collection in this area? Ta lomnak eo am ikujien wawen ain kobej ko?	Very serious likkun nana	
		Serious enana	
		Not serious ejjab nana	
		Don't know ijaje	
B2	How much rubbish does your household generate each week? Ewi jonan jokbej ej walok ilo mwiin?	Quarter of a wheelie bin, quata	
		Half a wheelie bin, jimettan	
		1 wheelie bin, 1 kein jokbej eo jej kojerbale kio	
		More than 1 wheelie bin, elaplok jen	
		Don't know1 keinjokbej	
B3	Please give an indication of the approximate proportion (percentage) of each of the following in your weekly rubbish. Jouj im letok jonan jokbej eo ej walok ilo mweo imom ilo kajojo week	Organic waste from the garden	
		Metals (cans, etc), kuat im metal ko	
		Plastic (bottles, etc), pilajtiik bato im men ko	
		Glass (bottles, jars, etc) kilaaj bato ko	
		Kitchen waste (food scraps) kobej in mona ko	
		Other waste, kobej ko jet	
		Don't know, ijaje	
B4	Does your household have a durable metal or plastic container for storing solid waste? Eor ke kein jokbej ko rebbin ko komman jen ak pilajttik non am kokoni jokbej ko?	Wheelie bin, kein jokbej ko	
		Other metal or plastic, men ko jet einwot metal ak pilajtiik	
		Basket or cardboard, iieb ko ak bok pepa ko	
		No container, ejelok nien jokbej	
		Don't know, ijaje	
B5	Does your household receive a collection service of any type? Eor ke en ej aini kobej ko ilo mwiin?	Yes, aet	
		No, jaab	
		Don't know, ijaje	
B6	If you do not receive a collection service, how do you get rid of your waste? Ekijkan an jolok kobej ko am ilo an ejelok riboki?	Bury in own yard, ij kalbwini iturin mwiin	
		Burn, tili	
		Self transport to landfill, make boki	
		Other, wawen ko jet	
		Don't know, ijaje	
B7	If your waste is collected, how frequently does the waste collection occur?	Daily, aoleb ran	
		2-3 times a week, 2-3 katten ilo juon week	
		Weekly, aoleb week	
		Biweekly, lokin 2 week	
		Don't know, ijaje	
B8	Where does your waste get collected from? Ia eo rej ain jokbej ko am jene?	Directly outside house, inabojin mwiin	
		Within 25 feet of house, 25 ne jen mweo	

		Within 50 feet of house, 50 ne jen mweo	
		More than 50 feet from house, elaplok jen 50 ne jen mweo	
B9	Is your container emptied into a communal container or open pile in the neighbourhood? Koj ke kojerbal jokbej ko rebellok ke koj jokbej iturin moko jet?	Communal container,	
		Open pile, imelaj ke	
		Not applicable, ejelok	
B10	How often is the communal container or open pile emptied/removed? Ewi jonan ikutkut in am jolok jokbej ko iturin mwiin?	Daily, aoleb ran	
		2 – 3 times each week, 2-3 alen ilo kajojo week	
		Weekly, aoleb week	
		Less than once each week, eiet jen juon alen ilo kajojo week	
		Don't know, ijaje	
B11	Who collects the waste? Won ro rej ainin kobej kein?	Majuro Atoll Waste Company, (MAWC) Jikin Jokbej eo an riMajuro	
		Local Council (MALGov), Local Gov	
		Neighborhood group, ribwidejin	
		Private company, company ko	
		Not collected, self transport, ejelok ej boki, ij make boki	
		Don't know, ijaje	
B12	What is your opinion of the service that you are receiving for collection of solid waste from your household? Ta lomnak eo am ikujien kilen jokbej eo kio ej komman?	Very satisfied, elikkun ju buruo	
		Satisfied, eju buruo	
		Not satisfied, ejjab ju buruo	
		Don't know, ijaje	
B13	If you are satisfied with the collection service, for how long have you been satisfied? Ne eju buruom kon kilen jokbej eo ej komman kio, jen naat?	Number of years, jete yio	
B14	What changed to make you satisfied with the collection service? Ta ko kokonan bwe ren oktak ilo kilen jobej eo kio?		
B15	If you are not satisfied with service, would you state your primary reason? Ne ejjab ju buruom kon kilen jokbej, komaron ke kwalok jet am lomnak ?	Collection service not reliable, Jejjab kejatdikdik kon kilen jokbej	
		Too long between collections, eto kotaan ien jokbej ko	
		Location of the pick-up point is unsatisfactory, enana jikin ebbok jokbej ko	
		Rodents, odors or flies when waste is not collected, enana bwiin im lonlon jikin ebbok jokbej ko	
		The collection workers are rude or impolite, Rijerbal ro renana	
		Lack of clean appearance of the neighbourhood, etton ad klimjeke	

		Other problem (detail?) pirablem ko jet	
B16	Do you know where the collected waste is taken for final disposal when it leaves your neighborhood? Kojela ke ia eo rej boki kobej ko am non e?	Yes (landfill?) komman sea wall	
		No, jab	
B17	Do you know what types of waste should be recycled or separated from waste going to the landfill? Kojela kain kobej rot ko rej aikuij in jenolok?	Yes , Aet	
		No , jaab	
		Aluminum cans, kuat alumnum ko	
		Steel, maal	
		Plastics , pilajtiik	
		Organic material, kobej in mona ko	
		Cardboard/paper, pepa ko	
		Glass bottles, bato ko	
B18	Do you think recycling is important?? Eor ke tokjen recycle?	Yes, aet	
		No, jab	
		Don't know, ijaje	
B19	Do you separate recyclable materials from other waste going to landfill? Koj kejjenolok ke kobej ko rej jokbej lok non seawall ko?	Yes, aet	
		No, jaab	
		Don't know, ijaje	
B20	If you do separate recyclable materials, how do they get collected? Ne koj kejjenolok kobej in recycle ko, won ro rej aini?	Self drop off at recycling point, ij make bokilok	
		Place in separate bag in wheelie bin, Ij kejenoloki iloan juon bag im likiti iloan kein jokbej ko	
		Collected separately from other waste, ij kejenoloki	
B21	If you do not separate recyclable materials, what is the main reason for this? Ta melelen am kejenolok kobej in recycle ko?	No collection or convenient recycling point, ejelok riboki ejelok jikin recycle	
		Too much effort/too busy, elap jerbale, iboub non ao kejenoloki	
		Other (explain), wawen ko jet	
B22	What do you do with your food waste? Koj ita kon kobej in mona ko?	Dispose of with other waste, jokbej ibben kobej ko jet	
		Compost, kein ekkat	
		Feed to animals, ij najieik men in mour ko	
		Throw ocean side, julok ilik	
		Throw lagoon side, julok iaar	
		Don't know, ijaje	
B23	What do you do with your garden (green/organic) waste? Ta eo koj koj kojebal non jikin kallib eo am?	Dispose of with other waste, jokbej ibben kobej ko jet	
		Compost, kojerbal non ekkat	
		Burn, tili	
		Don't know, ijaje	

C. COMMUNITY PREFERENCES FOR WASTE SERVICES: Lomnak ko an Jukjukim-pe ikujien wawen jokbej

Code	Question	Options	Response
C1	Are you satisfied with the current wheelie bin and weekly collection system (urban area)? Eju ke buruom kon kilen jokbej eo kio ke jej kojerbali weeli bin ko ilo kajojo week? Are you satisfied with the current lack of a collection system (rural area)? Eju ke buruom ne ejjab emman kilen aer jokbej?	Yes, aet	
		No, jab	
		Don't know, ijaje	
C2	Do you currently pay for waste collection? Koj kola ke non aer boki jokbej ko am?	Yes, aet	
		No, jaab	
		Don't know, Ijaje	
C3	If you do pay for waste collection, how much do you pay per week? Jete wonaan am kolla?	US$	
C4	If you do pay for waste collection, how do you pay? Ne koj kolla wonaan aer aini kobej ko, Ewi wawen am kolla?	Direct to MAWC	
		Direct to MALGov, kajjuto non MalGov	
		Through utility (electricity or water) bill, koba ibben jarom eo	
		Other (detail) Kellajrak wawen ko jet	
C5	Do you currently pay for waste disposal at the landfill? Koj kolla ke ilo am etal im jokbej ilo jikin jokbej eo kio?	Yes, aet	
		No, Jaab	
		Don't know, ijaje	
C6	Would you consider a prepaid bag system as an alternative to the current system? Emman ke kolla wonaan bag in jokbej? Under a prepaid bag system, only waste contained within a prepaid bag would be collected by the waste collection operator. You would have to buy prepaid bags from one of the local shops. Money from the prepaid bags would be used by the waste collection operator to maintain vehicles and pay collection staff. Ilo wawen in, jokbej ko wot iloan bag eo renaj boki im jab kobej ko jet	Yes, aet	
		No, Jaab	
		Don't know, ijaje	
C7	Do you know where the current landfill is located? Kojela ke ia eo rej kanne lok kon jokbej kio?	Yes (Jable?) aet ilo Jable	
		No, jaab	
C8	Do you believe that the landfill is environmentally safe and acceptable? Koj tomak ke kanne lok torrein iar im liik ej juon wawen eo emman non ejmour?	Yes, aet	
		No, jaab	
		Don't know, ijaje	
C9	A new landfill site will have to be built in the near future. Do you think the new landfill should be on the ocean side or the lagoon side? Ia eo koj lomnak bwe ren kommane jokbej kaal eo ie ilo ran kane rej itok?	Ocean side, ilik	
		Lagoon side, iaar	
		Don't know, ijaje	
C10	Please explain the main reasons for your preference. Jouj im komelele etoke koj kalet ijin non kommane jokbej kaal eo ie?		
C11	Do you think incineration of waste is	Yes, aet	

	environmentally safe and acceptable? Ekijkan am lomnak kon ittil kobej? Ejelet ke ejmour im keinikkan ko ad?	No, jaab	
		Don't know, ijaje	
C12	Please explain the main reasons for your answer (yes or no). Jouj im kwalok uak eo am aet ak jab im komeleliki		

D. ABILITY AND WILLINGNESS TO PAY FOR WASTE SERVICES:

Code	Question	Options	Response
D1	The current waste collection system costs money to operate. Would you be willing to contribute to the cost of the current waste collection service? Elap jolok jeen non kilen jokbej eo kio, koj monono ke in jiban?	Yes, aet	
		No (go to D5)	
		Don't know, ijaje	
D2	Would you be willing to pay $1 or more per week to cover the cost of the waste collection service? Komono ke in kolla $1 ak elaplok ilo kajojo week non jiban lok wonaan aini kobej ko kio?	Yes, aet	
		No, jaab	
D3	If you are prepared to pay $1 or more per week, you be willing to pay $2 or more? Ne komaron kolla $1 ilo juon week komaron ke kolla $2 ak laplok?	Yes, aet	
		No, jab	
D4	If you are not willing to pay $1 per week, would you be willing to pay 50 cents? Ne komaron kolla $1 ilo juon week koj monono in kolla 50 jeen?	Yes, aet	
		No, jaab	
D5	If the prepaid bag system was introduced, would you be willing to pay 50 cents or more per prepaid bag to cover the collection costs? Ne system in wia bag ne enaj kar komman, kon ke monono in kolla 50 jeen ak elaplok non kollaiki aer aini kobej ko?	Yes, aet	
		No, jab	
D6	If you are prepared to pay 50 cents or more, would you be willing to pay $1? Ne kobojak in kolla 50 jeen ak elaplok, komonono ke in kolla $1?	Yes, aet	
		No, jaab	
D7	If you are not prepared to pay 50 cents or more, would you be willing to pay 25 cents? Ne komaron kolla 50 jeen ak 25 jeen?	Yes, aet	
		No, jab	
D8	Would you be willing to pay the full cost of the current waste collection service or a prepaid bag system if a private company was providing the service and collecting the fee directly from you Komaron ke naj kollaiki aoleben wonan aini jokbej ko kio ke kolla wonaan bag system ne im juon company enaj bok eddoin?	Yes, aet	
		No, jab	
		Don't know, ijaje	
D9	If your answer to D1 was no, what is the reason that you don't want to pay for a collection service? Ne uak eo am non D1 ar jab, kwalok mok melele eo am?	Can't afford to pay for the full cost ,ejabwe jeen non ao kolla	
		Don't believe that the service will be reliable, ijjab leke service ko	
		Don't consider the service important enough to pay for Ijjab tomak bwe elap tokjen	
		Believe that general taxes should cover the cost of this service, tomak bwe tax ko ren kollaiki service in	
		Other - Please explain	

		Un ko je - komeleleiki	
D10	If you are not willing to pay for a collection service and government cannot afford to subsidize it for you, would you be satisfied with one or more of the following so that you do not pollute your neighborhood? Ne koj jab konan kollaiki im ejabwe jeen ibben kien eo non an kollaiki kilen ainin kobej kein, kon monono ke kon wawen kein bwe kon jab kattone melan eo am?		
	a) A less frequent collection service (biweekly)? Kaietlok ien jokbej ko non lokin 2 week		
	b) Self transport waste to the landfill, koj make juloki		
	c) Separation of recyclable materials and composting of kitchen wastes in your yard or garden, kejenoloki jen doon kobej ko rekkar no recycle im jikin kallib eo am		
	d) Separation of recyclable and burial of kitchen wastes in your yard or garden Kejenolok im kalbwini kobej in mona ko non jikin kallib eo eo am		
	e) No jab		
	f) Don't know ijaje		

"Thank you for your contribution to this survey. We hope to use these results to determine how best to provide affordable and desirable service to the people of your community." Kommol kon am bok kunaam ilo survey in. Kemij kejatdikdik bwe uak kein am renj jiban kokmanman lok jerbal kein non jukjukim-ped ko.

E1	If there is need to seek your advice further, may we contact you again?	Yes, aet	
		No, jab	
		Don't know, ijaje	

Do you have any other comments or questions about a solid waste collection or disposal?Eor ke am kakobaba im melele ko jet?

HOUSEHOLD SURVEY - MAJURO ATOLL
Date 23rd to 30th June 2014
Rita to Laura with random household selection by EPPSO

Question	Answer																								Summary
	A			B			C			D			E			F			G			H			
	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	
A2	36	23%	Male	113	73%	Female																			Quarter male/3 quarter female due to daytime survey
A3	31	20%	Head	43	28%	Spouse	61	39%	Other																Good spread between head, spouse and other. Some no responses.
A4	155		Households	1415		People	9.1		Average household size																Approximately 5% of population
A5																									
A6	49	32%	College	80	52%	High School	21	14%	Elementary School																Good spread of education levels
A7	42	27%	<$5k	48	31%	<$10k	20	13%	<$15k	19	12%	<$20k	11	7%	>$20k	11	7%	Don't know							Good spread of income levels with 58% of households earning <$10k
B1	4	3%	Very serious	42	27%	Serious	56	36%	Not serious	32	21%	Don't know													Range. Some not serious may be due to the current good collection service and relatively tidy appearance of Majuro
B2	2	1%	Quart WB	21	14%	Half WB	67	43%	1 WB	41	26%	>1 Wheelie Bin	6	4%	Don't know										Mostly 1 wheelie bin but that may be because that is the container they have. Some generating >1 wheelie bin have 10+ in household.
B3																									
B4	75	48%	Wheelie Bin	15	10%	Other metal/plastic	4	3%	Basket/cardboard	44	28%	No container	4	3%	Don't know										Approximately half had a wheelie bin.
B5	126	81%	Yes	20	13%	No	2	1%	Don't know																Most received collection service (Rita to airport)
B6	14	9%	Bury in yard	14	9%	Burn	13	8%	Self transport	3	2%	Ocean	0	0%	Don't know										Bury, burn and self transport were used by those not receiving collection service
B7	24	15%	Daily	2	1%	2-3x per week	98	63%	Weekly	6	4%	Fortnightly	1	1%	Don't know										Weekly collection was by far the most common
B8	52	34%	0 ft from house	37	24%	25ft from house	16	10%	50ft from house	16	10%	50+ft from house													Most had collection point within 25ft of their house
B9																									
B10																									
B11	115	74%	MAWC	0	0%	MalGov	6	4%	Neighbour group	0	0%	Private	12	8%	Not collected	0	0%	Don't know							MAWC known to provide the collection service
B12	48	31%	Very satisfied	60	39%	Satisfied	19	12%	Not satisfied	8	5%	Don't know													Most satisfied with collection service. Those that weren't tended to be those without wheelie bins
B13	1 to 3		years	1.8		years average																			Service has been good for 1 to 2 years
B14																									
B15																									
B16	122	79%	Yes	3	2%	No																			Most people know that disposal is to landfill
B17	120	77%	Yes	22	14%	No	99	64%	Al cans	69	45%	Fe	84	54%	Plastic	56	36%	Organic	57	37%	Cardboard	84	54%	Glass	Most know about recycling with Al cans, plastic and glass being the most known
B18	125	81%	Yes	8	5%	No	7	5%	Don't know																Most think recycling is important
B19	88	57%	Yes	27	17%	No	16	10%	Don't know																But less actually do recycle
B20	33	21%		50	32%	Separate plastic bag	12	8%																	Those that do recycle usually put recyclables in a separate bag in their wheelie bin
B21	13	8%	No collection/container	26	17%	Too busy	12	8%	Other																Those that don't recycle cite being too busy as the most common reason
B22	4	3%	Landfill	2	1%		114	74%	Feed to animals	17	11%	Ocean	8	5%	Lagoon	2	1%	Don't know							3/4 of respondents feed food waste to animals
B23	41	26%	Landfill	36	23%	Compost	7	5%	Burn	48	31%	Don't know													Organic waste is less well with don't know being the most common answer. Some composting.
C1	112	72%	Yes	20	13%	No	12	8%	Don't know																As for B12
C2	6	4%	Yes	125	81%	No	7	5%	Don't know																No collection fee paid
C3																									
C4																									
C5	4	3%	Yes	45	29%	No	9	6%	Don't know																No tip fee paid
C6	78	50%	Yes	35	23%	No	20	13%	Don't know																Half said they would consider a prepaid bag system
C7	152	98%	Yes	1	1%	No		0%	Don't know																Everyone knows where the current landfill is
C8	60	39%	Yes	63	41%	No	14	9%	Don't know																Even split on whether landfill is a good option.
C9	78	50%	Ocean	8	5%	Lagoon	58	37%	Don't know																Most think ocean side but many don't know
C10																									
C11	62	40%	Yes	65	42%	No	25	16%	Don't know																Even split on whether incineration is ok
C12																									
D1	109	70%	Yes	26	17%	No	14	9%	Don't know																70% said they are willing to contribute (bias between surveyors)
D2	110	71%	Yes	29	19%	No																			70% said yes to $1 per week
D3	91	59%	Yes	37	24%	No																			
D4	112	72%	Yes	24	15%	No																			
D5	101	65%	Yes	32	21%	No																			
D6	91	59%	Yes	40	26%	No																			
D7	104	67%	Yes	26	17%	No																			
D8	87	56%	Yes	27	17%	No	19	12%	Don't know																
D9	18	12%		1	1%		0	0%		6	4%		0	0%												Can't afford to pay was the most common reason
D10	20	13%		7	5%		6	4%		1	1%		3	2%		17	11%									Less frequent collection was the prefered cost saving option

ASSESSMENT OF SOLID WASTE MANAGEMENT ON MAJURO ATOLL

ESTABLISHMENT SURVEY QUESTIONNAIRE
COMMUNITY AWARENESS AND PREFERENCES
ABILITY AND WILLINGNESS TO PAY
Etale Wawen kebelak jokbej ko ilo Majuro Atoll
Kajitok ko
Non lale ewi jonak ko rekkar non an jukjukim-Ped ko kolla wonaan jokbej

Date	Establishment	Location	Survey No

A. INTRODUCTION:

"I would like to ask you some questions to assess how best to improve the solid waste collection service on Majuro. These questions usually take about 5-10 minutes. Your input is considered very valuable to this survey. Are you able to answer a few questions now?"
O Yes O No
"Let me first ask you a few questions about this establishment and you. This survey information will be held strictly confidential". Ij konan kajitok jet kajitok ko non bukot kijkan ad kokmanman lok wawen ain jokbej ko ilo Majuro in. Kajitok kein remaron bok 10-15 minute aitokier.
"Are you able to answer a few questions now?" komaron ke uaki kajitok kein?
O Yes , aet
O No, jab

Code	Question	Options	Response
A1	Name of Respondent, Etan Armij eo ej uak	Etam	
A2	Gender of Respondent,	Male or Female, kora ak emman	
A3	Position of Respondent, Ta jerbal eo an	Owner, imom mwiin	
		Manager, koj bok eddo	
		Other , please describe, men ko jet	
A4	Number of employees, jete rijerbal	Adults (employed) Ritto ro rej jerbal	
A5	Type of business, bujinej root in		

B. COMMUNITY AWARENESS LEVELS FOR SOLID WASTE MANAGEMENT: Ewi jonan an jukjukim-ped ko jela kon kilen kebelake jokbej ko:

"I would like to ask some questions regarding the collection of solid waste from your establishment." "Ikonan kajitok kon wawen ain kobej ko ilo jikin in."

Code	Question kajitok eo	Option, kelet	Response , uak
B1	In your opinion, how serious is the problem of solid waste collection in this area? Ta lomnak eo am ikujien kilen ain kobej ko ilo jikin in?	Very serious, likkun nana	
		Serious, ebwe an nana	
		Not serious, ejjab nana	
		Don't know, ijaje	
B2	How much rubbish does your establishment generate each week? Ewi jonan kobej eo ej walok jen mwiin ak jikin in?	1 wheelie bin, 1 nien jokbej (men ko eor neer)	
		Half a dumpster, jimettan kein jokbej (men killep ko)	
		1 dumpster, juon kein jokbej kileplep	
		More than 1 dumpster,	

		elaplok jen kein jokbej killep ko	
		Don't know, ijaje	
B3	Please give an indication of the approximate proportion (percentage) of each of the following in your weekly rubbish. Jouj im kwalok tok jonan jokbej ko ijokein ba kaki ilo kajojo week	Organic waste, kobej in mona	
		Metals (cans, etc), maal, (kuat, men ko eierlok wot)	
		Plastic (bottles, etc), pilajtiik (bato, men ko eierlok wot)	
		Glass (bottles, jars, etc) kilaaj (bato im men ko eirlok wot)	
		Food waste (food scraps)	
		Other waste, kobej ko jet	
		Don't know, ijaje	
B4	Does your establishment have a durable metal or plastic container for storing solid waste? Eor ke kein jokbej ko komman jen aen im pilajtiik ilo jikin in?	Wheelie bin, kein jokbej ko eor neer	
		Other metal or plastic, men ko jet einwot, maal im pilajtiik	
		Dumpster 2cub yd, kein jokbej ko 2 cub yd.	
		Dumpster >2cub yd, kein jokbej ko 2 cub yd	
		Don't know, ijaje	
B5	Does your establishment receive a collection service of any type? Eor ke en ej itok im boke jabrewot kain jokbej ko jen ijin?	Yes, aet	
		No, jab	
		Don't know, ijaje	
B6	If you do not receive a collection service, how do you get rid of your waste? Ne ejelok ej itok im boki jokbej ko, ewi wawen am jokbej?	Self transport to landfill, ij make boki non jikin jokbej eo	
		Other, wawen ko jet	
		Don't know, ijaje	
B7	If your waste is collected, how frequently does the waste collection occur? Ne eor en ej boki kobej ko ijin, ewi ikutkut in aer boki?	Daily, aoleb ran	
		2-3 times a week, 2-3 katten ilo juon week	
		Weekly, kajojo week	
		Biweekly, lokin 2 week	
		Don't know, ijaje	
B8	Where does your waste get collected from? Tu ia eo rej boki jokbej kein jene?	Directly outside establishment, naboj in mwiin	
		Within 25 feet of establishment, 25 ne tolokin jen jikin in	
		More than 25 feet from establishment, elaplok jen 25 ne tolokin jen mwiin ak jikin in	
B9	Who collects the waste? Won ro rej aini kobej ko?	Majuro Atoll Waste Company (MAWC), rijokbej ro an Majuro (MAWC)	
		Not collected, self transport, ejelok, ij make jokbej	
		Other, men ko jet	
B10	What is your opinion of the service that you are receiving for collection of solid waste from your establishment? Ta lomnak eo am ikujien kilen ain kobej eo kio ej komman?	Satisfied, eju buruo	
		Not satisfied, ejjab ju buruo	
		Don't know, ijaje	
B11	If you are satisfied with the collection service, for how long have you been satisfied? Ne eju buruom kon kilen aini kobej ko, ewi toan?	Number of years, jete de yio	
B12	What changed to make you satisfied with the		

	collection service? Ta ko kokonan bwe ren oktak bwe en maron ju buruom?		
B13	If you are not satisfied with service, would you state your primary reason? Ne ejjab ju buruom kon kilen ain kobej ko, komaron ke kwalok un ko?	Collection service not reliable, ejjab jokkin wot juon	
		Too long between collections, eto kotaan aer aini kobej ko	
		Location of the pick-up point is unsatisfactory, jikin ebbok eo ejjab emman	
		Rodents, odors or flies when waste is not collected, enana bwiin, lonlon ne eto aer jab boki	
		The collection workers are rude or impolite, rijerbal ro rejaje manit	
		Lack of clean appearance of the neighbourhood, ekomman bwe en etton ad lale jikin eo	
		Other problem (detail?), pirablem ko jet, tibidiki tok melele ko	
B14	Do you know where the collected waste is taken for final disposal when it leaves your neighbourhood? Kojela ke ia eo jokbej ko am rej jemlok lok ie?	Yes (landfill?), aet kolaplok ene emora	
		No, jab	
B15	Do you know what types of waste should be recycled or separated from waste going to the landfill? Kojela ke kain kobej rot ko rej aikuij jenolok bwe ren kanne lok sea wall ko?	Yes , aet	
		No jab	
		Aluminum cans, kuat almonium ko	
		Steel, maal	
		Plastics , pilajtiik	
		Organic material, kobej in mona	
		Cardboard/paper, pepa im bok ko	
		Glass bottles, kilaj bato ko	
B16	Do you think recycling is important? Eaurok ke recycle?	Yes, aet	
		No, jab	
		Don't know, ijaje	
B17	Do you separate recyclable materials from other waste going to landfill? Koj kejenolok ke kobej in recycle ko jen kobej ko rej kanne lok seawall ko?	Yes , aet	
		No, jab	
		Don't know, ijaje	
B18	If you do separate recyclable materials, how do they get collected? Ne koj kejenolok kein recycle ko, ewi wawen am aini?	Self drop off at recycling point, ij make bokilok non jikin recycle en	
		Place in separate bag in bin, ij kejenoloki ilo bag in jokbej im likit ilo nien jokbej ko	
		Collected separately from other waste, kejenoloki jen kobej ko jet	
B19	If you do not separate recyclable materials, what is the main reason for this? Ne koj jab kejenolok men in recycle ko, ta un ko?	No collection or convenient recycling point, ejelok jikin recycle	
		Too much effort/too busy, iboub non ao kejenolok	
		Other (explain), wawen ko jet, jouj im komelele	

B20	What do you do with food waste? Ta eo koj kommani non kobej in mona ko?	Dispose of with other waste, ij kobaiki ibben kobej ko jet	
		Compost, kein ekkat	
		Feed to animals, ij najidik men in mour ko	
		Throw ocean side, juloki iliik	
		Throw lagoon side, juloki iaar	
		Don't know, ijaje	
B21	What do you do with garden (green/organic) waste? Ta eo koj kommani kon menoknok ko jen jikin kllib eo am, ujoj ko koj rakiji?	Dispose of with other waste, juloki ibben kobej ko jet	
		Compost, kein ekkat	
		Burn, tili	
		Don't know, ijaje	

C. COMMUNITY PREFERENCES FOR WASTE SERVICES:

Code	Question	Options	Response
C1	Are you satisfied with the current collection system? Eju ke buruom kon wawen ae kobej ko kio?	Yes, aet	
		No, jab	
		Don't know, ijaje	
C2	Do you currently pay for waste collection?	Yes, aet	
		No, jab	
		Don't know, ijaje	
C3	If you do pay for waste collection, how much? Ne koj kollaiki aer aini jokbej ko, jete?	US$ / bin	
C4	If you do pay for waste collection, how do you pay? Ne koj kolla wonaan ain kobej ko, ewi wawen?	Direct to MAWC, kajju kolla non MAWC	
		Other (detail), melele ko jet, (tibidiki tok melele ko)	
C5	Do you currently pay for waste disposal at the landfill? Koj kolla ke kio ilo am jokbej ilo jikin jokbej eo elap?	Yes, aet	
		No, jab	
		Don't know, ijaje	
C6	Would you consider a prepaid bag system as an alternative to the current system if you don't produce much waste? En emman ke ibbam ne kokolla kadede bag ijelokin kilen ain kobej eo kio ne ejjab lap kobej ej walok jen mwiin ak jikin in?	Yes, aet	
		No, jab	
		Don't know, ijaje	
C7	Do you know where the current landfill is located? Kojela ke ia eo jej kanne lok kon kobej kio?	Yes (Jable?), aet (Jable)	
		No, jab	
C8	Do you believe that the landfill is environmentally safe and acceptable? Ejet am lomnak, jikin jokbej eo ejelet ke ejmour im mejatoto eo ad?	Yes, aet	
		No, jab	
		Don't know, ijaje	
C9	A new landfill site will have to be built in the near future. Do you think the new landfill should be on the ocean side or the lagoon side? Juon jikin jokbej kaal enaj aikuij in komman iliju im jeklaj, ekijkan am lomnak ej bed iliik ke iaar?	Ocean side, iliik	
		Lagoon side, iaar	
		Don't know, ijaje	
C10	Please explain the main reasons for your preference. Jouj im komelele ta un ko am?		
C11	Do you think incineration of waste is environmentally safe and acceptable? Ekijkan am lomnak kon ittil kobej? Emman ke non ejmour?	Yes, aet	
		No, jab	
		Don't know, ijaje	

C12	Please explain the main reasons for your answer (yes or no). Jouj im komeleleik un ko am?	

D. ABILITY AND WILLINGNESS TO PAY FOR WASTE SERVICES:

Code	Question	Options	Response
D1	The current waste collection system costs money to operate. Would you be willing to pay more to cover the actual cost of the current waste collection service? Wawen ain kobej ko kio ej jolok jeen bwe en maron jerbal, komaron ke kolla non jiban lok bwe en wonmanlok wot im komman jerbal in jokbej ko?	Yes, aet	
		No (go to D5)jab	
		Don't know, ijaje	
D2	Would you be willing to pay $5 or more per week for a wheelie bin waste collection service? Kon maron ke in kolla $5 ak laplok ilo kajojo week non juon nien jokbej ko eor neer?	Yes, aet	
		No, jab	
D3	Would you be willing to pay $15 or more per week for a dumpster (2 cub yd) waste collection service? Kon maron ke kolla $15 ak laplok ilo kajojo week non juon kein jokbej killep?	Yes,aet	
		No, jab	
D4	If the prepaid bag option was introduced, would you be willing to pay $2 or more per prepaid bag. Ne en kar jerbal kilen wia bag eo, kon maron ke kolla $2 ak laplok non juon bag?	Yes, aet	
		No, jab	
D5	Would you prefer to transport your waste to the landfill yourself and be charged a gate/tipping fee. Kon ke konan make julok kobej ko am im kolla ilo mejen kejem eo?	Yes, aet	
		No, jab	
		Don't know, ijaje	
D6	Would you be willing to pay a gate/tipping fee at the landfill on the following basis, Koj monono ke in naj kolla tip ilo ien eo koj boklok jokbej eo am?	$3 per car load , $3 juon load in car	
		$5 per pickup truck, $5 non juon pick up load	
		$10 per small truck, $10 non juon tirak jiddik	
		$20 per large truck, $20 non tirak killep	
D7	If your answer to D1 was no, what is the reason that you don't want to pay for a collection service? Ne uak eo am non kajitok eo ilo D1 ar jab, ta un eo am?	Can't afford to pay for the full cost, Ejjab bwe jeen ibba	
		Don't believe that the service will be reliable, Ijjab tomak ke enaj emmanlok wawen in	
		Don't consider the service important enough to pay for, ilak lale ejjab aurok bwe in kollaiki	
		Believe that general taxes should cover the cost of this service, Ij tomak ke tax ko ren kollaiki jerbal jab in	
		Other - Please explain, un ko jet, jouj im komelele	
D8	If you are not willing to pay for a collection service and government cannot afford to subsidize it for you, would you be satisfied with one or more of the following so that you do not pollute your neighborhood? Ne koj jab konan kolla non aer ain kobej ko am im kien eo ejjab maron kakke aikuij in am, en ke ju buruom kon wawen juon ak ruo in bwe kon jab maron in kattoon e melan eo?		

	a) A less frequent collection service (biweekly) jokbej ilo lokin 2 week	
	b) Self transport waste to the landfill and payment of a gate/tipping fee. Konaj make jokbej im kolla tip ilo mejen jikini jokbej en	
	c) Don't know, ijaje	

"Thank you for your contribution to this survey. We hope to use these results to determine how best to provide affordable and desirable service to the people of your community." Kommol kon am kar bok kunaam ilo survey in. Kemij kejatdikdik bwe uak kein am renaj kwalok wawen ko non kokmanmanlok wawen jerbal in jokbej ko ilo jukjukim-ped ko.

E1	If there is need to seek your advice further, may we contact you again?	Yes, aet	
		No, jab	
		Don't know, ijaje	

Do you have any other comments or questions about a solid waste collection or disposal? Eor ke bar am ennan ak kajitok ikujien kilen jokbej ko rej komman kio?

One option that is being looked at is engaging a private company or contractor to manage the recycling of selected types of waste such as aluminium cans. Would your company be interested or could you recommend someone? Juon wawen eo jej kalimjeke kio ej non kakobaik tok private company ak contract ir non aer maron recycle jet iaan kobej kein einwot almonium kuat ko. Im ne eor am itok limo ak jela kon ro remaron e jerbal in jouj im bar kwalok.

ESTABLISHMENT SURVEY - MAJURO ATOLL
Date 30th June to 3rd July 2014
Range of different types, sizes and locations of establishment selected

Question	Answer																								Summary
	A			B			C			D			E			F			G			H			
	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	No	%	Description	
A2	14	56%	Male	11	44%	Female																			Even split between male and female respondants
A3	3	13%	Owner	15	63%	Manager	6	25%	Other																Majority of respondants were managers
B1	11	46%	Very Serious	5	21%	Serious	8	33%	Not Serious	1		Don't Know													Most considered SWM to be a serious or very serious issue
B2	3	14%	1 Wheelie Bin	2	9%	1/2 Dumpster	9	41%	1 Dumpster	7	32%	>1 Dumpster	1	5%	Don't know										Most respondants produces one or more dumpsters (2yd3) per week
B3																									
B4	5		Wheelie Bin			Other			2 Dumpster			>2 Dumpster			Don't know										
B5	11	46%	Yes	13	54%	No	0		Don't know																Approximately half of respondants received a waste collection service
B6	15	94%	Self Transport			Other	1	6%	Don't know																Self transport to the landfill is how others dispose of waste
B7	1		Daily	3		2-3x per week	5		Weekly	2		Biweekly													
B8	10		Directly	0		<25 feet	0		>25 feet																Waste is collected directly outside the establishments
B9	9	50%	MAWC	7	39%	Not Collected	2	11%	Don't know																MAWC collects the waste
B10	6	46%	Satisfied	6	46%	Not Satisfied	1	8%	Don't know																There is a even split in regards to satisfaction with the collection service
B11			Years Satisfied																						
B12																									
B13	9	60%	Not Reliable	3	20%	Too Long	0	0%	Location	2	13%	Rodents/flies/odour	0	0%	Rude Workers	1	7%	Appearance	0	0%	Other	0	0%		Reliability and frequency are the two main issues for those that are not satisfied
B14	21	91%	Yes	2	9%	No																			Almost all establishments know where the waste is taken for disposal
B15	19	83%	Yes	4	17%	No	12		Al Cans	9		Steel	15		Plastics	9		Organic	12		Cardboard/paper	9		Glass	Most know what can be recycled, with Al cans, steel, plastics, organic, cardboard/paper and glass all identified
B16	21	95%	Yes	1	5%	No			Don't know																Almost all consider recycling important
B17	9	45%	Yes	10	50%	No	1	5%	Don't know																There is an even split in regards to whether recyclables are separated
B18	4	40%	Self Drop	5	50%	Separate bag	1	10%	Collected Separately																Those that do separate recyclables either drop them off at the landfill or put them in a separate bag for pick up
B19	5	38%	No Collection	7	54%	Effort/Busy	1	8%	Other																A lack of collection of recyclables and too much effort/too busy are the main reasons for not recycling
B20	3	16%	With Waste	1	5%	Compost	14	74%	Animals	1	5%	Ocean			Lagoon			Don't know							Food waste is usually fed to animals although some is disposed to landfill
B21	8	44%	With Waste	7	39%	Compost	1	6%	Burn	2	11%	Don't know													Organic waste is generally disposed of to landfill or by composting
C1	10	50%	Yes	6	30%	No	4	20%	Don't know																Half of the establishments are satisfied with the collection service
C2	6	38%	Yes	10	63%	No	0		Don't know																Most respondants do not pay for waste collection (assumed that all the use the MAWC collection do pay)
C3			$																						
C4	5		MAWC	0		Other																			
C5	1	5%	Yes	17	89%	No	1	5%	Don't know																Almost all respondants indicated that there is no charge for disposal of waste to the landfill
C6	9		Yes	1		No	2		Don't know	3															A prepaid bag system would be considered by most of the smaller establishments
C7	23	100%	Yes	0	0%	No																			All establishments know where the current landfill is
C8	15	60%	Yes	6	24%	No	4	16%	Don't know																Most respondants believe that landfilling is evironmentally safe and acceptable
C9	12	48%	Ocean	6	24%	Lagoon	7	28%	Don't know																Approximately half of respondants prefer the ocean side to the lagoon side although many do not know
C10																									
C11	10	40%	Yes	9	36%	No	6	24%	Don't know																There is an even split between respondants with respect to incineration
C12																									
D1	21	84%	Yes	1	4%	No	3	12%	Don't know																Most respondants indicated that they would be willing to pay more for waste collection to cover actual costs
D2	14	93%	Yes	1	7%	No																			Most respondants indicated that they would be willing to pay $5 per week for a wheelie bin collection service
D3	16	89%	Yes	2	11%	No																			Most respondants indicated that they would be willing to pay $15 per week for a dumpster (2yd3) collection service
D4	13	87%	Yes	2	13%	No																			Most respondants indicated that they would be willing to pay $2 per prepaid bag
D5	12	71%	Yes	5	29%	No	1		Don't know																Most respondants indicated that they would prefer to self transport waste to the landfill and pay a gate fee
D6	12	48%	$3	4	16%	$5	4	16%	$10	5	20%	$20													Many respondants were willing to pay $3 per car load and some were willing to pay more for large vehicle loads
D7			Can't Afford			Service Unreliable			Not Important	1		Taxes			Other										
D8			Less Frequent	2		Self Transport	2		Don't know																

Annex 4D.3

Demand Assessment and Willingness to Pay Survey

This annex is extracted from Cointreau-Levine S, Coad A and Gopalan P.
'Guidance Pack: Private Sector Participation in Municipal Solid Waste Management'
Swiss Centre for Development Cooperation in Technology and Management,
St Gallen, Switzerland 2000

Annex A9: DEMAND ASSESSMENT AND WILLINGNESS TO PAY SURVEY for SOLID WASTE COLLECTION AND DISPOSAL SERVICES

by Sandra Cointreau-Levine

Background

Multilateral and bilateral development agencies are increasingly emphasizing private sector provision of urban services, cost recovery from service recipients, demand-driven service provision, and community participation. To assess demand, willingness to pay, and affordability, there is a need to communicate with the potential recipients of services, asking them for their opinions regarding service options, costs, and methods of payment. Since private sector provision of urban services is a new approach in many places, it is important to demonstrate to the private sector that there is a real demand and willingness to pay. Then the private sector may be convinced that investment risks are acceptable. For areas where no demand exists or where there is no willingness to pay for a waste collection service, decisions will be required as to what action to take. Options include providing a collection service which is financed by a subsidy, advocating on-site systems (such as household recycling, burial and composting), and doing nothing.

After this introduction there is a model questionnaire form for asking residents in actual or potential solid waste service areas regarding their preferences and willingness to pay. Before developing a final version of this questionnaire and conducting the survey, there needs to be feasibility study to determine which service options could be viable, and to estimate the full *amortization*, operating, and maintenance costs of each. Costs need to be developed in terms of costs per tonne and costs per capita per year. The cost recovery system should cover the costs for disposal as well as collection, so the viability and costs of disposal options also need to be studied.

There are costs that may not be covered by the cost recovery system and so government is obliged to pay them. Government payments commonly cover the costs of

- sweeping of public streets,
- cleaning of public parks,
- collection services to public hospitals, police and military barracks, government office buildings, and public schools.

During the initial stages of the development of a direct cost recovery system, government payments might also cover services to low-income residents. The cost of these services needs to be estimated and government's willingness and commitment to pay established, especially if the private sector is to be involved in collecting wastes from such areas. During the survey the **costs must be presented to the residents in clear terms** so that they can respond to questions in a meaningful way.

For the purposes of the survey, there needs to be selection of representative neighborhoods to give a comprehensive view of the range of conditions prevalent in the study area. Usually the following types of neighborhoods are surveyed:

- high income residential,
- middle income residential,
- low income residential,
- mixed commercial and residential, and
- market areas.

In addition, the representatives of the following types of establishments should be surveyed because they offer potentially high revenues which could cross-subsidize low revenue service areas:

- hotels,
- office buildings,
- department stores,
- industrial estates,
- airports and ports, and
- embassies and residences of ambassadors.

The data from the survey would enable balancing of the competing objectives of

- providing at least a minimum level of service to areas where the demand is low,
- providing adequately frequent and convenient services coverage to areas where demand and willingness to pay are high, and
- optimum cost recovery.

The data would help identify areas that might be suitable for *pilot* testing of privatization and cost recovery approaches.

A second survey should be undertaken after residents have experienced the service improvements. Comparison with the results of the first survey would show whether the waste generators have changed their expectations, demands, and willingness to pay after experiencing an improved service. Periodic surveys are recommended to monitor changes in demand.

Instructions

Identification of each household and establishment

The identification of each household and establishment needs to be specific enough and clearly recorded so that the same door can be found for subsequent surveys one or more years later.

Respondent

The person interviewed should be the head of the household (or establishment), or someone who is clearly involved in making decisions about the expenditures and commitments of the household or establishment.

Survey Purpose

The reason for the survey needs to be clearly explained to each respondent. If the survey may be followed by a *pilot* test, project, or service change, this should be clearly stated.

Service Options

Each collection system option needs to be described. Preferably, there should be drawings or photos to illustrate the various options, including the type of household container and the size and type of collection vehicle. For each option, the frequency needs to be stated. If the service involves participation by residents (such as carrying dustbins to the roadside early in the morning or taking waste to a communal container), the schedule, placement requirements, and walking distances should be described. The method of disposal following collection should also be described, as part of the income from fees should be used for environmentally safe disposal. Respondents should be invited to ask questions, and to express their doubts (which should be recorded for future reference).

Service Price

Before conducting the survey, the costs for each option must be carefully estimated. Respondents should be told the price of each collection system option during the survey. (Estimating the fee that should be paid involves determining the cost of the service and an assessment of the proportion of the households that will actually pay the fee. For example, it may be appropriate to assume that the service is provided to all the households and establishments within an area – because exclusion of households or establishments that do not pay is difficult – and to assume that fees are paid by only 80 per cent of service recipients.)

Service Preferences

The possible types of service provider - local government or a private company - need to be described. The survey should determine whether waste generators have a preference, and record their concerns and doubts about the possibilities.

Fee Collection Preferences

The options for fee collection need to be described. The fee can be collected by government, the private company that collects the waste, commissioned fee collectors, or an existing authority (such as a water or electricity authority). The fee can be collected from door to door, by mail, at banks or at government offices. The survey should determine whether respondents have a preference, and record their concerns and doubts about the options.

Additional Information

Any other information that might be useful in determining demand and willingness to pay should be collected. If the household (or establishment) has unusual circumstances, burdens or constraints (such as a sick or disabled family member, or recent loss of employment or markets) which might influence their responses, this should be recorded separately. If the household (or establishment) appears to have a surprisingly large income (apparent in the display of affluence inconsistent with the declared income, or because of informal sector income, or income from relatives overseas) which might not be readily apparent from their responses, this should be recorded separately.

Sample Size

For each type of community or area to be surveyed, a sample of between 100 to 200 respondents is desired. For example, if an area has 1000 houses and 100 respondents are desired, every 10th house along the routes in the area would be interviewed. The starting house should be picked randomly.

Analysis of Results

The survey data should be sorted according to factors that might influence responses. For example, the service preference and willingness to pay responses could be correlated to factors such as literacy, ethnic background, urban or rural background, income, and prior experience with a particular type of collection service. The results of such correlations would show whether these factors have a significant effect on preferences and willingness to pay.

Pilot Test

It is extremely important that the questionnaire be tested and refined. Particular attention during the testing needs to be paid to sections C and F, because these general questions might fatigue the respondents and therefore not provide meaningful data which can be used to correlate results. Surveyors should take care that the descriptions of the various possible collection systems are sufficiently understood.

MODEL SURVEY QUESTIONNAIRE
FOR ASSESSING
DEMAND AND WILLINGNESS TO PAY

(from Part III Annex A9. Developed by Sandra Cointreau-Levine)

Date of interview: …….

Name of interviewer ……..

Area ……...

A. Identification:

"I would like to ask you some questions that would assist the local government in determining how to improve the solid waste collection service to your neighborhood. These questions usually take about …… minutes. We are interviewing a sample of ……. per cent of the households and establishments in your neighborhood, so your input is considered very valuable to this survey. Let me first ask you a few questions to identify this house (or establishment) and you."

A.1 Household (or establishment) identification: ……..

A.2 Name of Respondent: ……..

A.3 Position of Respondent:
Head of household (or establishment)
Spouse of head of household (or establishment)
Other , please describe ……...

A.4 How many people (children and adults) live in your household (or work in your establishment) on a regular basis? ……..

B. Major Concerns:

(For this question, present the list in a different order on a random basis to each respondent)
"I would like to show you a list of possible problems that might be faced by your household (or establishment):

a) Difficult access to drinking water
b) Poor quality of drinking water
c) Inadequate disposal of residential wastewater
d) Inadequate disposal of human excreta
e) Flooding and inadequate drainage of stormwater
f) Poor access for motor vehicles
g) Lack of public transport
h) Unreliable electricity supply
i) Inadequate solid waste collection service
j) Presence of litter and illegal piles of solid waste
k) Nuisance from solid waste transfer points
l) Nuisance from solid waste disposal sites

B.1 Of these possible problems, which do you consider the most serious problem for your household (or establishment)?

Most serious problem ……. (*Write letter – a to l*..)

Don't know

B.2. And which do you consider the second most serious problem?

Second most serious problem ……..(*Write letter – a to l.*)

Don't know

B.3 (If item (i) was not listed) In your opinion, how serious is the problem of solid waste collection in this area?

Very serious a
Somewhat serious b
Not serious c
Don't know d

B.4 (If item (j) was not listed) In your opinion, how serious is the problem of littering and illegal piles of solid waste in this area?

Very serious a
Somewhat serious b
Not serious c
Don't know d

B.5 (If item (k) was not listed) In your opinion, how serious is the problem of nuisance from solid waste transfer points in this area?

Very serious a
Somewhat serious b
Not serious c
Don't know d

B.6 (If item (l) was not listed) In your opinion, how serious is the problem of nuisance from solid waste disposal or dumping in this area?

Very serious a
Somewhat serious b
Not serious c
Don't know d

C. Existing Situation Regarding Solid Waste:

"I would like to ask you some questions regarding the collection or removal of solid waste from your household (or establishment)."

C.1 Does your household (or establishment) have a durable metal or plastic container for storing solid waste?

Yes, we have metal or plastic container a
We have basket or carton container b
No, we do not have a container c
Don't know d

C.2 Does your household (or establishment) receive a collection service of any type?

Yes a (*Go to Question C.3*)
No b (*Go to Section D*)
Don't know c (*Try question C.3*)

C.3 How frequently is your container usually taken out to be emptied?

Several times each day a
Daily b
Three times a week c
Twice a week d
Once a week e
Less frequently f
Don't know g

C.4 Who usually takes the container with its waste contents out to be emptied?

Head of household (or establishment) a
Spouse of head of household (or establishment) b
Another male adult c (Please specify) ……..
Another female adult d (Please specify) ……
Any male adult e
Any female adult f
Any child between the ages of 13 and 18 g
Any child between the ages of 6 and 12 h
Don't know i

C.5 Where is your container taken to be emptied?

The container is placed beside the road for emptying into a collection vehicle a
The container is emptied into a larger container in the same building b
The container is emptied into a communal container in the neighborhood. c
The container is emptied onto an open pile of waste in the neighborhood. d
The container is emptied at the final disposal, and the waste stays there e
Don't know f

C.6 Approximately how far or how many minutes walking time one-way is it to empty your container? (If possible the respondent should indicate to the questioner where it is, so that the questioner can later check the distance.)

……. meters one-way
……. minutes walking one-way
Don't know

C.7 If your container is emptied into a larger container in the same building or into a communal container in the neighborhood, how often is that (larger) container emptied?

Daily a
Three times a week b
Twice a week c
Once a week d
Less than once a week e
Less than once in 2 weeks f

Less than once in 3 weeks g
Less than once a month h
Don't know i

C.8 If your container is emptied onto an open pile of waste in the neighborhood, how often is that pile removed?

Daily a
Three times a week b
Twice a week c
Once a week d
Less than once a week e
Less than once in 2 weeks f
Less than once in 3 weeks g
Less than once a month h
Don't know i

C.9 For how many years has this type of waste collection service been provided to your household (or establishment)?

Less than one year a
One to two years b
Two to five years c
More than five years d
Don't know e

C.10 Who collects the waste from the curbside, communal container, or pile?

Local government a
Local public authority b
Neighborhood group c
Private company d
Don't know e

C.11 Has the same organization been collecting the waste for the past five years, or has there been a change in who has been collecting your waste?

The same organization for the last five years a
There has been a change in the last five years. b
Don't know c

If there has been a change, please give more details ……
……...

C.12 What is your opinion of the service that you are receiving for collection of solid waste from your household (or establishment)?

Very satisfied a *Go to Question C.14*
Reasonably satisfied b *Go to Question C.14*
Not satisfied at all c *Go to Question C.13*
Don't know d

C.13 If you are not satisfied with service, would you state your primary reason?

The service is not reliable a

Frequency of service – the interval between collections is too long. b
The location of the communal container or pick-up point is unsatisfactory c
Lack of clean appearance, odors, flies or fires at the communal container. d
The collection workers are rude or impolite. e
Lack of clean appearance of the neighborhood f
Other problem g Please explain……
……..

C.14 Do you know where the collected waste is taken for final disposal when it leaves your neighborhood?
Yes a *Go to Question C.15*
Don't know b *Go to Section D*

C.15 Are you concerned about whether the final disposal is environmentally safe and acceptable?
Yes a
No b
Don't know c

D. Description of Proposed Service Options

"Plans are being developed to upgrade the solid waste system in your neighborhood. To understand your preferences, I would like to discuss the options with you. For each of these options, the cost is different. Households and establishments in your neighborhood will be expected to pay a fee for this improved service. The type of service provided will depend on the fee which you and your neighbors can afford and are willing to pay, as well as your preferences."

D.1 Would you like to ask any questions about the plans to upgrade the solid waste system?
Yes a (Record questions and answer them.)
No b

E. Demand Assessment:

"Different methods of collecting solid waste have different costs and require different levels of involvement from residents such as you. The vehicles used for collection could be either trucks or tractors, depending on the road conditions in your neighborhood. The main methods of solid waste collection are as follows:

a) *Low Cost System.* A large communal container - probably of 5 to 8 cubic meters capacity – (interviewer should demonstrate the size) would be placed in your neighborhood at a central location and each household and establishment would be expected to carry its container of refuse to empty it into the container. The container would have an attendant to sweep the area and keep it tidy. A vehicle would pick up the container and take it away to be emptied before it is completely full.
b) *Low Cost System.* A vehicle would come to the neighborhood on a scheduled basis and park for a few minutes at each block or road junction to collect solid waste. When the vehicle parks, it would ring a bell, sound its horn or play a musical jingle to summon residents to bring their containers out to be emptied. All waste in the neighborhood would be kept inside until the vehicle comes.

c) *Medium Cost System*. As with the first service option, a large communal container would be placed in your neighborhood. However, instead of you and your neighbors being required to carry their waste to the communal container, door-to-door collection would be arranged for an added fee. The door-to-door collection would be done by a worker using a push cart or donkey, depending on which would work better in your neighborhood.

d) *Higher Cost System.* A vehicle would come to the neighborhood on a scheduled basis and provide a door-to-door service. At each building, containers of waste, which have been left at the curbside, would be emptied into the vehicle. The emptied containers would be placed neatly at the curb for residents to bring back into their household (or establishment). Residents would be required to adhere to the schedule and bring their waste to the curb in proper containers before the vehicle arrives."

E.1 Which of the service options just described do you prefer, giving consideration to the convenience and the cost?

Collection method (a) a – *Now go to Question E.2*
Collection method (b) b – *Now go to Question E.7*
Collection method (c) c – *Now go to Question E.10*
Collection method (d) d – *Now go to Question E.13*
Don't know e

E.2 If your preferred collection method (**a**) were introduced, how far would you be willing to walk to the large communal container?

50 meters a
100 meters b
150 meters c
200 meters d
More than 200 meters e
Don't know f

E.3 If your preferred collection method (**a**) were introduced, would you be willing to have the communal container within 20 meters of your house (or establishment)?

Yes a - Now go to Question E.5
No b – Now go to Question E.4
Don't know c – *Now go to Question E.4*

E.4 If you answer is "no" or you are not sure, would you please describe your concerns about the container location?

……

……

E.5 The cost of collection method (a) is …… per person per month. For your household (or establishment), which has ….. people, this amounts to …… per month.
Would you be willing to pay this fee to cover the cost of the waste collection service?

Yes a - Now go to Question E.21
No b - Now go to Question E.6
Don't know c - *Now go to Question E.6*

E.6 What is the maximum fee per month that your household (or establishment) would be prepared to pay for the collection method that you have chosen (method a)?

……..per month a - *Now go to Question E.17*

Won't pay any fee b - *Now go to Question E.16*
Don't know - c - *Now go to Question E.16*

E.7 If your preferred collection method (**b**) were introduced, are there certain times of day when you would find it most convenient to meet the vehicle when it comes to your block to collect waste? (More than one answer may be checked.)

Early morning before 9 a.m. a
Anytime in the morning b
Anytime in the afternoon c
Early evening after 5 p.m. d
Anytime during daylight e

E.8 The cost of collection method (b) is ……. per person per month if the collection vehicle comes …… times per week. For your household (or establishment), which has ……. people, the fee would be ……. per month.
Would you be willing to pay this fee to cover the cost of the collection service?

Yes a - *Now go to Question E.21*
No b - *Now go to Question E.9*
Don't know c - *Now go to Question E.9*

E.9 What is the maximum fee per month that your household (or establishment) would be prepared to pay for the collection method that you have chosen (method b)?

…….per month a - *Now go to Question E.17*
Won't pay any fee b - *Now go to Question E.16*
Don't know c - *Now go to Question E.16*

E.10 If your preferred collection method (**c**) were introduced, would you be willing to have the communal container within 20 meters of your house (or establishment)?

Yes a
No b
Don't know c

E.11 The cost of collection method (c) is …… per person per month for collection ……. times per week. For your household (or establishment), which has …… people, this amounts to …….. per month.
Would you be willing to pay this fee to cover the cost of the collection service?

Yes a - *Now go to Question E.21*
No b - *Now go to Question E.12*
Don't know c - *Now go to Question E12*

E.12 What is the maximum fee per month that your household (or establishment) would be prepared to pay for the collection method that you have chosen (method c)?

……per month a - *Now go to Question E.17*
Won't pay any fee b - *Now go to Question E.16*
Don't know c - *Now go to Question E.16*

E.13 If your preferred collection method (**d**) were introduced, what type of containers do you think that you and your neighbors should use for putting out your waste at the curbside?

Metal dustbins a

Plastic dustbins b
Plastic or nylon bags c

E.14 The cost of collection method (d) is ……. per person per month for collection of your waste from the curbside ……. times per week. For your household (or establishment), which has ……. people, this amounts to …… per month.
Would you be willing to pay this fee to cover the cost of your preferred collection method?
Yes a - *Now go to Question E.21*
No b - *Now go to Question E.15*
Don't know c - *Now go to Question E.15*

E.15 What is the maximum fee per month that your household (or establis=hment) would be prepared to pay for the collection method that you have chosen (method d)?
……per month a - *Now go to Question E.17*
Won't pay any fee b - *Now go to Question E.16*
Don't know c - *Now go to Question E.16*

E.16 What is the reason that you are unsure or don't want to pay for a collection service?

……..

……..

E.17 (For those who stated that they are unsure or don't want to pay for the collection service from government, or are not willing to pay the government enough to cover the full cost of service.) Would you be willing to pay the full cost of the collection service if a private company was providing the service and collecting the fee directly from you?
Yes a - *Now go to Section F*
No b - *Now go to Question E.18*
Don't know c - *Now go to Section F.*

E.18 What is your reason for not being willing to pay a fee to cover the full cost of a waste collection service from the government or a private company?
Can't afford to pay for the full cost a - *Now go to Question E.20*
Don't believe that the service will be reliable b - *Now go to Question E.19*
Don't consider the service important enough to pay for c - *Now go to Question E.19*
Believe that general taxes should cover the cost of this service d - *Now go to Question E.19*
Other e - Please explain …….

……...

Now go to Question E.19

E.19 If you are not willing to pay for a collection service and government cannot afford to subsidize it for you, would you be willing to dispose of your wastes according one of the "do-it-yourself" systems described below, so that you do not pollute your neighborhood?
Separation of recyclable materials and composting of kitchen wastes in your yard or garden
a - Now go to Section F
Separation of recyclable materials and burial of kitchen wastes in your yard or garden. b - Now go to Section F
No c
Don't know d

E.20 If you are not able to afford to pay for the full cost of the collection method that you initially selected, would you consider an alternative method that offers a lower level of service or more effort on your part? Which of the following alternatives would be most acceptable to you? (More than one answer can be checked.)

Selection of a method that has a lower cost a - Now return to Question E.1
Walking a longer distance to empty or place your container b
Less frequent collection of waste c
Participation as a volunteer in community efforts to help with collection d
Participation as a volunteer in community efforts to regularly clean up uncollected waste e
Other cost-saving suggestions f Please describe. …….…….

……...
None of these g - *Now go to Section F*
Don't know h

E.21 If you have said that you are willing to pay for a collection service, whom would you prefer to provide the service to you?

The local government a
A private company b
There is no difference c
Don't know d

E.22 If you have said that you are willing to pay for a collection service, to whom would you prefer to pay the fee?

To a government fee collector a
To a fee collector working for a private company b
To a neighborhood leader c
They are all equally suitable d
Don't know e

F. Other Information

"We will soon be ending this interview. Before we do end it, I would like to ask some questions about you and your family (or members of your establishment)."

F.1 What is your age? Under 24 a, 25 to 34 b, 35 to 44 c, 45 to 54 d, 55 to 64 e, Over 65 f.

F.2 What is your level of education (number of years of school)? …….. years

F.3 What is the level of education of the most educated member of your household (or establishment)? ……. years at school

F.4 (If a household) How many children under 15 years of age are in your household? …….

F.5 (If a household) How many people in your household contribute to the household income?

……. people

F.6 (If a household) What is the occupation of the principle income earner in the household?

Self-employed as laborer a
Self-employed as trader b
Self-employed as consultant or professional c
Employee of a private company d
Employee of government (public sector) e
Retired f
Other g
Don't know h

F.7 (If an establishment) What is the principle commercial activity of this establishment?

Trading in goods a
Trading in produce, meat, poultry or fish b
Professional services c
Manufacturing, food preparation d
Repair, maintenance e
Inn or Hotel f
Restaurant, café, bar g
Bank h
Other i Please describe ……..

"Thank you for your contribution to this survey. We hope to use these results to determine how best to provide affordable and desirable service to the people of your community.

F.8 If there is need to seek your advice further, may we contact you again?"

Yes a
No b
Don't know c

Appendix D

Waste Storage, Collection and Transportation Information

NEDLAND INDUSTRIES INC.

Poly Dura Kan Specifications

Size	Truckload Qty. (48')	# Per Stack	Load Rating (lbs)	Weight (lbs)	Dimensions D x W x H (includes casters)	Stacked Dimensions D x W x H (includes casters & lids)
2 Yard Frontload poly lid w/casters	60	5	1500	370	41" X 82" X 52"	51" X 82" X 88"
3 Yard Frontload poly lid w/casters	50	5	2000	450	55" X 82" X 60"	70" X 82" X 96"
4 Yard Frontload poly lid w/casters	45	5	3000	492	59" X 82" X 69"	74" X 82" X 101"
1.5 Yard Rear load poly lid w/ casters	78	6	1000	235	36" X 78" X 48"	48" X 78" X 88"
2 Yard Rear load poly lid w/casters	72	6	1500	285	48" X 78" X 48"	60" X 78" X 88"
3 Yard Rear load poly lid w/casters	35	5	2000	495	81" x 78 x 48"	86" x 78" x 101"
Optional Winch Hook for Rear load			2500	38		
Tow Package Option			5000	65		
Ground to bottom of pocket dimensions 6" casters	2yd FL 30 1/2"	3yd FL 31 1/2"	4yd FL 36"			
40' High cube shipping container	2yd FL 7 high	3yd FL 6 high	4yd FL 5 high			
40' High cube shipping container	1.5yd RL 7 high	2yd RL 7 high	3yd RL 5 high			

Mailing address:
P.O.Box 217
Ridgeland, Wisconsin 54763

Delivery address:
315 Railroad Street
Ridgeland, Wisconsin 54763

E-mail: polykan@chibardun.net web: www.nedland.com or www.ezrolloff.com
(715) 949-1982 (800) 447-4925 Fax (715) 949-1983

Poly Dura Kan Size & Specifications

Model:	Cu. Yards	Depth	Width	Overall Loading height	Weight	Wall thickness
Rear Load						
N-150RLP	1.5	36"	78"	48" with casters	235 #	3/16"
N-200RLP	2	48"	78"	48" with casters	285 #	3/16"
N-300RLP	3	81"	78"	48" with casters	495 #	1/4"
Front Load						
N-200FLP	2	41"	82"	49" with casters	370 #	1/4"
N-300FLP	3	55"	82"	46" with casters	450 #	1/4"
N-400FLP	4	59"	82"	54" with casters	492 #	1/4"

Container Specifications

Rear loads:

- Rotationally molded 100% virgin high-density polyethylene
- 8ga Steel powder coated top rail on sides and backs
- Powder coated steel 1 1/2" Solid trunnion 78" long with 3/16" side gussets
- 8ga Steel powder coated caster channels and belly pan
- 8ga Formed steel powder coated front kick bar bumpers
- Quick change caster pads with four swivel casters
- 3/4" Bottom drains
- Assembled with all stainless steel fasteners
- 1/2" Steel lid rod with nylon lock nut
- Rotationally molded lids with 250 # weight test
- One year warranty on lids and hardware
- Five year warranty on container body

Front loads:

- Rotationally molded 100% virgin high-density polyethylene
- 8ga Steel powder coated top rail on sides and backs
- 8ga Steel powder coated front top rail with inside brace for strength and clean dumping
- 8ga Steel powder coated side pockets with front corner wrap around bumper
- 5" x 10" Side pockets for easier fork release
- 8ga Steel powder coated caster channels and belly pan
- Quick change caster pads with two swivel caster and two ridge casters
- 3/4" Bottom drains
- Assembled with all stainless steel fasteners
- 1/2" Steel lid rod with nylon lock nut
- Rotationally molded lids with 250 # weight test
- One year warranty on lids and hardware
- Five year warranty on container body

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Fax (715) 949-1983

QUALITY PRODUCTS SINCE 1945

Roll Offs ◆ Compactors ◆ Poly Dura Kans ◆ Trailer and Truck Hoists

Poly Dura Kan Refuse Container Limited Warranty

Nedland Industries Inc warrants the poly components parts of its containers to be free from defects in materials and workmanship for a period of five (5) years prorated as noted below. The warranty period starts at time of delivery and involves the molded portion only, not any attached hardware, lids or casters.

The containers are warranted for failure during normal and regular use. It does not cover negligence or abusive use such as burns, cuts; damage caused by vehicle hits and/ or run over's improperly adjusted lift mechanisms or breakage due to dumping on top of a full hopper, vandalism or unauthorized alterations.

Nedland Industries Inc sole and exclusive responsibility for containers and components which fail by reason of defective material and workmanship during specified period shall be at its own expense, either to replace or to repair such defective container or part thereof, provided Nedland Industries, Inc. receives prompt written notice of any such defect.
The Nedland Industries Inc Poly Dura Kan Refuse Container Limited Warranty term shall be defined as follows:
First 24 months warranty replacement – No proration.

Succeeding years replacement cost to buyer is based on the following prorated formula:
* Number of months in service – divided by 60 months
* Multiply the results by current price of container of part.
* This amount is the replacement cost to buyer.

Replacement containers and/or parts provided under the terms of this warranty are guaranteed only for the remaining period of the original warranty period. Components believed to be defective shall be retained by the buyer for inspection by Nedland Industries Inc to verify the existence of the covered defect.

This warranty is in lieu of all warranties, expressed of implied, including but not limited to warranties of merchantability or of fitness for a particular purpose and the obligation and liability of Nedland Industries Inc liability is limited only to the value of the container and/or component.

Note Special Handling Precautions: Temperature Precautions

At temperatures reaching -20 F or below precautions and restrictions should be taken on containers during lifting and or dumping process. Due to brittleness of material at these temperatures creating possible breakage and possible voiding of warranty.

Effective March 1, 2005 this Warranty supersedes all other warranties stated or published.

Mailing address:
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NEDLAND INDUSTRIES INC.
RESIDENTIAL REFUSE CART WARRANTY

Nedland Industries Inc. warrants its residential refuse carts from functional failure due to defects in plastic materials or faulty workmanship or insufficient resistance to weathering while in normal use for a period of ten (10) years (120 months) from the date of shipment from the manufacturing facility to any purchaser ("Shipment Date"). Notwithstanding the above, Nedlands shall provide purchaser with a spare parts supply of component parts, such as axles and wheels, which fail.

For purposes of this warranty, "normal use" of a cart is considered to be the collection of residential solid wastes in conjunction with any semi-automated or fully automated mechanical lifting device manufactured to industry-wide guidelines ANSI Z245.60-2008 and/or ANSI Z245.30-2008 which are standard.

Nedlands shall be promptly notified of any failures under warranty in order that such failures may be inspected. Residential refuse carts which fail shall be accumulated by the customer, but no accumulation of defective products shall exceed 20 residential refuse carts without written notification to Nedlands.

Specifically excluded from this warranty are damages due to negligent or abusive use or normal wear and tear, including but not limited to, those items listed on Schedule A attached. Also specifically excluded are carts used as crew carts, dumped manually, or used for any purpose other than residential solid waste and curbside recyclables collection. Negligent, abusive, or specifically excluded use of carts voids this warranty after such use. This warranty is also voided upon the resale of the residential refuse carts.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL CE BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OR FOR ANY DELAY IN PERFORMANCE UNDER THIS WARRANTY.

RESIDENTIAL REFUSE CART
SCHEDULE A

FOLLOWING ARE DESCRIPTIONS OF SEVERAL SITUATIONS WHERE THE WARRANTY DOES NOT APPLY BECAUSE OF IMPROPER USE, NEGLIGENCE, ETC. THESE SITUATIONS ARE GIVEN AS EXAMPLES ONLY AND EXCLUSIONS FROM WARRANTY COVERAGE ARE NOT LIMITED TO THESE SITUATIONS.

EXAMPLES OF NORMAL WEAR AND TEAR

- Scratches, cuts or scores from any source.
- Accumulation of dirt or any other similar substance.
- Normal deterioration of metal parts during services.
- Normal discoloration due to atmospheric exposure or water conditions.
- Appearance of rust on steel parts.

EXAMPLES OF NEGLIGENT OR ABUSIVE USE

- Exposure to heat which may result in burns, scorches, melting.
- Exposure to chemicals such as solvents, petrochemicals, paints, or acids.
- Major impacts such as being hit by a vehicle.
- Improper storage such as storage in stacks, on lids, near heat or chemicals, outside uncovered without lid on, or in any area where damage may occur.
- Improper handling such as dropping stacks off delivery trucks, dragging over rough surfaces, stacking with wheels on, forcing through narrow openings, allowing packer mechanism to hit cart during dumping cycle.
- Improper handling by automated arms such as any scratches, cuts, creases, scores, cracks or breaks from a maladjusted or improper automated lift arm or semi-automated lift arm or semi-automated dumper, including squeezing lid with arm and dropping cart into packer or possible wheel/axle damage and including excessive lift speed including any lift speed faster than six seconds for full lift-dump-down cycle.
- Failure to properly open or secure lids when emptying or handling carts.
- Improper use such as any use other than for storage, transport, and dumping normal single unit residential solid wastes, including such improper use as:

  Construction, industrial, landscaping, liquid storage/transport, bulk solids storage/transport, recreational, commercial, food service and institutional applications.

NEDLAND Industries, Inc.

Nedland Industries, Inc. continues to lead the way with its quality line of Poly Dura Kart containers

Home of the Poly Dura Kart

96 Gallon container

65 Gallon container

Nedland Industries manufactures the highest quality Poly Dura Karts in the industry and are compatible with all American Standard dumping systems. All Poly Dura Karts are made of high-density rotationally molded polyethylene and are available in two sizes: 65 gallon and 96 gallon. Our containers are available in many different colors. With the industry's best warranty and competitive pricing it's hard to match or beat a Poly Dura Kart.

POLY DURA KART

Environmental Industry Associations

WASTEC

Nedland Industries, Inc. 315 Railroad Street Ridgeland, Wisconsin 54763

www.nedland.com (800)447-4925 www.nedland.com

Poly Dura Kart container features:

Quality Products since 1945

Dimensions

	65 Gallons	96 Gallons
• Overall Height	41″	43.5″
• Overall Depth	32″	35..5″
• Overall Width	26″	29.7″
• Wheel Diameter	10″	10″
• Axle Diameter	7/8″	7/8″
• Container Capacity	65	96
• Load Rating (lbs)	224	336
• Approximate Weight	40 lbs	50 lbs

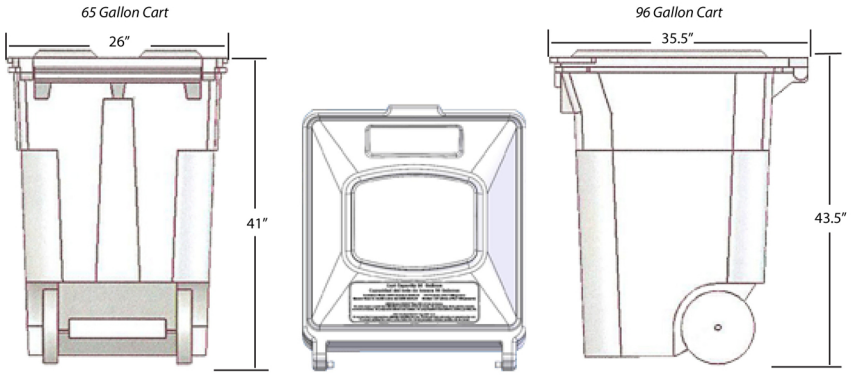
Truckload Quantities

Size	Stack	48′ Trailer	53′ Trailer
65 Gallon	6	252	288
96 Gallon	6	228	252

Standard Features

- Clean dumping, maintenance free interior
- Rotational molded containers from LLDPE/MDPE material for greater, dent and impact resistance
- Domed lid for strength and water deflection
- Molded in steel latch bars
- Custom color matches are available
- Compatible with both fully automated and semi - automated lifters.
- Backed with a 10 year warranty
- Molded in multi-lingual instructions
- Bottom wear pads for abrasion
- Containers come completely assembled and nestable for shipping

Schematics



All sizes are approximate, materials and product improvement is a continuous commitment a Nedland Industries. These specifications subject to change without notice.

Meets ANSI standards Z245.30 & Z245.60 Type B/G cart

Maintenance-Free from:
Rusting, corrosive conditions, welding and painting.

Built-In Super Strength:
Flexual Bend 2800 P.S.I, Tensile Strength 110,000 P.S.I.

Lightweight-Durable:
1/3 the weight of steel, 5 year prorated warranty.

Poly Dura Kan

No rust • No welding • No painting • Resists corrosion
Saves time and manpower with dumping at all stops.

Handling Ease & Safety:
Excellent maneuverability, Quieter than steel,
Dumps freely and clean.

3 Cubic yard
Front Load Slant

4 Cubic yard
Front Load Slant

2 Cubic yard
Rear Load

3 Cubic yard
Rear Load

FRONT LOAD CONTAINERS

Poly Dura Kan front load containers are designed for use with most front load truck bodies with pockets, each unit is constructed of high quality high density rotationally molded polyethylene. All units have 3/16" front bumpers and 3/16" elongated side pockets, 3/16" top rails on all four sides and 3/16" formed caster channels. All front load containers are assembled with stainless steel fasteners for long life. All steel parts are powder coated which involves electrostatically applying the finish, then baking to provide a more durable, scratch-resistant, long lasting product.

Specifications:

Model	Cu. Yards	Depth	Width	Overall Loading height
N-200FLP	2	38"	74"	49" with casters
N-300FLSP	3	53"	74"	46" with casters
N-400FLSP	4	55"	74"	54" with casters

REAR LOAD CONTAINERS

Poly Dura Kan rear load containers are designed for use on most rear load packer bodies. Each unit is constructed of high density rotationally molded polyethylene with 3/16" top rail on sides and back. Each unit has 1 1/4" solid trunnion 78" long with 3/16" gussets welded solid from side rail to trunnion and 3/16" formed steel caster channels. All rear load containers are assembled with stainless steel fasteners for long life. All steel parts are powder coated which involves electrostatically applying the finish, then baking to provide a more durable, scratch-resistant, long lasting product.

Specifications:

Model	Cu. Yards	Depth	Width	Overall Loading height
N-150RLP	1.5	35"	78"	48" with casters
N-200RLP	2	44"	78"	48" with casters
N-300RLP	3	81"	78"	48" with casters

All sizes are approximate, materials and product improvement is a continuous commitment at Nedland Industries, Inc. These specifications subject to change without notice.

Other quality Nedland Industries products:

Self-contained compacter with cart dumper

EZrolloff Trailers

Truck Hoist

Stationary compacter

Roll-offs, roll-off recievers, and steel, rear and front, load containers as well

POLY DURA KAN REFUSE CONTAINER LIMITED WARRANTY

Nedland Industries, Inc. warrants the poly component parts of its containers to be free from defects in materials and workmanship for a period of five (5) years prorated as noted below. The warranty period starts at time of delivery and involves the molded portion only, not any attached hardware, lids or casters.

The containers are warranted from failure during normal and regular use. It does not cover negligence or abusive use such as burns, cuts, damage caused by vehicle hits and/or run overs improperly adjusted lift mechanisms or breakage due to dumping on top of a full hopper, vandalism or unauthorized alterations.

Nedland Industries, Inc. sole and exclusive responsibility for containers and components which fail by reason of defective material and workmanship during specified period shall be at its own expense, either to replace or to repair such defective container or part thereof, provided Nedland Industries, Inc. receives prompt written notice of any such defect.

The Nedland Industries, Inc. Poly Dura Kan Refuse Container Limited Warranty term shall be defined as follows:

First 24 months warranty replacement – no proration.

Succeeding years replacement cost to buyer is based on the following prorated formula:
*Number of months in service – divided by 60 months.
*Multiply the result by current price of container or part.
*This amount is the replacement cost to buyer.

Replacement containers and/or parts provided under the terms of this warranty are guaranteed only for the remaining period of the original warranty period. Components believed to be defective shall be retained by the buyer for inspection by Nedland Industries, Inc. to verify the existence of the covered defect.

This warranty is in lieu of all warranties, expressed of implied, including but not limited to warranties of merchantability or of fitness for a particular purpose and the obligation and liability of Nedland Industries, Inc. under this warranty shall not include any transportation or other changes or the cost of installation or liability for direct or indirect or consequential damages or delay resulting from the defect. Nedland Industries, Inc. liability is limited only to the value of the container and/or component.

NOTE SPECIAL HANDLING PRECAUTONS: Temperature Precautions

At temperatures reaching –20 F or below precautions and restrictions should be taken on containers during lifting and or dumping process. Due to brittleness of material at these temperatures creating possible breakage and possible voiding of warranty.

Effective October 1, 1996 this Warranty supersedes all other warranties stated or published.

NEDLAND Industries, Inc.

Nedland Industries, Inc. continues to lead the way with the quality line of Poly Dura Kan polyethelene refuse containers.

Home of the Poly Dura Kan

No rust • No welding • No painting • Resists corrosion
Saves time and manpower with dumping at all stops.

2 Cubic yard Front Load

1.5 Cubic yard Rear Load

Our unsurpassed Poly Dura kans are made of high-density rotationally molded polyethelene and are available in six sizes: 1.5, 2 and 3 cubic yard rear load, 2 cubic yard front load, as well as 3 and 4 cubic yard front load slant models.

POLY DURA KAN®

Nedland Industries, Inc. 315 Railroad Street Ridgeland, Wisconsin 54763
www.nedland.com (800)447-4925 www.nedland.com

NEDLAND INDUSTRIES INC.

QUALITY PRODUCTS SINCE 1945

Roll Offs · Compactors · Front and Rear Loads · Poly Dura Kans

Poly Dura an	**PRICE**
1 1/2yd Rear Load (Poly Lids & Casters)	$370.00
with optional winch hook add	$40.00
2yd Rear Load (Poly Lids & Casters)	$430.00
with optional winch hook add	$40.00
3yd Rear Load (Poly Lids & Casters)	$760.00
2yd Front Load (Poly Lids & Casters)	$510.00
3yd Front Load (Poly Lids & Casters)	$605.00
4yd Front Load (Poly Lids & Casters)	$660.00
Poly Dura art	
96 Gallon (Semi & Fully auto residential cart)	$72.00
65 Gallon (Semi & Fully auto residential cart)	$63.00
96 Gallon (Semi & Fully auto residential cart with hot stamp)	$74.00
65 Gallon (Semi & Fully auto residential cart with hot stamp)	$65.00
One time Logo charge for hot stamping (Customer owned)	$350.00

Current prices effective April 15, 2014

Prices subject to change without notice.

Mailing address:
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315 Railroad Street
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NEDLAND INDUSTRIES INC.

QUALITY PRODUCTS SINCE 1945

Roll Offs · Compactors · Front and Rear Loads · Poly Dura Kans

PRICES EFFECTIVE April 15, 2014

				w/Poly Lids
Rear Load w/Casters				
N100RL-C	1.0	Cubic Yd	Standard-Steel	$ 386
N150RL-C	1.5	Cubic Yd	Standard-Steel	$ 375
N200RL-C	2.0	Cubic Yd	Standard-Steel	$ 399
N300RL-C	3.0	Cubic Yd	Standard-Steel	$ 595
N200RLR-C	2.0	Cubic Yd	Compactor Receiver Container	$ 1,255
Rear Load wo/Casters				
N300RL	3.0	Cubic Yd	Standard-Steel	$ 610
N400RL	4.0	Cubic Yd	Standard-Steel	$ 665
N600RL	6.0	Cubic Yd	Standard-Steel	$ 880
N800RL	8.0	Cubic Yd	Standard-Steel	$ 1,105
N1000RL	10.0	Cubic Yd	Standard-Steel	$ 1,160
N400RLR	4.0	Cubic Yd	Compactor Receiver Container	$ 1,570
N600RLR	6.0	Cubic Yd	Compactor Receiver Container	$ 1,780
N800RLR	8.0	Cubic Yd	Compactor Receiver Container	$ 2,135
Front Load Containers				
N200FL	2.0	Cubic Yd	Standard-Steel	$ 469
N200FL-C	2.0	Cubic Yd	Standard-Steel with Casters	$ 515
N300FLS	3.0	Cubic Yd	Slant-Steel	$ 585
N400FLS	4.0	Cubic Yd	Slant-Steel	$ 669
N600FLS	6.0	Cubic Yd	Slant-Steel	$ 868
N800FLS	8.0	Cubic Yd	Slant-Steel	$ 1,042
N200FLR-C	2.0	Cubic Yd	Compactor Receiver Container	$ 1,510
N300FLR	3.0	Cubic Yd	Compactor Receiver Container	$ 1,580
N400FLR	4.0	Cubic Yd	Compactor Receiver Container	$ 1,635
N600FLR	6.0	Cubic Yd	Compactor Receiver Container	$ 1,930
N800FLR	8.0	Cubic Yd	Compactor Receiver Container	$ 2,205
Open-Top Roll-Off Containers				
NRO-12-16	12.0	Cubic Yd	16.0 Ft Length	$ 3,420
NRO-20-20	20.0	Cubic Yd	20.0 Ft Length	$ 3,890
NRO-20-22	20.0	Cubic Yd	22.0 Ft Length	$ 4,000
NRO-30-20	30.0	Cubic Yd	20.0 Ft Length	$ 4,335
NRO-30-22	30.0	Cubic Yd	22.0 Ft Length	$ 4,500
NRO-40-20	40.0	Cubic Yd	20.0 Ft Length	$ 5,015
NRO-40-22	40.0	Cubic Yd	22.0 Ft Length	$ 5,215
Roll-Off Receivers				
NROR-30-18	30.0	Cubic Yd	18.0 Ft Length	$ 6,415
NROR-40-20	40.0	Cubic Yd	20.0 Ft Length	$ 6,830
NROR-42-22	42.0	Cubic Yd	22.0 Ft Length	$ 7,170

Roll-Off Option	Above Roll-Offs Cable Pull Only, For Cable Pull and Small Hook	$ 310
	Above Roll-Offs Cable Pull Only, For Cable Pull and Large Hook	$ 375

*** All above pricing is F.O.B Ridgeland, WI**
*** Prices Subject to Change without Notice**

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Rear load Containers

Nedland Rear load waste containers are manufactured in sizes from 1 cubic yard to 10 cubic yards and are backed by Nedland's more than 60 years of service, design and manufacturing experience.

Nedland Rear load containers are built from prime high quality steel plate and structural steel channel with heavy duty swing frames on all large models. These containers are built to provide durability, reliability with many years of maintenance-free service.

- **Rear-load containers manufactured in sizes from 1 cubic yard to 10 cubic yards**
- **Prime high quality steel plate**
- **Structural steel channel**

Model	Cubic Yards	Depth	Width	Overall Height	Truckload Qty.(48') step deck
N-100RL	1	26"	78"	45"	28
N-150RL	1.5	37"	78"	45"	49
N-200RL	2	38"	78"	48"	49
N-300RL	3	80"	78"	48"	16
N-400RL	4	90"	78"	48"	24
N-600RL	6	126"	78"	48"	19
N-800RL	8	150"	78"	48"	19
N-1000RL	10	174"	78"	48"	6

CONSTRUCTION FEATURES

Nedland rear containers are designed for use on most rear load packers. Each unit is constructed of 14-gauge steel plate with 1 ¼" or larger solid trunnion 78" long. All units have 10-gauge front bumper channels and 10-gauge floors. All containers with casters come standard with 6" x 2" polyolefin casters with caster pads mounted on 10-gauge caster channels. Nedland larger rear load containers N-300RL to N-1000RL are designed for rear load packer bodies with hoist operation. The container is constructed of 12-gauge steel with 3" and 4" structural steel channel for added strength. All units have 10-gauge bumper channels, 10-gauge steel floors and heavy duty overhead hoist hook-ups and reinforced swing frames. Models N-300RL, N-400RL and N-600 RL have optional 6" x 2" casters options.

QUALITY PRODUCTS SINCE 1945

Roll Offs · Compactors · Front and Rear Loads · Poly Dura Kans

Nedland Industries, Inc.

Steel Rear Load, Front Load, Roll-Off Containers Limited Warranty

Nedland Ind warrants its containers to be free of defects in materials and workmanship for a period of two year from date of shipment from the factory. This warranty only covers the normal use the containers were designed for.

Nedland Ind will replace all parts free of charge that are found to be defective by the factory or a company representative of Nedland Ind. Nedland Ind or a company representative must authorize any repairs before they are performed.

Nedland Ind only extends the warranty that it receives on any products that it buys from an outside vendor. No freight, travel cost, lodging, or meals are covered under this warranty, all labor cost shall be in accordance with Nedland Ind flat rate. All products must be returned to Nedland Ind freight prepaid to be covered under this warranty.

This limited warranty is expressly in lieu of other warranties expressed or implied and of all other obligations or liabilities on the part of Nedland Ind and it neither assures nor authorizes any other person to assure for any other liability in connection with the sale herein contemplated

Nedland Ind does not assume any liability for loss of product, time or any other consequential damages.

All claims must be processed through Nedland Ind or an authorized Nedland Ind representative

This warranty supersedes all warranties prior to 7/15/09

Nedland Industries Inc.
417 Railroad Street
Ridgeland, WI 54763

Mailing address:
P.O.Box 217
Ridgeland, Wisconsin 54763

Delivery address:
315 Railroad Street
Ridgeland, Wisconsin 54763

E-mail: polykan@chibardun.net web: www.nedland.com or www.ezrolloff.com
(715) 949-1982 (800) 447-4925 Fax (715) 949-1983

11900 East Locke Road, Lockeford, CA, 95237
PHONE: 877-333-4414 FAX: 209-333-4422
Quote Number: WQ-0027194

QUOTATION

Sell To:		Ship To:	
Customer Contact	Tristan Bellingham	Ship To Name	
Customer Name	Pattle Delamore Partners	Shipping Address	Majuro, Marshall Islands
Billing Address	235 Broadway Auckland, NZ 2025	Customer Job Reference	
Email	tristan.bellingham@pdp.co.nz		
Phone	(649) 523-6939		

Salesperson	Val Bochenek	Created Date	07/07/2014
Email	vbochenek@wastequip.com	Expiration Date	08/12/2014
Phone	(800) 843-3358	Quote Number	WQ-0027194

Customer Service Contact	Tiana Guzman
Email	tguzman@wastequip.com
Phone	(877) 333-4414

Product	Product Description	Details	Options	QTY	Unit Price	Extended Price
SPECIAL REAR LOAD CONTAINER	Special Rear Load - CA (See Details for Product Information)	2yd Rear Load Container 14Ga Nestable, OR Spec Singlewall Doublelip Plastic Lids Casters/Quick Release Pads Standard Prime & Paint (Deduct $20 per container for no casters and skids supplied instead)		100	$582.00	$58,200.00

Subtotal	$58,200.00
Freight (F.O.B)	$37,350.00
Tax	$0.00
Total	$95,550.00

Special Instructions and Information

Additional Information
Special Instructions

11900 East Locke Road, Lockeford, CA, 95237
PHONE: 877-333-4414 FAX: 209-333-4422
Quote Number: WQ-0027194

Shipping Details

Est. Ship Date		Shipping Terms	FOB Destination
			20 RELs fit in 20ft shipping container. 5 containers to ship 100 RELs.
Shipping Instructions		Shipping Terms Details	Ship 2 truckloads to San Jose Port.
			5 Containers to be delivered to Majuro Port, customer to arrange shipping from port.
Installation Instructions			

Additional Information

Payment Terms: Net 30 Days

Additional Terms:

Our quote is a good faith estimate, based on our understanding of your needs. Your order is an offer to purchase our products and services, subject to our acceptance, and in accordance with the Wastequip Terms and Conditions. The Wastequip Terms and Conditions, which are available on our website and incorporated by reference herein, constitute the entire agreement regarding the purchase of our products and services, including our limited warranties.

Our pricing is based on your anticipated order, including product specifications, quantities and timing - any differences to your order may result in different pricing. Due to volatility in petrochemical, steel and related product material markets, actual prices, as well as freight, are subject to change and will be confirmed prior to acceptance of an order. Unless otherwise stated, materials and container sizes indicated on sales literature, invoices, price lists, quotations and delivery tickets are nominal sizes and representations – actual volume, products and materials are subject to manufacturing and commercial variations and Wastequip's practices, and may vary from nominal sizes and materials. All prices are in US dollars; this quotation may not include all applicable taxes, brokerage fees or duties.

Signatures

Salesperson: _____

CC:

Accepted By: _____

Company Name: _____

Date: _____

Purchase Order: _____

Please Reference Quote Number on all Purchase Orders

Appendix E

Time and Motion Study Information

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

TIME AND MOTION SUMMARY

Summary Japan Data

Date	Truck	Trip	Times							Number of Stops	Ave Time per Stop (min)	Ave Loading Time per Container (min)	Distance* (km)	No of Bins				Volume		Tonnage
			Leave Landfill	Start Collecting	End Collecting	Arrive Landfill*	Finish Dumping*	Total Collection Time (min)	Total Trip Time (min)					Large Bin	Drum Bucket	Plastic Bag	Cardboard Box	Uncompacted (0.13t/m3)	Compacted (0.45t/m3)	
5/02/2014	International	1	8:35:00	09:00:00	10:45:00	11:15:00	11:25:00	105	170	44	2.4	0.7	20	122	15	7	10	33.3	9.6	4.3
		2	13:03:00	13:24:00	14:34:00	15:00:00	15:10:00	70	127	27	2.6	0.5	20	86	28	9	7	26.1	7.6	3.4
17/02/2014	Freighliner	1	08:55:00	09:00:00	11:32:00	12:00:00	12:10:00	152	195	61	2.5	0.6	15	149	42	41	19	44.9	13.0	5.8
		2	13:10:00	13:25:00	15:51:00	16:10:00	16:20:00	146	190	65	2.2	0.6	12	149	55	35	5	46.1	13.3	6.0
20/02/2014	Freighliner	1	08:23:00	08:37:00	12:30:00	12:50:00	13:00:00	233	277	75	3.1	0.7	22	226	42	60	14	64.1	18.5	8.3
21/02/2014	Freighliner	1	08:25:00	08:38:00	11:02:00	11:20:00	11:30:00	144	185	58	2.5	0.7	24	123	29	36	15	36.2	10.5	4.7
24/02/2014	International	1	09:00:00	09:03:00	11:22:00	11:40:00	11:50:00	139	170	81	1.7	0.6	10	146	33	30	6	42.1	12.1	5.5
		2	13:27:00	13:37:00	14:51:00	15:00:00	15:10:00	74	103	39	1.9	0.6	26	58	46	9	7	21.8	6.3	2.8
25/02/2014	International	1	08:24:00	08:41:00	11:23:00	11:50:00	12:00:00	162	216	66	2.5	0.7	20	183	26	21	3	50.0	14.4	6.5
		2	13:11:00	13:32:00	14:20:00	14:50:00	15:00:00	48	109	23	2.1	0.7	20	40	15	7	9	12.8	3.7	1.7
26/02/2014	Freighliner	1	09:12:00	09:36:00	11:39:00	12:10:00	12:20:00	123	188	31	4.0	0.6	22	155	41	15	4	45.3	13.1	5.9
		2	13:39:00	14:03:00	15:42:00	16:10:00	16:20:00	99	161	36	2.8	1.0	22	82	11	10	1	22.3	6.4	2.9
27/02/2014	International	1	10:19:00	10:37:00	13:54:00	14:20:00	14:30:00	197	251	56	3.5	0.7	10	170	34	51	11	48.7	14.1	6.3
28/02/2014	International	1	08:40:00	08:49:00	11:09:00	11:30:00	11:40:00	140	180	50	2.8	0.5	20	167	60	16	19	51.9	15.0	6.7
							Average	**131**	**180**	**51**	**2.6**	**0.66**	**19**	**133**	**34**	**25**	**9**	**39**	**11**	**5.1**

Summary of PDP Data

Date	Truck	Trip	Times							Number of Stops	Ave Time per Stop (min)	Ave Loading Time per Container (min)	Distance (km)	No of Bins				Volume		Tonnage
			Leave Landfill	Start Collecting	End Collecting	Arrive Landfill	Finish Dumping	Total Collection Time (min)	Total Trip Time (min)					Wheelie Bin	Large Plastic Container or Bag	Small Plastic Container or Bag	Dumpster	Uncompacted (0.13t/m3)	Compacted (0.45t/m3)	
30/06/2014	Freighliner	A	8:16:00	08:27:00	11:40:00	11:42:00	11:47:00	193	211	85	2.3	0.6	10	213	87	44	0	66.7	19.3	8.7
3/07/2014	Mack	B	08:45:00	09:07:00	10:15:00	10:24:00	10:32:00	85	107	6	14.2	9.4	18	0	0	0	9	13.5	3.9	1.8

Assumptions

Wheelie Bin (95gal)	0.27	m3 volume of waste (ie ~3/4 full)
Large Plastic Container or Bag	0.15	m3 volume of waste (ie ~3/4 full)
Small Plastic Container or Bag	0.02	m3 volume of waste (ie full)
Dumpster	1.50	m3 volume of waste (ie full)
* Arrive Landfill, Finish Dumping and Distance for Japan Data assumed based on travel time at the start of the collection run and general observations by PDP in June/July 2014		

Collection Capacity

Garbage Truck	Size (m3)	Size (tonnes)	Trips /day	Total (t at 90% capacity)
Rear Loader 1 (Freightliner)	24	10.8	2	19
Rear Loader 2 (Peterbilt)	20	9	2	16
Rear Loader 3 (International)	20	9	2	16
Front Loader (Mack)	30	13.5	2	24
Total MAWC household collection (existing Rita-Airport) is 14.1t/day assuming weekday collection only. Hence a single large rear loader has sufficient capacity to service the current collection area (Rita to Airport) with 2 collection trips and 90% utilisation.				
Total MAWC household collection (proposed Rita-Laura) is 18.8t/day assuming weekday collection only. Hence only the larger rear loader (Freightliner) has sufficient capacity to service the entire atoll (Rita to Airport) with 2 collection trips and 90% utilisation (unless waste generation from the Airport to Laura is significantly different from Rita to the Airport).				

Summary Comments

Rear Loader Household Collection
The morning collection trip usually starts at around 08:30 and takes between 3 and 4 hours.
Afternoon trip starts between 13:00 and 14:00 and takes less than 2 hours.
Average collection time from first to last stop is just over 2 hours per trip
Average distance per trip is approximately 20km
Average number of collection stops per trip is approximately 50 but relatively wide range (23-85)
Average time per collection stop is approximately 2 min and 30 sec
Average loading time per container is approximately 30 to 40 seconds
Average number of large bins (wheelie bins) per collection trip is approximately 130
Front Loader Commercial Collection
Limited data but there is clearly considerable excess capactiy with the single large front loader truck
There is very high operational risk with only one front loader truck capable of emptying dumpsters
The front loader collection trip was completed within 90 minutes and the truck was estimated to be less than 20% full
The front loader stopped for 20 minutes at one location waiting for the long bed truck (Kia) to bring two dumpsters for emptying
Loading times were short where access to the dumpsters was straightforward
Loading times were longer where dumpsters had to be moved manually into position for the front loader to lift

Appendix F

Prepaid Garbage Bag Costed Design

PREPAID BAG COSTED DESIGN (LOW)

Waste Generation Data			
Number of HH	4013	Based on 2011 Census	
HH Waste Generation Rate	0.5	kg/person/day based on JICA waste generation 2013	
Average HH Size	6.7	people/HH based on 2011 Census	
Average HH Waste Generation Rate	3.0	kg/HH/day	
Organic Waste	1.5	kg/HH/day based on JICA waste composition 2013	
Recyclable Waste	0.5	kg/HH/day based on JICA waste composition 2013	
Other (Landfill) Waste	1.0	kg/HH/day	
Average HH Landfill Waste	7	kg/HH/week	
Waste generation	1	prepaid bag/HH/week assuming diversion of organic waste and recyclables	
Approximate Numbers of Prepaid Bags	4000	prepaid bags/week	Actual numbers likely to be higher with lower waste diversion rate and
	200000	prepaid bags/year	some smaller establishments using prepaid bags

Collection Cost per Bag				
Payroll	Driver	$	7,280.00	1 driver, $3.50/hr, 40hrs/wk, 52wks/yr
	Collection Workers	$	15,600.00	3 workers, $2.50/hr, 40hrs/wk, 52wks/yr
	Management	$	6,750.00	0.15FTE, $45,000/yr
	Administration	$	3,000.00	0.15FTE, $20,000/yr
Depreciation	Office Equipment	$	489.10	Assume 0.1 of2013 MAWC expense (one truck 3 days per week)
	Trucks	$	15,000.00	Assume $150,000 truck at 10% straightline
Fuel and Oil	Diesel	$	5,376.50	Assume 0.1 of 2013 MAWC expense
	Lubricants	$	1,895.90	Assume 0.1 of 2013 MAWC expense
Repairs and Maintenance	Office Equipment	$	3,617.90	Assume 0.1 of 2013 MAWC expense
Miscellaneous		$	7,305.10	Assume 0.1 of 2013 MAWC expense
	Total	$	66,314.50	Collection cost per year
		$	0.33	Cost per bag for collection
		$	47.37	Collection cost per tonne

Supply Cost per Bag				
Prepaid Bags	CIF	$	27,000.00	Based on 200,000 prepaid bags (1 year supply at 1/household/week)
	Import Duty	$	3,240.00	Standard rate (12% of CIF) assumed for costing purposes.
	Distribution	$	10,000.00	Margin for importer/distributor ($0.05/bag)
	Retail	$	10,000.00	Margin for retailer ($0.05/bag)
	Total	$	50,240.00	Supply and distribution
		$	0.25	Cost per bag for supply and distribution

TOTAL	$	116,554.50	Excludes public awarenes and landfill disposal
	$	0.58	per bag based on 200,000 (approximately 1 per household per week)

Other Costs Not Included in Costed Design			
Public Awareness	$	50,000.00	Ongoing for radio and Marshall Islands Journal adverts. Consultation meetings.
Subsidy for Phased Implementation of Prepaid Bag System	$	9,000.00	1 month supply of free bags (2/HH/wk), then $0.30/bag; Utilise existing subsidised HH waste collection system.
Collection of Organics and Recyclables	$	150,000.00	Higher costs than the prepaid bag system unless frequency reduced.

Possible Schedule A		
Day	Area	Number of HH
Monday	Airport to Laura	753
Tuesday	Airport to Bridge	868
Wednesday	Rita to Jenrok	919
Thursday	Uliga to Delap	345
Friday	Delap to Bridge	897

Possible Schedule B		
Day	Area	Number of HH
Monday	Jable to Laura	1390
Tuesday	Batkan to Small Island	1329
Wednesday	Uliga to Rita	1294
Other days for recyclables and/or organics		

Collection Capacity	
1 large truck should be able to collect >1200 bags per trip	
8.4	t per trip based on 7kg per bag
19	m3/trip based on 0.45t/m3 compacted density
6.7	bags per minute for 3 hour collection run
2.2	bags per minute per collection worker

Fuel Check (3mile/gal)		
1075	gal/yr at $5/gal	
3226	miles/yr at 3mi/gal	
62	miles/wk	
12	miles/day at 5days/wk	Based on 1 truck with 2
20	km/day	collection trips per day

Prepaid Bag Cost		
$ 0.14		NZ$ per bag ex Hi-Tech Packaging (Excluding GST)
$ 0.12		US$ per bag at US$0.85/NZ$1.00
$ 3,000.00		Allowance for shipping base on US$0.015 per bag

* Miscellaneous costs (based on MAWC 2013 accounts) includes utilities, communications, taxes and licences, office supplies, insurance, auditing, travel, advertising, equipment rental, and other miscellaneous costs (refer to MAWC 2013 audited accounts in Appendix B).

PREPAID BAG COSTED DESIGN (MID)

Waste Generation Data			
Number of Households (HH)	4013	Based on 2011 Census	
HH Waste Generation Rate	0.5	kg/person/day based on JICA waste generation 2013	
Average HH Size	6.7	people/HH based on 2011 Census	
Average HH Waste Generation Rate	3.0	kg/HH/day	
Organic Waste	1.5	kg/HH/day based on JICA waste composition 2013	
Recyclable Waste	0.5	kg/HH/day based on JICA waste composition 2013	
Other (Landfill) Waste	1.0	kg/HH/day	
Average HH Landfill Waste	7	kg/HH/week	
Waste generation	1	prepaid bag/HH/week assuming diversion of organic waste and recyclables	
Approximate Numbers of Prepaid Bags	4000	prepaid bags/week	Actual numbers likely to be higher with lower waste diversion rate and some
	200000	prepaid bags/year	smaller establishments using prepaid bags

Collection Cost per Bag				
Payroll	Driver	$ 7,280.00	1 driver, $3.50/hr, 40hrs/wk, 52wks/yr	
	Collection Workers	$ 15,600.00	3 workers, $2.50/hr, 40hrs/wk, 52wks/yr	
	Management	$ 9,000.00	0.2FTE, $45,000/yr	
	Administration	$ 4,000.00	0.2FTE, $20,000/yr	
Depreciation	Office Equipment	$ 807.02	Assume 0.165 of2013 MAWC expense (0.5x0.33=0.165)	
	Trucks	$ 20,000.00	Assume $200,000 truck at 10% straightline	
Fuel and Oil	Diesel	$ 8,871.23	Assume 0.165 of 2013 MAWC expense	
	Lubricants	$ 3,128.24	Assume 0.165 of 2013 MAWC expense	
Repairs and Maintenance		$ 5,969.54	Assume 0.165 of 2013 MAWC expense	
Miscellaneous		$ 12,053.42	Assume 0.165 of 2013 MAWC expense	
	Total	$ 86,709.43	Collection cost per year	
		$ 0.43	Cost per bag for collection	
		$ 61.94	Collection cost per tonne	

Supply Cost per Bag			
Prepaid Bags	CIF	$ 27,000.00	Based on 200,000 prepaid bags (1 year supply at 1/household/week)
	Import Duty	$ 3,240.00	Standard rate (12% of CIF) assumed for costing purposes.
	Distribution	$ 10,000.00	Margin for importer/distributor ($0.05/bag)
	Retail	$ 10,000.00	Margin for retailer ($0.05/bag)
	Total	$ 50,240.00	Supply and distribution
		$ 0.25	Cost per bag for supply and distribution

TOTAL	$ 136,949.43	Excludes public awarenes and landfill disposal
	$ 0.68	per bag based on 200,000 (approximately 1 per household per week)

Possible Schedule A		
Day	Area	Number of HH
Monday	Airport to Laura	753
Tuesday	Airport to Bridge	868
Wednesday	Rita to Jenrok	919
Thursday	Uliga to Delap	345
Friday	Delap to Bridge	897

Possible Schedule B		
Day	Area	Number of HH
Monday	Jable to Laura	1390
Tuesday	Batkan to Small Island	1329
Wednesday	Uliga to Rita	1294
Other days for recyclables and/or organics		

Collection Capacity	
1 large truck should be able to collect >1200 bags per trip	
8.4	t per trip based on 7kg per bag
19	m3/trip based on 0.45t/m3 compacted density
6.7	bags per minute for 3 hour collection run
2.2	bags per minute per collection worker

Fuel Check (3mile/gal)		
1774	gal/yr at $5/gal	
5323	miles/yr at 3mi/gal	
102	miles/wk	
20	miles/day at 5days/wk	Based on 1 truck with 2 collection trips per day
33	km/day	

Prepaid Bag Cost		
$ 0.14	NZ$ per bag ex Hi-Tech Packaging (Excluding GST)	
$ 0.12	US$ per bag at US$0.85/NZ$1.00	
$ 3,000.00	Allowance for shipping base on US$0.015 per bag	

* Miscellaneous costs (based on MAWC 2013 accounts) includes utilities, communications, taxes and licences, office supplies, insurance, auditing, travel, advertising, equipment rental, and other miscellaneous costs (refer to MAWC 2013 audited accounts in Appendix B).

Other Costs Not Included in Costed Design		
Public Awareness	$ 50,000.00	Ongoing for radio and Marshall Islands Journal adverts. Consultation meetings.
Subsidy for Phased Implementation of Prepaid Bag System	$ 9,000.00	1 month supply of free bags (2/HH/wk), then $0.30/bag; Utilise existing subsidised HH waste collection system.
Collection of Organics and Recyclables	$ 150,000.00	Higher costs than the prepaid bag system unless frequency reduced.

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

PREPAID BAG COSTED DESIGN (HIGH)

Waste Generation Data			
Number of HH	4013	Based on 2011 Census	
HH Waste Generation Rate	0.5	kg/person/day based on JICA waste generation 2013	
Average HH Size	6.7	people/HH based on 2011 Census	
Average HH Waste Generation Rate	3.0	kg/HH/day	
Organic Waste	1.5	kg/HH/day based on JICA waste composition 2013	
Recyclable Waste	0.5	kg/HH/day based on JICA waste composition 2013	
Other (Landfill) Waste	1.0	kg/HH/day based on JICA waste composition 2013	
Average HH Landfill Waste	7	kg/HH/week	
Waste generation	1	prepaid bag/HH/week assuming diversion of organic waste and recyclables	
Approximate Numbers of Prepaid Bags	4000	prepaid bags/week	Actual numbers likely to be higher with lower waste diversion rate and
	200000	prepaid bags/year	some smaller establishments using prepaid bags

Collection Cost				
Payroll	Driver	$	7,280.00	1 driver, $3.50/hr, 40hrs/wk, 52wks/yr
	Collection Workers	$	15,600.00	3 workers, $2.50/hr, 40hrs/wk, 52wks/yr
	Management	$	11,250.00	0.25FTE, $45,000/yr
	Administration	$	5,000.00	0.25FTE, $20,000/yr
Depreciation	Office Equipment	$	1,222.75	Assume 0.25 of2013 MAWC expense (1 truck 5 days/wk)
	Trucks	$	20,000.00	Assume one $200,000 truck at 10% straightline
Fuel and Oil	Diesel	$	13,441.25	Assume 0.25 of2013 MAWC expense (1 truck 5 days/wk)
	Lubricants	$	4,739.75	Assume 0.25 of2013 MAWC expense (1 truck 5 days/wk)
Repairs and Maintenance		$	9,044.75	Assume 0.25 of2013 MAWC expense (1 truck 5 days/wk)
Miscellaneous *		$	18,262.75	Assume 0.25 of2013 MAWC expense (1 truck 5 days/wk)
	Total	$	105,841.25	Collection cost per year
		$	0.53	Cost per bag for collection
		$	75.60	Collection cost per tonne

Supply Cost				
Prepaid Bags	CIF	$	27,000.00	Based on 200,000 prepaid bags (1 year supply at 1/household/week)
	Import Duty	$	3,240.00	Standard rate (12% of CIF) assumed for costing purposes.
	Distribution	$	10,000.00	Margin for importer/distributor ($0.05/bag)
	Retail	$	10,000.00	Margin for retailer ($0.05/bag)
	Total	$	50,240.00	Supply and distribution
		$	0.25	Cost per bag for supply and distribution

TOTAL	$	156,081.25	Excludes public awarenes and landfill disposal
	$	0.78	per bag based on 200,000 (approximately 1 per household per week)

Possible Schedule A		
Day	Area	Number of HH
Monday	Airport to Laura	753
Tuesday	Airport to Bridge	868
Wednesday	Rita to Jenrok	919
Thursday	Uliga to Delap	345
Friday	Delap to Bridge	897

Possible Schedule B		
Day	Area	Number of HH
Monday	Jable to Laura	1390
Tuesday	Batkan to Small Island	1329
Wednesday	Uliga to Rita	1294
Other days for recyclables and/or organics		

Collection Capacity	
1 large truck should be able to collect >1200 bags per trip	
8.4	t per trip based on 7kg per bag
19	m3/trip based on 0.45t/m3 compacted density
6.7	bags per minute for 3 hour collection run
2.2	bags per minute per collection worker

Fuel Check (3mile/gal)		
2688	gal/yr at $5/gal	
8065	miles/yr at 3mi/gal	
155	miles/wk	
31	miles/day at 5days/wk	Based on 1 truck with 2
50	km/day	collection trips per day

Prepaid Bag Cost		
$ 0.14		NZ$ per bag ex Hi-Tech Packaging (Excluding GST)
$ 0.12		US$ per bag at US$0.85/NZ$1.00
$ 3,000.00		Allowance for shipping based on US$0.015 per bag

* Miscellaneous costs (based on MAWC 2013 accounts) includes utilities, communications, taxes and licences, office supplies, insurance, auditing, travel, advertising, equipment rental, and other miscellaneous costs (refer to MAWC 2013 audited accounts in Appendix B).

Other Costs Not Included in Costed Design			
Public Awareness	$	50,000.00	Ongoing for radio and Marshall Islands Journal adverts. Consultation meetings.
Subsidy for Phased Implementation of Prepaid Bag System	$	9,000.00	1 month supply of free bags (2/HH/wk), then $0.30/bag; Utilise existing subsidised HH waste collection system.
Collection of Organics and Recyclables	$	150,000.00	Higher costs than the prepaid bag system unless frequency reduced.

PREPAID BAG COSTED DESIGN (MID-2 BAGS PER HOUSEHOLD PER WEEK)

Waste Generation Data			
Number of Households (HH)	4013	Based on 2011 Census	
HH Waste Generation Rate	0.5	kg/person/day based on JICA waste generation 2013	
Average HH Size	6.7	people/HH based on 2011 Census	
Average HH Waste Generation Rate	3.0	kg/HH/day	
Organic Waste	0.5	kg/HH/day based on JICA waste composition 2013	
Recyclable Waste	0.5	kg/HH/day based on JICA waste composition 2013	
Other (Landfill) Waste	2.1	kg/HH/day	
Average HH Landfill Waste	15	kg/HH/week	
Waste generation	2	prepaid bag/HH/week assuming diversion of organic waste and recyclables	
Approximate Numbers of Prepaid Bags	8000	prepaid bags/week	Actual numbers likely to be higher with lower waste diversion rate and some smaller establishments using prepaid bags
	400000	prepaid bags/year	

Collection Cost per Bag				
Payroll	Driver	$ 7,280.00	1 driver, $3.50/hr, 40hrs/wk, 52wks/yr
	Collection Workers	$ 15,600.00	3 workers, $2.50/hr, 40hrs/wk, 52wks/yr
	Management	$ 9,000.00	0.2FTE, $45,000/yr
	Administration	$ 4,000.00	0.2FTE, $20,000/yr
Depreciation	Office Equipment	$ 1,222.75	Assume 0.25 of 2013 MAWC expense (0.165x1.5)
	Trucks	$ 20,000.00	Assume $200,000 truck at 10% straightline
Fuel and Oil	Diesel	$ 13,441.25	Assume 0.25 of 2013 MAWC expense
	Lubricants	$ 4,739.75	Assume 0.25 of 2013 MAWC expense
Repairs and Maintenance		$ 9,044.75	Assume 0.25 of 2013 MAWC expense
Miscellaneous		$ 18,262.75	Assume 0.25 of 2013 MAWC expense
	Total	$ 102,591.25	Collection cost per year
		$ 0.26	Cost per bag for collection
		$ 36.64	Collection cost per tonne

Supply Cost per Bag			
Prepaid Bags	CIF	$ 54,000.00	Based on 400,000 prepaid bags (1 year supply at 2/household/week)
	Import Duty	$ 6,480.00	Standard rate (12% of CIF) assumed for costing purposes.
	Distribution	$ 20,000.00	Margin for importer/distributor ($0.05/bag)
	Retail	$ 20,000.00	Margin for retailer ($0.05/bag)
	Total	$ 100,480.00	Supply and distribution
		$ 0.25	Cost per bag for supply and distribution

TOTAL	$	203,071.25	Excludes public awarenes and landfill disposal
	$	0.51	per bag based on 400,000 (approximately 2 per household per week)

Possible Schedule A		
Day	Area	Number of HH
Monday	Airport to Laura	753
Tuesday	Airport to Bridge	868
Wednesday	Rita to Jenrok	919
Thursday	Uliga to Delap	345
Friday	Delap to Bridge	897

Possible Schedule B		
Day	Area	Number of HH
Monday	Jable to Laura	1390
Tuesday	Batkan to Small Island	1329
Wednesday	Uliga to Rita	1294
Other days for recyclables and/or organics		

Collection Capacity	
1 large truck should be able to collect >1200 bags per trip	
8.4	t per trip based on 7kg per bag
19	m3/trip based on 0.45t/m3 compacted density
6.7	bags per minute for 3 hour collection run
2.2	bags per minute per collection worker

Fuel Check (3mile/gal)		
2688	gal/yr at $5/gal	
8065	miles/yr at 3mi/gal	
155	miles/wk	
31	miles/day at 5days/wk	Based on 1 truck with 2 collection trips per day
50	km/day	

Prepaid Bag Cost		
$ 0.14	NZ$ per bag ex Hi-Tech Packaging (Excluding GST)	
$ 0.12	US$ per bag at US$0.85/NZ$1.00	
$ 3,000.00	Allowance for shipping base on US$0.015 per bag	

* Miscellaneous costs (based on MAWC 2013 accounts) includes utilities, communications, taxes and licences, office supplies, insurance, auditing, travel, advertising, equipment rental, and other miscellaneous costs (refer to MAWC 2013 audited accounts in Appendix B).

Other Costs Not Included in Costed Design		
Public Awareness	$ 50,000.00	Ongoing for radio and Marshall Islands Journal adverts. Consultation meetings.
Subsidy for Phased Implementation of Prepaid Bag System	$ 9,000.00	1 month supply of free bags (2/HH/wk), then $0.30/bag; Utilise existing subsidised HH waste collection system.
Collection of Organics and Recyclables	$ 150,000.00	Higher costs than the prepaid bag system unless frequency reduced.

ELLDEX
PACKAGING GROUP

CUSTOMER QUOTATION FOR: Refuse bags **DATE:** 28 July 2014

CUSTOMER CONTACT: Tristan Bellingham

CUSTOMER FAX/EMAIL: tristan.bellingham@pdp.co.nz

ELLDEX CONTACT: Cathy Lundie

EMAIL ADDRESS: cathy.lundie@elldex.com

PHONE NUMBER: 027 509 4268

Product Description	Product Code	Elldex MoQ	Film Type	Print No. of Cols	Width mm	Side Gusset mm	Length mm	Mu Micron	Price Per/UoM
60L Prepaid rubbish bags-Handle Sack bag • **MDPE** • **Color: Yellow** • **30Mu@390mm Width + 240mm Side Gusset x 900mm Length** • **1side 1 color-black @15% ink coverage** • **25pcs per headerblock insert one plain polybag, 500pcs per carton.**		**100,000**	MDPE	One - Black	390	240	900	30	$ 149.87
Plates - one off charge									$ 420.00

TERMS AND CONDITIONS OF QUOTATION

1. This Quotation has been prepared in the currency of: NZD
2. This price list does NOT include GST.
3. These Prices will still be subject to any further need to recover costs outside our direct control.
4. This price list does NOT include artwork, film or plates.
5. Our standard manufacturing lead-time is 4-6 weeks from receipt of the order and or final printing plates, unless agreed otherwise.
6. Our standard import lead-time is 12-16 weeks from receipt of the order and or final printing plates, unless agreed otherwise.
7. All import quotes will be subject to a confirmed price at the time of order confirmation and the currency exchange rate at that time.
8. Payment is due on the 20th of the month following invoice date.
9. All custom manufactured jobs may vary to quantity ordered (due to machine setups) as follows:
   - 8.1. Orders up to and including 10,000 units - plus or minus 20%.
   - 8.2. Orders over 10,000 units - plus or minus 10%.
   - 8.3. Any variance will be added to or deducted from quantity ordered.
10. Our standard Terms of Trade as per our account application details apply to all purchases.
11. Freight will be charged on all orders under $500 in total value, unless agreed otherwise.
12. Ownership of all delivered goods will not pass to the customer until full payment has been received.
13. This quotation is valid for 7 working days from the date shown at the top of this document.
14. Any stock held by Elldex will be subject to a Stock Holding / Warehousing Agreement where the customer is required to take all finished stock within a maximum period of 6 months. *(Separate Agreement to be established on acceptance of this quotation).*
15. E&OE

QUOTE ACCEPTED

Name: _____

Signed: _____

Date: _____

Order number: _____

Deliver to: _____

_____

_____

PLEASE PHONE US IF YOU HAVE ANY QUESTIONS ABOUT THIS QUOTE OR PLEASE PRINT, SIGN AND FAX THIS QUOTE TO ELLDEX ON +64 9 475 6727

3 Winston Place, Henderson,
Auckland, New Zealand
PO Box 84 045 Westgate, Auckland
Ph. 09 836 5740 Fax. 09 836 7326

Quote No: 1407238

25th July 2014

Pattle Delamore Partners Ltd

Dear Tristan

We have pleasure in submitting the following quotation for your consideration.

Product Code	TBA
Description	Pink (Opaque) Rubbish Bags
Size	400w x 200sg x 900L
Material	30um HDPE
Quantity	**100,000**
Price per 1,000	**$142.00**
Printed/Plain	Printed 1 Colour
Packing	500 per carton
Artwork & Origination	Art to be supplied to our specifications
Gravure Plates	Plate Costs Included
Draw Down Period	One Drop Ship to Auckland location
Freight Terms	FIS to one Auckland location for palletized orders
Delivery Date	Approx. 12 weeks after receipt of order and artwork sign off
Payment Terms	20th following invoice
Quote Expires	14 days from the date of this quote.

Quantities may vary by +/- 10%

We trust you find the enclosed to your requirements, please let me know if I can be of further assistance

Yours sincerely

Lacie Hutchinson
Account Manager

TERMS & CONDITIONS OF QUOTATION:

1. Quotation pricing does NOT include GST
2. Payment is due in full on 20th of the following month following invoice
3. Due to manufacturing process quantity supplied on customised jobs may vary from quantity ordered by +/- 10%
4. Samples of finished Clients goods may be used for Hi-Tech promotions
5. Quotes are based on interpretation of information supplied to us and is given in good faith. Should an order be placed against this quotation we reserve the right to re-quote if there are significant alterations between our quote and the final job specification. All prices relating to pre-production are estimates only, based on digital art being supplied by the client, On confirmation of order, a cancellation / alteration fee may apply if setup costs have been incurred. After manufacture the customer will be liable for all costs incurred.
6. Dimensions given above are nominal and may vary slightly
7. The customer agrees to purchase all stock covered by this quote at the specified price. When product is supplied on a draw down basis the client agrees to purchase the specified quantity within 6 months of availability, unless otherwise agreed to in writing.
8. Goods remain the property of Hi-Tech Packaging Ltd until paid for in full.
9. Prices are based on current costs when quoted and are valid for 14 days. Hi-Tech Packaging Ltd reserves the right to revise prices following written notification.
10. Hi-Tech Packaging will not accept any liability whatsoever for delays in delivery due to circumstances beyond our control

CUSTOMER QUOTATION ACCEPTANCE

Please circle accepted quantity and price, then sign, and return by post or fax. Please retain a copy for your files.

QUOTE AND TERMS OF SUPPLY ACCEPTED

Name (Full Name): _____

Signed: _____

Position: _____

Date: _____







MARSHALL ISLANDS JOURNAL
RATE CARD – Effective January 1, 2012

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   INTERNATIONAL ð US$227.00

2. Emailed .pdf version (per year)
   To All Locations: US$57.00/year by PayPal OR $52.00 by cash or US dollars check

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PRINT ADVERTISING — TYPICAL SIZES AND RATES FOR PRINT-READY ADS*

(Note: all prices are in US dollars)

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Quarter Page $160.00 **Eighth Page $82.50**

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ÅCamera ready copy.
ÅTranslation $40 (maximum 400 words)
ÅAny photographs that require scanning for advertisements are $7.50 per photo.
ÅThe Marshall Islands Journal reserves the right to reject unsuitable copy.
ÅNet 30 days. For payments made by wire transfer, add US$25.00 to price of ad.
ÅAffidavit of publication $5.00.
ÅAd reservation
   Full Page ï by Friday 5 pm for next weekôs paper
   Color ï Not available
   All others ï by Monday 12 noon for same week Friday
*Layout fee: 20% of base price.
Note: for print-ready ads submitted by email, .pdf format is preferred.

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Attn: Suzanne Chutaro, Advertising Manager
www.marshallislandsjournal.com

Appendix G

Container Deposit Programme
Implementation Plan

Container Deposit Programme Implementation Plan

Prepared for

Secretariat of the Pacific Regional Environment Programme

June 2015

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Limitations:

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1.0 Introduction

A United Nations Development Programme (UNDP) report titled Ejjelok Kwopej! Turning Rubbish into Resource (Leney, 2005) presents a waste reduction plan centred around a Container Deposit Programme (CDP) for urban Marshall Islands. This updated Implementation Plan relies heavily on this earlier work, and updates the information based on the current situation.

The 2005 UNDP report concluded that implementing a CDP for the Republic of the Marshall Islands (RMI) was feasible for aluminium cans (Al cans) and polyethylene terephthalate (PET) bottles, with other recyclable materials possibly added later. This research confirms that a CDP for the RMI is feasible for Al cans, PET bottles, glass bottles and used lead acid batteries (ULABs).

The information contained in this Implementation Plan, and in the main report, can form the basis of a Cabinet Paper to be prepared as the first step in establishing a CDP for the RMI.

1.1 What is a Container Deposit Programme?

A Container Deposit Programme (CDP) is a system set up where a tax is imposed on selected types of containers on import to the RMI. The tax basically becomes a deposit which is held in a dedicated account (Special Fund). Legislation is used to regulate the process and protect the funds being collected. When a container is returned empty to the designated Materials Recovery Facility (MRF), or other collection point, the person returning the container receives a refund. The refund is typically slightly less than the deposit, with the difference being used to fund the collection and recycling operation. The MRF bales the returned containers and exports them to overseas buyers for recycling. CDPs are an example of Extended Producer Responsibility (EPR).

A general CDP diagram is included below to illustrate how such systems work. A more specific CDP diagram is included in Section 1.4.

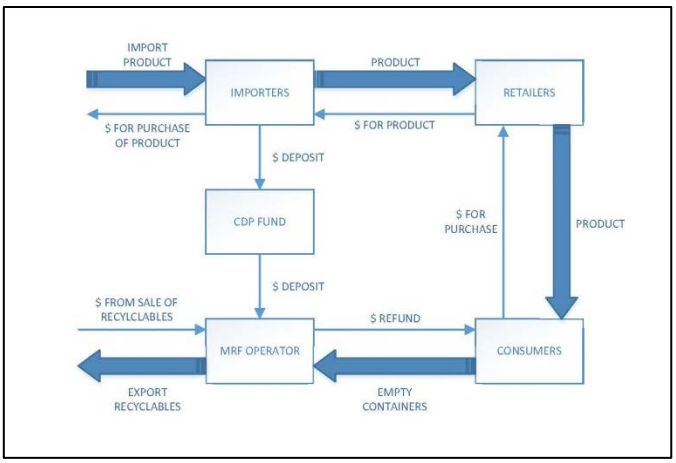


Diagram 1: General Container Deposit Programme

1.2 Benefits of a Container Deposit Programme

Solid waste management on small islands and atolls is challenging as the volume of imported goods is generally high and recycling of waste material is challenging due to the cost of shipping to recycling markets. A CDP is necessary in order to be able to recycle lower value materials such as plastics, glass, cardboard, ULABs and ferrous metals. In general, without a CDP, only Al cans and non-ferrous metals (stripped from whiteware, vehicles, air conditioning units, etc) are recycled as these are the only recyclable materials where it is economically feasible due to the higher scrap value of these materials.

The main benefits of a CDP are listed below:

- Reduces waste for collection and disposal to landfill.
- Reduces litter (where CDP items are present in litter).
- Provides funding to recycle lower value recyclables, and possibly for other environmental programmes.
- Increases economic activity, including export revenue.
- Creates employment.
- Improves the environment by reducing waste and promoting recycling (important in the wider context of promoting the RMI as a leader in environmental management).
- Keeps recyclable materials separate (ie not mixed with other wastes) and eliminates the need for sorting.
- Possible reduction in consumption of alcohol and soft drinks which are contributing factors for many social and health issues.

1.3 Examples of Existing Container Deposit Programmes

CDPs have been established in Kiribati, Kosrae and Yap, and Palau. These provide working examples of CDPs in relatively similar environments. A summary of each of these CDPs is given below. CDPs have also been established in many other parts of the world.

1.3.1 Kiribati

The CDP in Kiribati was established in 2004 when the CDP legislation was passed by the Government, with the CDP activities commencing in early 2005. Materials included in the CDP are aluminium cans, PET bottles, glass bottles and lead acid batteries. A deposit of 6c per container and a refund of 5c per container are set, with 1c per container for the recycling operator. The system is centred around Kaoki Mange, the MRF based on South Tarawa, which is run by a private company under contract to the Government.

1.3.2 Kosrae

The CDP in Kosrae, established in the mid-2000s, is similar to the one in Kiribati, with the initial funding coming from UNDP (an earlier CDP, set up in the early 1990s, collapsed in the early 2000s because of a lack of funds for administering

the system (deposit and refund both set at 5c). Deposit, refund and handling fee amounts are as for Kiribati (6c, 5c and 1c per container respectively). Large stockpiles of containers held in the community made start-up of the new CDP challenging (potential for rapid depletion of the deposit funds that had built up in the 2 years since refunds had stopped). Limits (geographical and monetary) were put in place to minimise start-up problems along with public awareness campaigns (radio broadcasts) to keep the communities informed.

The operation of the Kutkut Mwo MRF (located next to the port) was put out to tender by the Kosrae State Government (KSG) and is currently run by the Micronesia Eco Corp. The KSG imposes a deposit fee on the importation of Al cans, PET bottles, glass bottles and lead acid batteries. The deposit fee collected on these items is put aside to fund the recycling of the items. Every month, the Micronesia Eco Corp collects the recyclable materials and pays refunds back into the community ($85,000 in 2011 and $86,000 in 2012, which equates to approximately 1.7 million containers). At the MRF the Al cans and plastic are baled and exported with ULABs to Korea, China or Hong Kong. Glass is crushed and reused as a sand replacement or disposed of on island.

1.3.3 Yap

The CDP in Yap commenced in 2007 after a feasibility was completed in the early 2000s by the UNDP. The CDP is similar the one in Kiribati (deposit 6c per container, refund 5c per container, with 1c per container for the recycling operator). The containers included in the CDP are Al cans, PET bottles, PET cooking oil containers and glass beverage bottles. The recycling programme is operated by a private local company called Island Paradise Company. On returning containers to Island Paradise Company, the public are issued claim forms for reimbursement to the Office of Administrative Services (OAS). The Division of Tax and Revenue collect the deposits from importers and the Division of Finance manages the funds. The Yap EPA was the agency that promoted the implementation of a CDP in Yap. The Island Paradise Company and the OAS both report to the Yap EPA regularly on activity and account status. Some other recyclable materials (scrap metal, lead acid batteries, other aluminium, e-waste and copper) are collected by the Island Paradise Company but are not part of the CDP. Potential new container categories for inclusion in the CDP are aluminium food cans, tin cans, motor vehicles and lead acid batteries.

1.3.4 Palau

In Palau, the recycling program law passed its final readings and was approved by the President in 2006. However, for a number of reasons the recycling program regulations were not approved and signed by the President until 2009. In March 2011 a workshop was held to review the law and its contents, and the Customs Office started collecting the deposit fee in April 2011. In October 2011, after 6 months of deposit fee collections to build up funds, the redemption centre (the MRF) opened to the public and started paying refunds. The 6 month period for

collecting the container deposit fee proved to be too short and after 1 year a monthly limit on the rate of redemption was required in order to maintain the financial viability of the CDP. Accumulating sufficient deposit funds is critical in order to allow for receipt of the stockpile of existing containers in the community once the refund payments commence. In Palau a deposit of $0.10 per container is collected and a refund of $0.05 per container is given. The remaining $0.05 per container is split evenly between the MRF operator and a general recycling fund.

1.4 Proposed Container Deposit Programme for the RMI

The CDP proposed for the RMI focuses on Al cans, PET bottles, glass bottles and ULABs. Other recyclable materials can be added later as necessary but at the start it is important to focus on a few types of material to keep it simple. Al cans and PET/glass bottles are included because these items are easily identified on import by Customs and constitute a significant percentage of the waste generated on Majuro. ULABs are included mainly for environmental reasons. Without a CDP only Al can recycling is economically feasible.

The possibility of implementing a CDP similar to Palau should be discussed as there are significant advantages to this approach (larger deposit ($0.10) allows for an attractive refund ($0.05) and more money for recycling activities ($0.05)) over the CDPs implemented in the other locations (smaller deposit ($0.06), similar refund ($0.05) but only limited funds for recycling activities ($0.01)). It might however be difficult to get a CDP implemented if there is opposition to or concern over a high deposit amount, particularly with the additional tax already imposed on alcohol for use by the College of the Marshall Islands (CMI).

The deposit, refund and handling fee proposed in this report for a CDP in the RMI ($0.05, $0.03 and $0.02 respectively for Al cans and PET/glass bottles) achieves a balance between keeping the deposit to a minimum, providing a reasonable level of incentive for the public to recycle and sufficient funds to operate the MRF and export recyclables. Other options would be to follow the Palau example with deposit, refund and recycling funds set at $0.10, $0.05 and $0.05 respectively, or follow the Kiribati/Kosrae/Yap examples of a $0.06 deposit but with the refund set at $0.04 to leave more money for funding recycling activities.

Below is a diagram illustrating the proposed CDP for the RMI. Return rates should be reasonable under any of the deposit/refund/handling fee scenarios above.

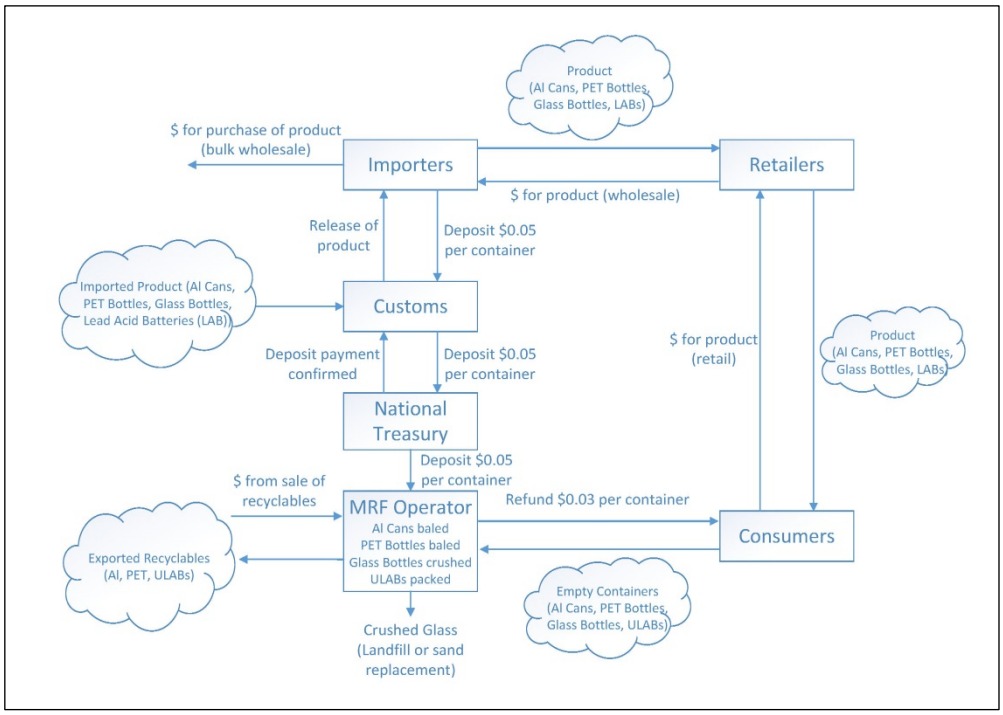


Diagram 2: Container Deposit Programme for the RMI

2.0 Container Deposit Legislation

2.1 Outline of Legislation

The CDP legislation basically sets up legal framework for establishing the deposit tax to be imposed on the import of specific types of containers and the creation of a Special Fund for managing the deposit tax funds. The CDP legislation refers to Regulations that set out the containers included in the CDP along with the deposit tax amount, refund amount and the balance amount to support operation of the MRF. The CDP legislation also specifies what the residual money in the Special Fund can be used for (ie recycling activities only).

Examples of CDP Legislation from Kosrae and Yap are included in Attachment A. A copy of the CDP legislation from Kiribati is included in the UNDP report in Attachment E.

2.2 Process for Enacting Legislation

The UNDP report (Leney, 2005) included a summary of the process to write and enact legislation in the RMI. The process is summarised below:

1. Cabinet paper prepared by OEPPC and presented to Cabinet for consideration.
2. Cabinet accepts paper and directs the OAG to draft legislation.
3. OAG prepares draft legislation and presents it to Cabinet through the Office of the President.

4. Cabinet advises OAG of any amendments and OAG prepares final draft legislation is submitted back to Cabinet.
5. Final draft legislation is included in the Government Legislative Programme for the next session of the Nitijela.
6. Nitijela conducts a first reading and may pass the legislation for review.
7. Public hearings are held.
8. A committee reviews the legislation and may recommend a second reading.
9. The legislation is presented to the Nitijela, with any amendments, for a second reading.
10. If the legislation passes, it receives assent from the President and becomes law.

The process for preparing and enacting CDP legislation should be confirmed with the relevant RMI Government agencies such as the OAG.

2.3 Regulations

Regulations developed under the CDP legislation would need to follow a similar process for enactment. The Regulations would specify the types of containers included in the CDP and the deposit/refund amounts.

The UNDP report (Leney, 2005) included a summary of the process to write and enact Regulations under the CDP legislation as follows:

- Regulations drafted and presented to Cabinet by the Office of the President.
- Cabinet forwards the Regulations to the OAG.
- The OAG completes checks for administrative procedure and constitutionality.
- The Regulations are released for public comment (30 days).
- The Regulations are accepted, published and enacted.

The process for preparing and enacting Regulations under the CDP legislation should be confirmed with the relevant RMI Government agencies such as the OAG.

2.4 Timeframes

The timeframe for preparing and enacting legislation can be lengthy with several stages to be completed as summarised in Section 2.2 above. The Nitijela sit twice a year for 50 days each time. It is envisaged that the CDP legislation could become law within one year. A timeline for preparing and enacting CDP legislation is included in the Provisional Work Plan included in Attachment A.

3.0 Container Recycling

3.1 Materials Considered for the CDP

The UNDP report (Leney, 2005) considered PET plastic and aluminium beverage containers, such as beer, soda and water containers, as the bulk material of interest. This is still the case. Glass bottles have been included with the material being considered for on-site processing and reuse. Used lead acid batteries (ULABs) are also considered under the CDP due to their scrap value and the risk to the environment if they are not recycled appropriately.

HDPE bottles, tyres, e-waste, cardboard, vehicles, air conditioners, whiteware are not proposed for inclusion at this stage but could be included later through amendment of the Regulations.

3.2 Potential Container Numbers

There are several sources of information that can be used to estimate the expected quantities of CDP materials, namely import/customs data, waste generation and composition and previous estimates (Leney, 2005). There are limitations with each approach with import data based on value ($) rather than quantity, waste generation/composition based on limited sampling and the UNDP estimates being 10 years old. The following quantities for aluminium cans, PET bottles, glass bottles and ULABs are expected to be imported per year:

Table 1: Expected Quantities for Recyclables

Type	Import Data	Waste Gen/Comp	Leney, 2005	Comments
Al cans	**6 M** (0.6)	34 M (3.4)	5 M (0.5)	MAWC and the private recycler both indicated 2-3 months for a full container load.
PET bottles	**2 M** (0.2)	13 M (1.3)	1 M (0.1)	Import data figure for water only
Glass bottles	**1 M** (0.1)	2.0 M (0.2)	-	Import data estimate is for beer bottles only (not food bottles and jars).
ULABs	1,000	-	-	Actual figure likely to be at least **2,000**.

Notes:
Number in brackets () = the number of cans/bottles per person per day, useful as a check on the estimated quantities. M = million.
Number in bold is considered to be the most realistic and is used in the costed designs.

Expected recovery rates are anticipated to be at least 80%, but will depend on a variety of factors such as the level of incentive provided by the refund amount and the ease/convenience of returning containers for recycling. Very high recovery rates (over 90%) are possible.

3.3 Markets and Rates

Advice has been sought from two leading recycling firms, CMA Recycling Ltd (a scrap metal dealer based in Auckland, New Zealand) and Visy (MRF operator with facilities in Australia and New Zealand). Both of these recycling firms have experience in the Pacific Islands and extensive contacts in the recyclable markets throughout Asia. They have provided advice on current purchase rates for the materials as well as practical advice on pre-processing the materials on island and potential issues with contamination. Current markets and rates are presented in the table below.

There is also the possibility of exporting recyclables based on a Free Alongside Ship (FAS) arrangement with a buyer. In this case the buyer is responsible for all shipping and the seller (the MRF operator on Majuro) just has to load the container and transport it to Majuro port on the arranged day. The revenue to the CDP operator would be lower under this arrangement but it may be worth considering if the primary objective of the CDP is to export recyclables from Majuro Atoll. Visy have expressed interest in a FAS arrangement for recyclable materials from Majuro and other Pacific Islands. Visy recycle all of the types of material below so the CDP operator would only have to deal with one buyer rather than multiple buyers under other arrangements[1].

Table 2: Markets for Recyclables

Item	Type	Value	Market
1	Al cans	$1,200/tonne	Korea, China
2	PET bottles	$500/tonne	Australia, Thailand, China
3	Glass bottles/jars	None	None (crush and use on Majuro)
4	uLABs	$600/tonne	Korea, Philippines
5	Ferrous metal	$75–$200/tonne	China, Indonesia
6	Non-ferrous metal	Various	China, Korea
7	Cardboard	$180/tonne	China, Indonesia

Notes: Values as advised by CMA Recycling and Visy in mid-2014. By May 2015 the value of ferrous scrap had fallen to $75/t.

The markets for recyclables and the value of scrap are subject to change based on a range of factors. The Global Financial Crisis (GFC) in 2008 resulted in a

[1] The deal with Metal Kingdom is understood to have been a FAS arrangement, although Metal Kingdom were only interested in Al cans and other high value non-ferrous metals.

significant drop in scrap prices due to a reduction in demand for metals[2]. Korea has recently been the primary market for recyclables from the Pacific (Fiji)[3] and there is high demand for recyclables (particularly scrap metal) in China. The market value of recyclables is very dependent on how clean and pure the recyclables are, with mixed scrap being of very low value[4] [5].

3.4 Shipping

A significant amount of scrap metal from the Pacific has been exported to Australia and New Zealand for processing and subsequent export on to the primary markets in Asia. This is an option for countries in the South Pacific where there are established shipping routes and freight costs are not too high. A detailed analysis of reverse logistics (shipping from the Pacific Islands) has been completed as part of the J-PRISM project[6]. This project focussed on Fiji, Samoa, Tonga, Tuvalu and Vanuatu, but provides a useful reference document for understanding and planning shipping elsewhere in the Pacific.

The RMI however has closer ties to the USA (regular shipping route from the West Coast via Hawaii) and other Island states in the north Pacific. Guam is the main shipping hub for the region and there are regular links from Guam to the main recycling ports in Korea, China and other Asian countries.

The quoted cost of shipping for a 20ft container from Majuro to Ningbo, Hong Kong and Busan ranged from $1,200 to $1,400 (ocean freight + BAF)[7]. Shipping prices in the Pacific are relatively high due to low volumes and limited competition. Additional costs for land transport to Majuro Port, terminal handling, documentation, etc. also need to be allowed for and hence a shipping cost of at least $2,000 per TEU is used in the CDP costed designs in Attachment B.

3.5 Cost of Business

There are a number of costs incurred in operating a MRF and exporting recyclable materials. These costs (operating and capital) are summarised in the costed design spreadsheets included in Attachment B. The main operating costs are listed below:

- Wages (manager, administration, supervisor, maintenance technician, workers)
- Shipping (including lifting, transport and related costs)
- Expenses (such as fuel, electricity, maintenance, office and amenities)
- Depreciation (on buildings and equipment)
- Insurance
- Land rent (if MRF not located at landfill)

[2] JICA (2013) attributed the drop in scrap price to a reduction in demand following the Beijing Olympics in 2008.
[3] Amano, 2014.
[4] Pers. Comm. Brett Howlett, General Manager, CMA Recycling Ltd.
[5] Minter, 2013.
[6] JICA, 2013.
[7] Quote from Mariana Express Lines. See Attachment B.

The UNDP report (Leney, 2005) contains some further information on costs.

3.6 Materials Recovery Facility

3.6.1 Location

The ideal location for a MRF is either on part of an active or closed landfill or near Delap dock for efficient transport of filled containers for export. The preferred location, if there is sufficient space, is on a closed part of the active landfill. This minimises land rental costs which can be more than $3,000 per acre per year and maximises the efficiency of the solid waste management and recycling activities, particularly if MAWC is responsible for both. Land rent has not been included in the costed design spreadsheets in Attachment B on the basis that there is the option of locating a MRF at the landfill.

3.6.2 Layout

A MRF needs to be established to process the containers that are returned to claim the refund. A plan of the MRF on Koror (Republic of Palau) is attached as an example of a functioning MRF. There are many design considerations for establishing a MRF, some of which are summarised below:

- Health and safety – ensure that people (workers and the public) are kept separate as much as possible from vehicles and equipment.
- Material flows[8] – sufficient area for container reception, baling equipment, storage (as-received and baled containers), public parking and truck movements.

It is recommended that initially the MRF be sent up as a low cost moveable facility utilising shipping containers and a canopy. Once the CDP and MRF are established, real data on container flows is known, and the recycling fund has built up, the MRF could be moved to a more permanent location/building.

A draft design of a MRF is included in Attachment D. The layout of the MRF in Palau, the Koror State Recycling Centre, is included in the document in Attachment F.

3.6.3 Equipment

The recycling equipment needed for the MRF to allow for the processing of recyclable materials is summarised in the table below.

[8] Up to 30,000 containers per day may be returned to the MRF for refund based on a 5 day per week MRF operation.

Table 3: Materials Recovery Facility Equipment			
Item	**Equipment**	**Materials**	**Cost ($ CIF)**
1	Al can baler (RJ Midi or similar)	Al cans	$55,000
2	Vertical baler (Miltek 509HD or similar)	PET and Cardboard	$25,000
3	Glass crusher	Glass	$75,000

Notes:
Lifting and loading equipment may also be required if manual handling of the baled recyclables is not possible.
Refer to Attachment B for a costed design based on a cheaper glass crusher (capital cost $10,000). Note that a cheaper glass crusher will not give a crushed product suitable for use as a sand replacement.
A ferrous baler could be utilised also but a suitable unit, such as the RJ100, costs around $200,000.
Costs based on quotes provided and estimated shipping costs. Subject to change.

3.7 Collection Centres

Collection or redemption centres can be set up around Majuro (and even on other atolls) for the public to return containers for refund. This option is not recommended for Majuro however as it would require more people and equipment (including a truck), and would make management of the CDP more difficult. A better option would be to offer a sufficiently attractive refund and have all containers returned directly to the MRF (those without the ability to deliver containers directly to the MRF would sell to someone that could (ie informal trading of containers for cash)). That way the public would do a lot of the 'work' and the containers would arrive in bigger loads which should make running the MRF and paying refunds simpler.

Once the MRF has been operating for a while the option of collection centres could be reassessed if the system could accommodate the additional costs. If return rates are high with the MRF as the only collection centre then there should be no need to open additional collection centres, although one on Ebeye (the other major population centre) might be necessary.

3.8 CDP Financial Summary

The costs associated with operating the CDP are summarised in the spreadsheets included in Attachment B. A summary of approximate costs is presented in the table below.

Table 4: CDP Cost Summary				
Item	**Capital Costs**	**Operating Costs**	**Operating Revenue**	**Operating Profit (Loss)**
Al cans	$115,000	$300,000	$420,000	$120,000
PET bottles	$55,000	$110,000	$125,000	$15,000
Glass bottles/jars	$105,000	$105,000	$120,000	$15,000
ULABs	$30,000	$30,000	$30,000	$0

Notes: Establishment of an MRF is estimated to be $100,000 (buildings, administration, amenities, power) shared between the various CDP materials on the following basis (Al cans 50%; PET bottles 20%; Glass bottles 20%; ULABs 10%).

Recycling of materials and diversion from the landfill also results in an avoided cost based on the value of landfill airspace. Based on previous studies a landfill airspace value of $50/m^3 is assumed[9]. The avoided cost of saving landfill airspace has not been included in the calculations in the table above.

4.0 Implementation Plan

A detailed design of a CDP for Majuro was prepared by Mr Alice Leney under a UNDP funded project in 2005 (Leney, 2005). The design includes an implementation plan, work plan and budget. Key elements include drafting and adoption of CDP legislation, public awareness, setting up an MRF and setting up the business, financial and administration systems. The implementation plan below is based on the previous work referenced above.

A pilot trial could be considered as part of the implementation plan but may not be beneficial due to disruption to recycling activities unless the pilot trial continues until full implementation of main CDP. Other CDPs in similar locations (Kiribati, Kosrae, Yap and Palau) are understood to have been established without a pilot trial stage and have been operating successfully for several years. Hence there is a significant amount of collective experience and knowledge in setting up and operating CDPs in the Pacific. Refer to Section 7.1.6 of the main report for a discussion on the implementation of a pilot trial if this is to be considered further. Attachment B contains costed designs for a year long pilot trial for Al cans, glass bottles and ULABs.

The implementation plan below assumes that a pilot trial is not undertaken.

4.1 Agencies Involved

The NWMS 2012-2016 includes the development of a CDP under the Sustainable Financing priority area. The lead agencies involved are the OEPPC and MAWC,

[9] Leney, 2005 and Beca, 2003 (scaled up based on the 10 years since these estimates were given. The current RFP for the proposed Jenrok landfill will provide a more up to date estimate.

and the partner agency is the OAG. OEPPC should be the lead agency for initiating the legislative process, planning the public awareness campaign and setting up management and contractual arrangements. OEPPC and MAWC should work together in setting up a MRF.

A South-South exchange would be beneficial for the agencies/personnel involved in setting up the CDP in the RMI, to learn from others who have already implemented and operate a CDP in a similar location (Kiribati, Kosrae, Yap and Palau).

4.2 Legislative Process

The legislative process, summarised in Section 2.2, should be confirmed by OEPPC prior to commencing the preparation of the CDP Cabinet Paper. The Cabinet Paper is the first step in the legislative process and should be the number one priority. Once the Cabinet Paper has been prepared and presented to Cabinet the focus can shift to other activities.

A Provisional Work Plan is included in Attachment A showing the sequence of steps for the legislative process as summarised in Section 2.2.

4.3 Public Awareness

The UNDP report (Leney, 2005) contains useful information on developing a public awareness programme utilising newspaper, radio and television adverts, while also emphasising the importance of establishing a short, catchy name/phrase (a 'Kajin Majol' name) or slogan similar to Kaoki Mange (Return the Rubbish) in Kiribati.

A public awareness campaign for a CDP should utilise a variety of media including adverts and articles in the local weekly newspaper (the Marshall Islands Journal), adverts and information segments on local community radio stations and posters placed in busy urban areas. With the increasingly widespread use of computers, tablets and smart phones, the power of the internet and of social media should also be utilised. Information can also be disseminated through community groups, schools and churches, and in public meetings.

The first priority is to develop a recognisable slogan and logo to identify CDP and recycling. The public awareness campaign would then focus on:

- Introducing the proposed CDP including explaining how it will work, the benefits of a CDP, and the process for getting it started.
- Progress reports on the legislative process and advertising the public hearing.
- Progress reports on the legislative process and feedback on the public hearing.
- Information on the planned roll out of the CDP (including reasons for delaying commencement of paying refunds).

- Instructions on how, where and when to bring recyclable containers and claim refunds.

4.4 Establish a Materials Recovery Facility

4.4.1 Operator

MAWC is responsible for waste management (collection and landfill management) on Majuro and this is its sole function (as opposed to the situation on Kiribati where waste collection remains the responsibility of the local governments). Hence there are good reasons for MAWC to be involved in any CDP that might be set up. A Memorandum of Understanding (MoU) could be signed with MAWC to operate the MRF for a set period (say 2 years). The performance of MAWC could be evaluated during that period to determine whether they should be the one to continue operating the MRF. This set up is similar to in Palau where a MoU was signed with the Koror State Recycling Centre to function as the MRF for the CDP.

4.4.2 Location

The preferred location for a MRF is on a closed section of landfill (currently at Jable) to avoid the expense of leasing a site. This could be included in the MoU with MAWC who would have offices, workshop and amenities at the landfill anyway. The MRF site should be large enough to comfortably accommodate the MRF with room for expansion if necessary. Once the CDP is well established and deposit funds have accumulated then the possibility of leasing a permanent site (and establishing a permanent MRF building) could be investigated.

4.4.3 Layout

The MRF will need an office, amenities building, covered container reception area, storage for containers prior to baling/crushing, covered and secure areas for the baling and crushing equipment, and areas for the storage of processed containers. The draft MRF layout in Attachment D would be suitable for a MRF on Majuro. The final layout would be adjusted to suit the specific site chosen for the MRF. Use of 20ft containers for all buildings and the construction of a canopy between the containers would minimise the cost of the MRF facility.

4.4.4 Equipment

The equipment required for a MRF is listed in Table 3 above. Planning for the procurement of the necessary equipment should occur well in advance to allow for the long delivery time once the order has been placed. Additional time should be allocated for installation and commissioning prior to opening of MRF. The glass crusher listed in Table 3 could be replaced with a cheaper glass crusher although the trade-off is that the crushed glass would then still be quite sharp and coarse, and would not be suitable as a sand replacement. The MRF could commence operations using the cheaper glass crusher, with the more expensive glass crusher purchased after the CDP has been running for a period.

4.4.5 Personnel

The personnel required for operation of the MRF are:

- Manager (1) – overall responsibility for the MRF
- Accountant (1) – managing finances and preparing accounts and reports
- Assistant accountant (1) – managing finances and preparing accounts/reports
- Supervisor (1) – managing operations on the floor
- Equipment technician (1) – maintaining equipment
- Workers (8) – counting returned containers, operating baling and crushing machines, packing containers for export

Some existing MAWC employees could be re-allocated to the MRF, and if MAWC are the MRF operator then some positions could be shared between the existing waste collection and landfill operations, and the MRF.

Formal training should be provided for the supervision, equipment technician and workers on the safe use and operation of the equipment prior to opening of the MRF.

4.5 Management and Contractual Arrangements

4.5.1 Special Fund

One of the key management and contractual arrangements is control of finances. It is critical that CDP funds be kept in a separate account and used solely for CDP activities (payment of refunds to the public (via the MRF operator) and payment of refunds to the MRF operator on export of recyclable materials). Comprehensive accounting records should be kept and regular audits should be undertaken to ensure that the CDP is operating as it should. The CDP legislation should specify clearly what the CDP funds can be used for.

4.5.2 Potential Private Enterprise Partners

As noted in Section 4.4 above, it makes sense for MAWC to be the MRF operator for an initial term of 2 years. After the initial 2 year period, the operation of the MRF could be put out to tender. Private operators that might be interested in bidding on the tender and operating the MRF under contract to the RMI Government include the RMI Recycling Company and Robert Reimers Enterprises.

Monitoring during the first 2 years of operation would provide information on actual operating costs which would be useful in negotiating the MRF contract with future operators. It is anticipated that a portion of the deposit allocated to operating the MRF ($0.02 per container) could be used for other recycling initiatives (undertaken under by the MRF operator under the contract, or some money could be diverted for use by another organisation for other recycling activities (such as an organic waste composting operation)).

4.5.3 Roll Out of the CDP

Once the CDP legislation has been passed into law, customs should commence collection of the deposit tax. However, unless funding from elsewhere is immediately available, the payment of refunds for returned containers should be delayed by at least 6 months to allow deposit funds to accumulate (the public awareness campaign will have to very clearly explain why this delay is necessary).

A cap on the maximum value of refunds to be paid out each day should be set[10] (possibly at $1,000/day) and the deposit fund monitored on a weekly basis to maintain some level of control over the system (large stockpiles of containers held by the community can drain the deposit funds very quickly and cause the system to collapse).

Another way to control the flow of containers to the MRF is to limit the opening hours for accepting containers for refund (say 0800 to 1300). That would also allow the MRF to shut their gate and focus on baling and crushing the returned containers before the end of the working day. This would also minimise the possibility of refunded containers leaking out the back door and being used to claim a second refund (only uncrushed containers would be accepted for refund with the number of containers measured using custom made wire cages).

4.5.4 Payment of Refunds

The payment of refunds can be done in one of two ways as summarised below.

- MRF handles the money and pays refunds to the people returning the containers directly; or,
- Voucher system used where the MRF issues a voucher or receipt for the value of the containers returned which is then taken to the CDP Fund administrator and cashed in.

The direct payment option has the advantage of simplicity and minimising administration costs (understood to be used in Kiribati, Yap and Kosrae), whereas the voucher option allows for more control and monitoring of the CDP (used in Palau).

To make counting of the returned containers, and payment of refunds, simpler, a minimum number of containers should be set. A minimum number of 100 containers may be appropriate (giving a $3 refund based on a $0.03/container refund), with, ideally, increments of 50 thereafter.

5.0 Challenges in Implementing a CDP

There are many challenges to be overcome in setting up and operating a CDP. Many of these challenges have been faced, and subsequently resolved, in the

[10] The maximum daily limit could be set at $1,000 which equates to over 30,000 containers based on a refund amount of $0.03/container. The maximum daily limit could be adjusted as deposit funds allow.

existing CDPs in Kiribati, Kosrae, Yap and Palau. A summary of the main challenges, and possible solutions, is given below:

- Deposit funds used for other purposes
  - Deposit funds should be kept in a designated account and the use of the funds specified clearly in the legislation.
  - Regular monitoring and reporting of CDP activity.
- Insufficient funds to sustain the CPD
  - Ensure that the handling fee is sufficient to sustain the recycling operations in the event that shipping or other costs increase, or revenue from the sale of scrap decreases.
  - Delay the commencement of refunds to allow deposit funds to accumulate for a period.
- Fraud (including containers leaking out the back door and being refunded twice)
  - Make the MRF a secure facility (fully fenced) and that there is adequate space at the MRF for secure storage of materials.
  - Bale the Al cans and PET bottles, and crush glass bottles immediately on receipt at the MRF.
  - Mark ULABs (with stamp or paint) to identify those that have already been refunded.
  - Regular (monthly) monitoring and reporting of CDP activity.
  - Annual audit of CDP accounts.
- Underestimation of container numbers, particularly during the start-up period
  - Ensure that adequate controls are put in place to limit the number of containers returned and the amount of refunds paid if necessary. This could be by putting a limit on the funds available for refund each day/week, restricting operating hours of the MRF and limiting the number of collection centres (if any other than the MRF).
- Lack of public awareness
  - Prioritise public awareness and use a variety of media (newspaper, radio, posters, community meetings, etc).
  - Establish an identity with an easily recognisable slogan and symbol.
  - Ensure that the messages are clear and consistent.
- Public or commercial backlash
  - Prioritise public awareness
  - Present clearly the benefits and advantages of a CDP.
  - Give clear explanations for how the CDP is set up and to justify how it is operated.
- Lack of political will
  - Prepare a well researched and well written Cabinet Paper detailing why a CDP is good for the RMI.

  - Obtain support from across the political spectrum (leaders, candidates, political parties).
  - Anticipate and prepare for any challenges such as upcoming elections.
- Equipment breakdowns
  - Procure good quality equipment able to process the anticipated numbers of containers.
  - Schedule and undertaken regular maintenance to minimise potential breakdowns.
  - If funding allows, have some redundancy in the MRF, such as duplicate Al can and PET balers, and glass crushers.
- Recyclable materials not exported
  - MRF operator to provide evidence (shipping dockets) of export of recyclable materials as part of the CDP monitoring and reporting.
  - Handling fee paid to MRF operator on export.

There are also challenges that cannot be controlled such as:

- Changes to shipping routes and/or costs which might make the export of recyclables more difficult and expensive; and
- Fluctuations in the value of scrap based on global supply and demand dynamics (such as occurred in the late 2000s) which may put pressure on the financial sustainability of the recycling activities.
- Disruption to MRF operations due to weather. For example, the roof of the MRF in Palau was damaged during Typhoon Bopha and put a halt to operations for a period. Similarly, a canopy structure formerly present at the Jable landfill was destroyed in storm event.

Attachment A: Provisional Work Plan

PROVISIONAL WORK PLAN

Priority	Item	Agency	Action	Detail	Timeframe											
					Year 1				Year 2				Year 3			
					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	CDP Legislation	OEPPC, OAG, MAWC	Cabinet Paper	Cabinet Paper to be prepared by OEPPC using the information contained in the Implementation Plan and the main report.												
			Draft Legislation	Legislation to be drafted by OAG based on the example legislation from Kiribati, Kosrae, Yap and Palau and presented to Cabinet.												
			First Reading	First reading of CDP legislation by the Nitijela.												
			Public Hearing	Conduct a public hearing on the CDP legislation												
			Review Legislation	Review the draft CDP legislation and amend as necessary for the second reading.												
			Second Reading	Second reading of CDP legislation by the Nitijela.												
			Enactment	Legislation passed by Nitijela, receives assent from the President and becomes law.												
2	Public Awareness	OEPPC, MAWC	Initial	Develop an easily recognisable slogan and symbol. Prepare newspaper and radio adverts, posters, website and social media information to promote the proposed CDP (how it will work, benefits and process for setting it up).												
			Public Hearing	Use newspaper and radio adverts, and website to promote the public hearing on the CDP legislation.												
			Progress	Use newspaper and radio adverts,website and social media, to keep public up to date on progress.												
			Ongoing	Use newspaper and radio adverts,website and social media, to keep public up to date on commencement and ongoing operation of the CDP and MRF.												
3	Financial and Management Systems	MoF, OEPPC	Special Fund	Set up Special Fund to be used for the CDP.												
			MRF Operator	Establish a MoU with MAWC to operate the MRF for an initial 2 year period.												
			Monitoring	CDP accounting, monitoring and reporting systems to be set up.												
4	Materials Recovery Facility	MAWC	Planning	Selection location and design layout of the MRF												
			Procurement	Procure materials and equipment												
			Establishment	Establish MRF buildings, and install and commission equipment.												
			Resourcing	Hire/assign and train staff.												
5	Commence CDP	Customs, MoF, MAWC	Enforce CDP Tax	Customs to collect CDP tax prior to release of containers of imported material and deposit money in Special Fund.												
			Open MRF	MAWC to open MRF and pay refunds for returned containers.												
			Monitoring/Reporting	Commence monitoring and reporting on CDP and MRF activities.												
			Auditing	Commence annual auditing of CDP and MRF activities.												

Attachment B: Costed Designs for a CDP in RMI

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

CONTAINER DEPOSIT PROGRAMME - ALUMINIUM CANS

Assumptions (Full Implementation)		
Total number of aluminium cans	6,000,000	per year
Number of Al cans/day	16438	based on 6 million per year
Total weight of Al cans	100	tonne based on 60 cans per kg
20ft Container weight	15	tonne based RJ Midi

Operating Expenses	**Total**	
Al can purchases	$ 180,000.00	based on $0.03 per can refund to public
Operation staff (x3)	$ 15,600.00	Hourly rate $2.50, 8hrs/day
Manager (0.5 FTE)	$ 22,500.00	Manager salary $45,000
Administration 1 (0.5 FTE)	$ 10,000.00	Accountant salary $20,000
Administration 2 (0.5 FTE)	$ 5,000.00	Accountant assistant salary $10,000
Supervisor (0.5 FTE)	$ 7,500.00	Supervisor salary $15,000
Equipment Technician (0.5 FTE)	$ 7,500.00	Equipment Technician salary $15,000
Operational Overheads	$ 15,000.00	Includes fuel, electricity, maintenance, office, amenities, etc
Depreciation (Equipment)	$ 5,500.00	Straight line, 10%, 10 years, on RJ Midi Baler
Depreciation (Building)	$ 10,000.00	Straight line, 10%, 10 years, on $100,000 building
Shipping expenses	$ 13,333.33	$2000 per 20ft to Korea and 15t container weight
TOTAL OPERATING EXPENSES	**$ 291,933.33**	

Revenue	**Total**	
Sale of Al cans	$ 120,000.00	Based on $1,200/t market value
CDP Income	$ 300,000.00	Based on $0.05/container through the CDP ($0.02 to MRF operator)
TOTAL REVENUE	**$ 420,000.00**	

Profit (Loss)	**$ 128,066.67**

Capital Costs	**Total**	
Administration set up	$ 10,000.00	
MRF set up	$ 50,000.00	Portion of MRF set up cost allocated to Al cans (50%)
Equipment	$ 55,000.00	RJ Midi (CIF)
TOTAL CAPITAL COSTS	**$ 115,000.00**	

Assumptions (Pilot Trial - 1 year)		
Total number of aluminium cans	6,000,000	per year (1 year pilot period for CDP legislation)
Number of Al cans/day	16438	based on 6 million per year
Total weight of Al cans	100	tonne based on 60 cans per kg
20ft Container weight	15	tonne based RJ Midi Baler

Operating Expenses	**Total**	
Al can purchases	$ 120,000.00	based on $0.02 per can refund to public
Operation staff (x2)	$ 10,400.00	Hourly rate $2.50, 8hrs/day
Manager (0.1 FTE)	$ 4,500.00	Manager salary $45,000
Administration 1 (0.2 FTE)	$ 4,000.00	Accountant salary $20,000
Administration 2 (0.5 FTE)	$ 5,000.00	Accountant assistant salary $10,000
Operational Overheads	$ 15,000.00	Includes fuel, electricity, maintenance, office, amenities, etc
Depreciation	$ 5,500.00	Straight line, 10%, 10 years, on RJ Midi Baler
Shipping expenses	$ 13,333.33	$2000 per 20ft to Korea and 15t container weight
TOTAL OPERATING EXPENSES	**$ 177,733.33**	

Revenue	**Total**	
Sale of Al cans	$ 120,000.00	Based on $1,200/t market value
Subsidy	$ 60,000.00	Based on $0.01/container
TOTAL REVENUE	**$ 180,000.00**	

Profit (Loss)	**$ 2,266.67**

Capital Costs	**Total**	
Administration set up	$ 10,000.00	
MRF set up	$ 50,000.00	Portion of MRF set up cost allocated to Al cans (50%)
Equipment	$ 55,000.00	RJ Midi (CIF)
TOTAL CAPITAL COSTS	**$ 115,000.00**	

Note that for the Pilot Trial existing MAWC staff, equipment and resources can be utilised and hence the operating expenses detailed above could be reduced significantly.

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

CONTAINER DEPOSIT PROGRAMME - GLASS BOTTLES (BASIC GLASS CRUSHER)

Assumptions (Full Implementation)		
Total number of glass bottles	1,000,000	per year
Number of glass bottles/day	2740	based on 1 million per year
Total volume of glass bottles (uncrushed)	330	m3 based on 330ml bottles
Total volume of glass bottles (crushed)	110	m3 based on 3 to 1 volume reduction

Operating Expenses	**Total**	
Glass bottle purchases	$ 30,000.00	based on $0.03 per glass bottle refund to public
Operation staff (x2)	$ 10,400.00	Hourly rate $2.50, 8hrs/day
Manager (0.1 FTE)	$ 4,500.00	Manager salary $45,000
Administration 1 (0.15 FTE)	$ 3,000.00	Accountant salary $20,000
Administration 2 (0.15 FTE)	$ 1,500.00	Accountant assistant salary $10,000
Operational Overheads	$ 10,000.00	Includes fuel, electricity, maintenance, office, amenities, etc
Depreciation	$ 1,000.00	Straight line, 10%, 10 years, on glass crusher
TOTAL OPERATING EXPENSES	**$ 60,400.00**	

Revenue	**Total**	
CDP Income	$ 50,000.00	Based on $0.05/container through the CDP ($0.02 to MRF operator)
Avoided Cost	$ 11,000.00	Saving in landfill space of 220m3 at $50/m3
TOTAL REVENUE	**$ 61,000.00**	

Profit (Loss)	**$ 600.00**

Capital Costs	**Total**	
Administration set up	$ 10,000.00	
MRF set up	$ 15,000.00	Portion of MRF set up cost allocated to glass bottles (15%)
Equipment	$ 10,000.00	Glass crusher
TOTAL CAPITAL COSTS	**$ 35,000.00**	

Assumptions (Pilot Trial - 1 Year)		
Total number of glass bottles	1,000,000	per year
Number of glass bottles/day	2740	based on 1 million per year
Total volume of glass bottles (uncrushed)	330	m3 based on 330ml bottles
Total volume of glass bottles (crushed)	110	m3 based on 3 to 1 volume reduction

Operating Expenses	**Total**	
Glass bottle purchases	$ 20,000.00	based on $0.02 per glass bottle refund to public
Operation staff (x2)	$ 10,400.00	Hourly rate $2.50, 8hrs/day
Manager (0.05 FTE)	$ 2,250.00	Manager salary $45,000
Administration 1 (0.1 FTE)	$ 2,000.00	Accountant salary $20,000
Administration 2 (0.1 FTE)	$ 1,000.00	Accountant assistant salary $10,000
Operational Overheads	$ 5,000.00	Includes fuel, electricity, maintenance, office, amenities, etc
Depreciation	$ -	Straight line, 10%, 10 years
TOTAL OPERATING EXPENSES	**$ 40,650.00**	

Revenue	**Total**	
Subsidy	$ 30,000.00	Based on $0.03/container
Avoided Cost	$ 11,000.00	Saving in landfill space of 220m3 at $50/m3
TOTAL REVENUE	**$ 41,000.00**	

Profit (Loss)	**$ 350.00**

Capital Costs	**Total**	
Administration set up	$ 10,000.00	
MRF set up	$ 15,000.00	Portion of MRF set up cost allocated to glass bottles (15%)
Equipment	$ -	Glass crusher
TOTAL CAPITAL COSTS	**$ 25,000.00**	

Note that for the Pilot Trial existing MAWC staff, equipment and resources can be utilised and hence the operating expenses detailed above could be reduced significantly.

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

CONTAINER DEPOSIT PROGRAMME - GLASS BOTTLES (ADVANCED GLASS CRUSHER)

Assumptions (Full Implementation)		
Total number of glass bottles	1,000,000	per year (includes glass food jars also)
Number of glass bottles/day	2740	based on 1 million per year
Total volume of glass bottles (uncrushed)	330	m3 based on 330ml bottles
Total volume of glass bottles (crushed)	110	m3 based on 3 to 1 volume reduction
CDP activities initially operated by MAWC using existing staff and equipment		

Operating Expenses	**Total**	
Glass bottle purchases	$ 30,000.00	based on $0.03 per glass bottle refund to public
Operation staff (x2)	$ 10,400.00	Hourly rate $2.50, 8hrs/day
Manager (0.1 FTE)	$ 4,500.00	Manager salary $45,000
Administration 1 (0.15 FTE)	$ 3,000.00	Accountant salary $20,000
Administration 2 (0.15 FTE)	$ 1,500.00	Accountant assistant salary $10,000
Operational Overheads	$ 10,000.00	Includes fuel, electricity, maintenance, office, amenities, etc
Depreciation	$ 7,500.00	Straight line, 10%, 10 years, on glass crusher
TOTAL OPERATING EXPENSES	**$ 66,900.00**	

Revenue	**Total**	
Sale of crushed glass	$ 9,900.00	Based on $90/m3 market value
CDP Income	$ 50,000.00	Based on $0.05/container through the CDP ($0.02 to MRF operator)
Avoided Cost	$ 16,500.00	Saving in landfill space of 330m3 at $50/m3
TOTAL REVENUE	**$ 76,400.00**	

Profit (Loss)	**$ 9,500.00**

Capital Costs	**Total**	
Administration set up	$ 10,000.00	
MRF set up	$ 15,000.00	Portion of MRF set up cost allocated to glass bottles (15%)
Equipment	$ 75,000.00	Glass crusher
TOTAL CAPITAL COSTS	**$ 100,000.00**	

Assumptions (Pilot Trial - 1 Year)		
Total number of glass bottles	1,000,000	per year
Number of glass bottles/day	2740	based on 1 million per year
Total volume of glass bottles (uncrushed)	330	m3 based on 330ml bottles
Total volume of glass bottles (crushed)	110	m3 based on 3 to 1 volume reduction
CDP activities initially operated by MAWC using existing staff and equipment		

Operating Expenses	**Total**	
Glass bottle purchases	$ 20,000.00	based on $0.02 per glass bottle refund to public
Operation staff (x2)	$ 10,400.00	Hourly rate $2.50, 8hrs/day
Manager (0.05 FTE)	$ 2,250.00	Manager salary $45,000
Administration 1 (0.1 FTE)	$ 2,000.00	Accountant salary $20,000
Administration 2 (0.2 FTE)	$ 2,000.00	Accountant assistant salary $10,000
Operational Overheads	$ 15,000.00	Includes fuel, electricity, maintenance, office, amenities, etc
Depreciation	$ 7,500.00	Straight line, 10%, 10 years
TOTAL OPERATING EXPENSES	**$ 59,150.00**	

Revenue	**Total**	
Sale of crushed glass	$ 9,900.00	Based on $90/m3 market value (sand replacement)
Subsidy	$ 30,000.00	Based on $0.03/container
Avoided Cost	$ 16,500.00	Saving in landfill space of 330m3 at $50/m3
TOTAL REVENUE	**$ 56,400.00**	

Profit (Loss)	**-$ 2,750.00**

Capital Costs	**Total**	
Administration set up	$ 10,000.00	
MRF set up	$ 15,000.00	Portion of MRF set up cost allocated to glass bottles (15%)
Equipment	$ 75,000.00	Glass crusher
TOTAL CAPITAL COSTS	**$ 100,000.00**	

Note that for the Pilot Trial existing MAWC staff, equipment and resources can be utilised and hence the operating expenses detailed above could be reduced significantly.

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

CONTAINER DEPOSIT PROGRAMME - ULABs

Assumptions (Full Implementation)		
Total number of ULABs	2,000	per year
Total weight of ULABs	36	tonne per year
20ft Container weight	20	tonne

Operating Expenses	**Total**	
ULAB purchases	$ 6,000.00	based on $3 per ULAB refund to public
Operation staff (x1)	$ 5,200.00	Hourly rate $2.50, 8hrs/day
Manager (0.05 FTE)	$ 2,250.00	Manager salary $45,000
Administration 1 (0.1 FTE)	$ 2,000.00	Accountant salary $20,000
Administration 2 (0.1 FTE)	$ 1,000.00	Accountant assistant salary $10,000
Operational Overheads	$ 10,000.00	Includes regulatory compliance, office, amenities, etc
Shipping expenses	$ 4,500.00	$2500 per 20ft to Korea and 20t container weight
TOTAL OPERATING EXPENSES	**$ 30,950.00**	

Revenue	**Total**	
Sale of ULABs	$ 21,600.00	Based on $600/t market value
CDP Income	$ 10,000.00	Based on $5.00/ULAB through the CDP ($2.00 to MRF operator)
TOTAL REVENUE	**$ 31,600.00**	

Profit (Loss)	**$ 650.00**

Capital Costs	**Total**	
Administration set up	$ 20,000.00	Regulatory compliance (technical assistance may be required)
MRF set up	$ 10,000.00	Portion of MRF set up cost allocated to ULABs (10%)
TOTAL CAPITAL COSTS	**$ 30,000.00**	

Assumptions (Pilot Trial - 1 Year)		
Total number of ULABs	2,000	per year
Total weight of ULABs	36	tonne per year
20ft Container weight	20	tonne

Operating Expenses	**Total**	
ULAB purchases	$ 4,000.00	based on $2 per ULAB refund to public
Operation staff (x1)	$ 5,200.00	Hourly rate $2.50, 8hrs/day
Manager (0.05 FTE)	$ 2,250.00	Manager salary $45,000
Administration 1 (0.05 FTE)	$ 1,000.00	Accountant salary $20,000
Administration 2 (0.1 FTE)	$ 1,000.00	Accountant assistant salary $10,000
Operational Overheads	$ 10,000.00	Includes regulatory compliance, office, amenities, etc
Shipping expenses	$ 4,500.00	$2500 per 20ft to Korea and 20t container weight
TOTAL OPERATING EXPENSES	**$ 27,950.00**	

Revenue	**Total**	
Sale of ULABs	$ 21,600.00	Based on $600/t market value
Subsidy	$ 6,000.00	Based on $3.00/ULAB
TOTAL REVENUE	**$ 27,600.00**	

Profit (Loss)	**-$ 350.00**

Capital Costs	**Total**	
Administration set up	$ 20,000.00	Regulatory compliance (technical assistance may be required)
MRF set up	$ 10,000.00	Portion of MRF set up cost allocated to ULABs (10%)
TOTAL CAPITAL COSTS	**$ 30,000.00**	

Note that for the Pilot Trial existing MAWC staff, equipment and resources can be utilised and hence the operating expenses detailed above could be reduced significantly.

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

CONTAINER DEPOSIT PROGRAMME - PET BOTTLES

Assumptions (Full Implementation)		
Total number of PET bottles	2,000,000	per year
Number of PET bottles/day	5479	based on 2 million per year
Total weight of PET bottles	50	tonne based on 25g/PET bottle
20ft Container weight	10	tonne based Miltek baler

Operating Expenses	**Total**	
PET bottles purchases	$ 60,000.00	based on $0.03 per can refund to public
Operation staff (x2)	$ 10,400.00	Hourly rate $2.50, 8hrs/day
Manager (0.25 FTE)	$ 11,250.00	Manager salary $45,000
Administration 1 (0.25 FTE)	$ 5,000.00	Accountant salary $20,000
Administration 2 (0.25 FTE)	$ 2,500.00	Accountant assistant salary $10,000
Supervisor (0.25 FTE)	$ 3,750.00	Supervisor salary $15,000
Equipment Technician (0.25 FTE)	$ 3,750.00	Equipment Technician salary $15,000
Operational Overheads	$ 10,000.00	Includes fuel, electricity, maintenance, office, amenities, etc
Depreciation	$ 3,000.00	Straight line, 10%, 10 years, on Miltek baler
Shipping expenses	$ 10,000.00	$2000 per 20ft to Korea and 10t container weight
TOTAL OPERATING EXPENSES	**$ 119,650.00**	

Revenue	**Total**	
Sale of PET bottles	$ 25,000.00	Based on $500/t market value
CDP Income	$ 100,000.00	Based on $0.05/container through the CDP ($0.02 to MRF operator)
TOTAL REVENUE	**$ 125,000.00**	

Profit (Loss)	**$ 5,350.00**

Capital Costs	**Total**	
Administration set up	$ 10,000.00	
MRF set up	$ 25,000.00	Portion of MRF set up cost allocated to PET bottles (25%)
Equipment	$ 30,000.00	Miltek H600 (CIF)
TOTAL CAPITAL COSTS	**$ 65,000.00**	

Alert Engineering Co Ltd
PO Box 58411, Botany, Manukau, 2163, New Zealand
7 Gabador Place, Mt Wellington, Auckland, 1060, New Zealand
Phone: (09) 573 1008 Fax: (09) 573 1004 email:sales@alertnz.com

Quotation Number: 4687

23-Jul-14

Your Ref: Tristan Bellingham
Fax No: 09 523 6901

Pattle Delamore Partners Ltd
P O Box 9528
New Market
Auckland

Re: Alert Baling Machines

Dear Tristan,

Thank you for your inquiry for which we have pleasure in submitting the following quotation to manufacture the following equipment:

Quote Summary:	**Unit Price**	**Quantity**	**Price**
RJ100-5M Manual 5 Foot Press 10" Main Ram 7" Lid Ram	$192,000.00	1	**$192,000.00**
RJ Midi Baler Manual With 6" Packer Cylinder	$54,000.00	1	**$54,000.00**
	Price Summary		$246,000.00
	GST	15.00%	$36,900.00
	Total		**$282,900.00**

This Quotation is in New Zealand Dollars
Subject to our Standard Conditions of Sale
Quotation Valid for 30 Days from the date of issue
Terms Of Payment:30% Deposit on order confirmation, Balance due in full prior to leaving our workshop.
Overdue payments will incur interest at a rate of 1.5% per calendar month or part thereof.
Currency Fluctuations:
The above Quotation is based on an exchange rate of $1.00 NZ Dollar = N/A
Any variation will be to the Buyers Account.
Sales Tax, GST.Duties:
The above Quotation does not include any Taxes or Duties and any payable will be to the Buyers Account.
Freight Charges: - Unless Specified otherwise this Quotation does not include Freight Costs
Freight Charges will be recovered at cost and passed on to the Buyers Account.
Insurance: - Risk or Loss passes to the Buyer as at the time of Delivery

Note: Equipment Remains the Property of Alert Engineering Company Ltd until Full and Final Payment Received.

Quotation Accepted by: _____ Date: _____

Kelvin Healy
Sales & Marketing Manager

Otaki Transfer Station,
1 Riverbank Road,
Otaki 5512
M 027 588 1970
E malcolm@crushedglass.co.nz
www.crushedglass.co.nz

6 August 2014

Tristan Bellingham
Senior Environmental Engineer
Pattle Delamore Partners Ltd

tristan.bellingham@pdp.co.nz

Dear Tristan

Recycled Glass Crushing Plant – Majuro Atoll

Thank you for your enquiry and the opportunity to present the following proposal.

Our proposal is based on a requirement to process circa 250tonnes per annum and produces a graded output for use as an aggregate replacement and/or alternative landfill cover.

The proposed system is a closed-loop operation and is trailer mounted for mobility.

Silaca Glass Crusher:
Registered design and made in New Zealand with fabricated steel, vee belts and pulleys
Body 5mm gauge steel
Operating crushing mechanics 20-25mm gauge steel
13hp stationary petrol motor or diesel equivalent

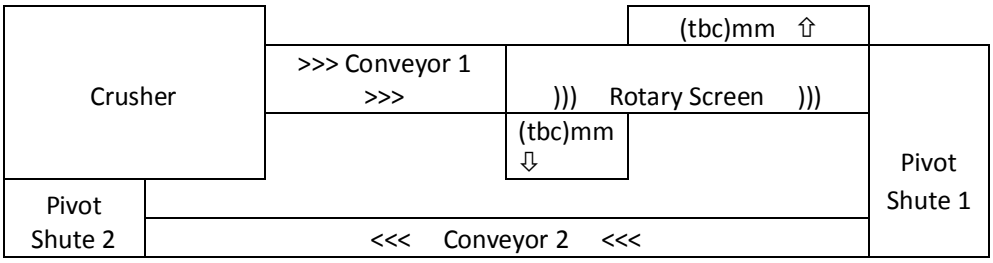
Conveyor:
Synthetic troughed belt with sidewalls and 1.5hp electric roller motor with a reduction box
(Note: The electric motor is 240v and can be driven by a portable generator. We have not included the generator as the client should be able to easily source locally to meet requirements.)

Rotary Screen (drum configuration):
Collection A (grade size tbc, bin/fadge client supply)
Collection B (grade size tbc, bin/fadge client supply)
Pivot Conveyor (to return oversize to Crusher)

Trailer and Mount:
C-section frame
SHS posts and supports
13" wheels on Duratorque axle

Otaki Transfer Station,
1 Riverbank Road,
Otaki 5512
M 027 588 1970
E malcolm@crushedglass.co.nz
www.crushedglass.co.nz

The following elevation provides an overview.



Maintenance:

The machine can operate for 1500 hours per annum and our current machine has been going for 4 years with only minor refurbish of the operating mechanics and replacement vee belts. Each 1500 hours should see the resurfacing of the rollers with a simple lathe. Maintenance is straightforward with easy access grease points.

Warrantees:
Standard 12-month warrantees apply to motors and conveyor belt.

Availability:
60 days from date of deposit, freight forward ready.

Freight Conditions:
Freight ex Kapiti excluded.

Acceptance:
The parties agree that confirmation by email is accepted. Quotation valid for 28 days from date of this proposal.

Price:
$70,000NZD excluding GST.

Payment Schedule:
Deposit – 50% due on confirmation of order.
Balance due when order is freight forward ready.

Feed Hopper:

I have not included this as it is something that could be manufactured locally. If our proposal is acceptable we will happily supply specifications at no extra cost.

Otaki Transfer Station,
1 Riverbank Road,
Otaki 5512
M 027 588 1970
E malcolm@crushedglass.co.nz
www.crushedglass.co.nz

Attachment:

Please find attached our plant & equipment catalogue which provides background specifications.

I look forward to hearing back from you in due course and happy to field any further questions should you require more information.

Kind regards

Malcolm Mason
General Manager
Silaca Glass Crushers Ltd

Easi Recycling NZ

January 2014 Waste Baler Price List

FREEPHONE
0800 342 3177
EMAIL
info@easirecycling.co.nz

Easi350

Purchase $8,600

Rental from $40 per week

- Bale weight * 50-100kgs
- Bale size 750(w) x 500(d) x 700(h)
- Pressing force up to 5 ton
- Automatic bale cycle

Easi450

RRP $14,750

Rental from $60 per week

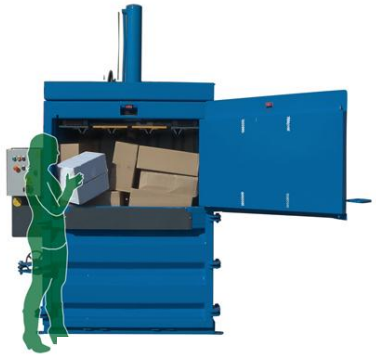
- Bale weight * 100-180kgs
- Bale size 950(w) x 600(d) x 800(h)
- Pressing force up to 8 ton
- Automatic bale cycle

Easi1600

RRP $21,995

Rental from $100 per week

- Bale weight * 150-300kgs
- Bale size 1100(w) x 750(d) x 800(h)
- Pressing force up to 16 ton
- Automatic bale cycle



Mill Size EasiV50

RRP $24,995

Rental from $126 per week

- Bale weight * 350-500kgs
- Bale size 1200(w) x 800(d) x 1000(h)
- Pressing force up to 50 ton
- Automatic bale cycle

Horizontal Easi500H

RRP $74,400

Rental from $500 per week

- Bale weight * 400-500kgs
- Bale size 1000(w) x 1000(d) x 800(h)
- Pressing force up to 50 ton
- Anti jam program

Easi Bottle Crusher

RRP $8,600

Rental from $50 per week

- Size 800(w) x 1200(d) x 1900(h)

All rental rates include delivery, training, installation, commissioning, annual servicing, preventative maintenance, parts.
**Bale weights depend on material and even loading.*

www.easirecycling.co.nz

Revenue Share Options Available for –
2 tonne + Cardboard per week
200kg + Clean LDPE Plastic Film

Easi Recycling New Zealand Price List 2014

Balers & Presses Model	Force	Approx Machine Weight	H x W x D Bale Dimensions	Approx Bale Weight	Trade Price	2 Years	3 Years	4 Years	5 Years	Service Contract
WR350H	5 tonne	360 kgs	700x750x500	50 kgs+	$8,600.00	$63.48	$52.37	$43.63	$41.74	$708.00
WR450H	8 tonne	580 kgs	800x950x600	100 kgs+	$14,750.00	$93.62	$77.28	$64.37	$61.61	$780.00
WR1600H	16 tonne	1200 kgs	800x1100x750	150 kgs+	$21,995.00	$154.73	$127.68	$106.42	$101.81	$900.00
V50 Mill size	50 tonne	1700 kgs	1000x1200x800	350-500 kgs	$24,995.00	$163.80	$152.47	$138.60	$126.00	$1,188.00

Horizontal Balers					from	2 Years	3 Years	4 Years	5 Years	Contract
Easi 500H	50 tonne	6000 kgs	800x1000mmx1000mm	400Kgs+	$74,400.00	$680.40	$579.60	$534.24	$501.48	$2,388.00

Glass Crushers			2 Years	3 Years	4 Years	5 Years	Contract
Easi Glass Crusher	60 - 100 Bottles per minute	$8,600.00	$63.07	$58.99	$54.94	$52.90	$708.00

EPS Machines			2 Years	3 Years	4 Years	5 Years	Contract
AC-100	Upto 100 Kgs per hour	$67,188.00	$415.73	$388.92	$362.09	$348.67	$2,388.00
AC-200	Upto 200 kgs per hour	$80,520.00	$496.73	$464.66	$432.62	$416.59	$2,760.00

All balers are available on 'Revenue Share' subject to material volumes and grade ie - V50 = 3 tonne + / week cardboard.
Easi 350 - 200kg + / week LDPE Plastic
All rental prices are weekly and include installation, commissioning, training, servicing and parts
All prices subject to GST at the prevailing rate. Rental Prices are subject to status

Mil-tek NZ Ltd
(Head Office)
62C Hillside Road
Glenfield
Auckland 0627
P: 09 446 0709
F: 09 446 0706
www.miltek.co.nz

23 July 2014

Dear Tristan,

Thank you for your quote request. All prices below ***exclude*** GST, freight and installation.

RE: Pattle Delamore Partners

205TS Miltek Bale Press	**$8850.00**
305 Miltek Bale Press	**$12750.00**
306HD Miltek Bale Press	**$17325.00**
509HD Miltek Bale Press	**$21500.00**

(Our pneumatic range all require compressors as no onsite air)

H600 Miltek Hydraulic Bale Press	**$28500.00**
HZT600 Horizontal Top Loader Bale press	**$112,500.00**

(Our hydraulic range 3 phase power)
Purchase of a machine includes a full 12 month parts warranty only

If you have any further questions please do not hesitate to contact our Regional Sales Manager Leone Vito on 021 339 592

Kind regards,

Leone Vito
Regional Sales Manager
Mil tek NZ Ltd
leone@miltek.co.nz
M: 021 339 592

Tristan Bellingham

From: Damian Reimers <damian_reimers@mh.mariana-express.com>
Sent: Friday, 1 August 2014 2:54 p.m.
To: 'pauline soon'; 'EXTERNAL MELL Pricing'; 'Shirley Tan'; Tristan Bellingham
Cc: hackney_takju@mh.mariana-express.com; 'Tijo Joe'; mio_domnick@mh.mariana-express.com; 'Francis Domnick'
Subject: RE: [Majuro] 150+ 20ft containers shipped from Majuro

Hi Tristian,

Please see string email below with quote offered and kindly let us know.

Thanks,

Damian Reimers
Ast. Manager/Ops. Manager
Pacific Shipping, Inc.
P.O. Box 929
Majuro, Marshall Islands MH 96960
Office: + (692) 625-1496
Fax: + (692) 625-3344
Mobile: + (692) 455-7703
Email: damian_reimers@mh.mariana-express.com
Skype: damian.reimers

From: pauline soon [mailto:pauline_soon@mariana-express.com]
Sent: Friday, August 01, 2014 1:54 PM
To: 'Damian Reimers'; 'EXTERNAL MELL Pricing'; 'Shirley Tan'
Cc: hackney_takju@mh.mariana-express.com; 'Tijo Joe'; mio_domnick@mh.mariana-express.com; 'Francis Domnick'
Subject: RE: [Majuro] 150+ 20ft containers shipped from Majuro

Hi Damian ,

Refer to the below emails, regret to advise we are unable offer scrap service to the following ports :

1. Majuro to Jakarta, Indonesia
2. Majuro to Sydney, Australia
3. Majuro to Auckland, New Zealand
4. Auckland to Majuro

However, we can offered Ex- Majuro to Ningbo, Hong Kong & Pusan.

Please see our quote as follow :

POL	MAJURO
POD	NINGBO
CONTAINER TYPE	20'DC
COMMODITY	SCRAP METAL
OCEAN FREIGHT	USD 1000
BAF	USD 400

TOTAL	**USD 1400**

POL	**MAJURO**
POD	**HONG KONG**
CONTAINER TYPE	20'DC
COMMODITY	SCRAP METAL
OCEAN FREIGHT	USD 800
BAF	USD 400
TOTAL	**USD 1200**

POL	**MAJURO**
POD	**BUSAN**
CONTAINER TYPE	20'DC
COMMODITY	SCRAP METAL
OCEAN FREIGHT	USD 1000
BAF	USD 400
TOTAL	**USD 1400**

Terms & Condition :

1. CY/CY
2. Above rates quoted are subject to both end surcharges.
3. Validity till end of Aug 2014.

Please quote to the Customer accordingly and advise us the outcome once available.

Thank you and Best Regards ,

Best Regards,
Pauline Soon
MXE Trade
MARIANA EXPRESS LINES

Mariana Express Lines Pte Ltd
79 Anson Road, #09-03 Singapore 079906
DID: (65) 65971119
Fax: (65) 6597 1110
Skype : pauline.soon-mel

From: Damian Reimers [mailto:damian_reimers@mh.mariana-express.com]
Sent: Wednesday, 30 July, 2014 7:38 AM
To: 'pauline soon'; 'EXTERNAL MELL Pricing'; Shirley Tan
Cc: hackney_takju@mh.mariana-express.com; 'Tijo Joe'; mio_domnick@mh.mariana-express.com; 'Francis Domnick'
Subject: FW: [Majuro] 150+ 20ft containers shipped from Majuro

Hi Pauline,

Kindly assist to provide quote for ports mentioned on below email ex. Majuro port and take note on thread emails.

Thank you!

Attachment C: Examples of Container Deposit Legislation (Yap and Kosrae)

EIGHTH KOSRAE STATE LEGISLATURE

EIGHTH REGULAR SESSION, 2006 L. B. No. 8-293

A BILL FOR AN ACT

To repeal Title 9, Chapter 22 of the Kosrae State Code in its entirety and to propose new coding for Title 9, Chapter 22 to establish and regulate the Kosrae Recycling Program and to amend Title 10, Section 205(1)(d) to conform the regulation of the Kosrae Recycling Program with the new Title 9, Chapter 22; and for other purposes.

BE IT ENACTED BY THE KOSRAE STATE LEGISLATURE:

Section 1. Purpose. In order to protect the environment of the State of Kosrae it is vital that a program be established that will ensure the recycling and removal from Kosrae of much of the material that is currently treated as waste and deposited in land-fills or otherwise disposed of as trash, it is necessary to establish by law a state recycling program that will allow for the collection and removal from Kosrae of waste products in a self-sustaining manner.

Section 2. Repeal. Title 9, Chapter 22 of the Kosrae State Code is hereby repealed.

Section 3. New Coding. New Coding is proposed for Title 9, Chapter 22 of the Kosrae State Code to read as follows:

"Chapter 22. Kosrae Recycling Program

Section 9.2201. Recycling Program Established. This Chapter establishes a recycling program for the State of Kosrae whereby the State of Kosrae shall from time to time appoint a recycling agent to collect such waste materials as are designated by regulation and to the extent possible dispose of such material by sale and shipment from Kosrae.

(1) The recycling program shall be, to the maximum extent, self-sustaining so that the collection of Recycling Deposit Fees and the sale of designated waste materials will be sufficient to fund the continued collection and removal of waste material from Kosrae.

Section 9.2202. Recycling Agent. As of the effective date of this Chapter, the Recycling Agent for the State of Kosrae is the Kosrae Island Resources Management

Authority (KIRMA).

(1) A Recycling Agent shall hold its appointment until such time as a new Recycling Agent is nominated and appointed by the Governor.

(2) A Recycling Agent may only be appointed by the Governor following the Legislature's consent by resolution to the nomination by the Governor.

Section 9.2203. Regulation. The Kosrae Island Resource Management Authority shall promulgate rules and regulations, guidelines, programs, and operating principles as may be deemed proper and necessary in the light of government policies and objectives of this Chapter.

(1) The rules and regulations, guidelines, programs, and operating principles shall be in writing and shall be designated as the Recycling Program Regulations.

(2) Before taking effect, the Recycling Program Regulations must be approved by resolution of the Legislature.

(3) Amendments to the Recycling Program Regulations must be approved by resolution of the Legislature.

Section 9.2204. Recycling Deposit Fee. A recycling deposit fee in an amount specified by the Recycling Program Regulations shall be charged upon all items designated by the Recycling Program Regulations arriving in the State of Kosrae.

(1) The Recycling Deposit Fee is not a tax on imports.

(2) The Recycling Deposit Fee shall be paid by the person or entity importing the designated items.

(3) The Recycling Deposit Fee shall not apply to those items imported to Kosrae that are intended for re-export, or items imported to Kosrae for transshipment to a destination outside of Kosrae.

Section 9.2205. Recycling Fund. A Recycling Fund has been established pursuant to Title 10, Section 10.205 (1) (d) of the Kosrae State Code.

(1) There shall be paid into the Recycling Fund

(a) Any money appropriated by the Kosrae State Legislature for the purposes of the Fund; and

(b) All monies collected as a Recycling Deposit Fee under this Chapter or Recycling Program Regulations; and

(c) Any other money lawfully available to the Fund

(2) There shall be paid out of the Recycling Fund

(a) The amount of any expenditure by the State on the costs of recovering waste materials; and

(b) The amount of any advances made to the Recycling Agent for the payment of Deposits.

Section 9.2206. Payments by Recycling Agent. The Recycling Agent shall make such payments to persons or entities for those items designated by the Recycling Program Regulations as may be from time to time specified in the Recycling Program Regulations.

Section 9.2207. Advances to Recycling Agent. The Division of Finance and Administration shall process and provide advances from the Recycling Fund to the Recycling Agent within one working day of the written request for funds supported by any requirements specified by the Recycling Program Regulations.

Section 9.2208. Reporting. The Director of KIRMA shall, on or before August 1 of each year, submit to the Kosrae State Legislature and the Governor

(1) A statement showing the estimated income and expenditure of the Recycling Fund for the current financial year; and

(2) estimates of the income and expenditure of the Recycling Fund for

the next financial year.

(3) The Director of KIRMA shall, on or before February 1 of each year, submit a report to the Kosrae State Legislature and the Governor dealing generally with the operations of the Recycling Fund during the preceding financial year and containing the audited statement of accounts for that financial year.

Section 9.2209. Offenses. Any person who

(1) Willfully refuses, or without reasonable excuse neglects or fails to pay a Recycling Deposit Fee; or

(2) Willfully, with intent to defraud, claims or takes the benefit of any exemption from the Recycling Deposit Fee without being entitled to that benefit; or

(3) In circumstances not falling within either of the preceding subsections, contravenes provisions of this Chapter or any regulations made under this Chapter;

shall be in violation of the offense of Cheating under Title 13, Section 13.404 of the Kosrae State Code.

Section 9.2210. Civil proceedings. Without prejudice to any criminal prosecution, any Recycling Deposit Fee which remains unpaid after it has become due for payment shall be recoverable by the State, from the person liable to pay the Recycling Deposit Fee, as a civil debt."

Section 4. Amendment. Title 10, Section 205(1)(d) is hereby amended to read as follows:

"Section 10.205. The Revenue Fund

(1) The Revenue Fund contains all monies received by the Government pursuant to a law imposing a tax, duty or tariff, and all other revenues and reimbursements from a fine, fee, license, interest, rent, or Government service, and other

Government collection or collections by a government for the Government's benefit. A person who receives monies pursuant to this section transmits the monies within seven days of receipt to the Division of Finance and Budget for deposit in the Revenue Fund except that:

(d) The Division of Finance and Budget retains in a Recycling Fund all monies collected pursuant to Title 9, Chapter 22, and follows the Recycling Program Regulations for the disbursement of Recycling Fund monies for the refund of Recycling Deposit Fees, and the maintenance of a recycling program;"

Section 5. Effective Date. This act takes effect upon approval by the Governor or upon its becoming law without such approval.

Date: August 14, 2006

Introduced by: /s/
John Martin

Recycling Program Regulations, August 2006

1. **Authority.** These regulations are promulgated by the Director of KIRMA pursuant to Title 9, Chapter 22 of the Kosrae State Code. These regulations and any amendments hereto shall have the force and effect of law.

2. **Purpose.** The purpose of these regulations is to implement the Kosrae Recycling Program setting forth guidelines, procedures, requirements and standards for the operation of the Program and to enable fiscal control and accountability over all monies collected as Recycling Deposit Fees and all monies paid out in the course of collection of designated waste materials for recycling.

3. **Definitions.** In these regulations:

beverage means any liquid intended for human consumption by drinking;

designated collection point means any place agreed to be a place of collection for recyclable waste material in an agreement between the Recycling Agent and the State of Kosrae, or otherwise designated under these regulations.

PET means polyethelene terephalate.

Recycling Agent means the person or entity appointed by, or contracting with, the State of Kosrae to be responsible for the recycling of those waste materials designated under these regulations.

Recycling Deposit Fee means the fee charged by the State to importers of those items designated under these regulations.

Recycling Fund means the fund established under Title 10, Section 10.205 (1) (d) of the Kosrae State Code.

Recycling Material means those materials designated under Schedule A to these regulations.

Recycling Refund means the amount paid by the Recycling Agent in return for Recycling Material delivered to a designated collection point.

4. **Liability to Pay Recycling Deposit Fee.**

(a) The Recycling Deposit Fee must be paid by the importer of any Recycling Material designated under Schedule A of these regulations.

(b) Liability for the Recycling Deposit Fee arises when Recycling Materials designated under these regulations are imported to Kosrae except where;

(i) The items are imported for the purpose of re-export; or

(ii) The items are imported for the purpose of transshipment.

(c) The Recycling Deposit Fee shall be paid to any person authorized by the Director of Finance and Administration.

(d) The amount of the Recycling Deposit Fee shall be for those Recycling Materials and in those amounts specified by Schedule A of these regulations.

Schedule A

Number	Recycling Material	Amount of Fee
1.	Any beverage container made from aluminum	$0.06 per container
2.	Any glass beverage container	$0.00 per container
3.	Any beverage container made from PET	$0.00 per container
4.	Any cooking oil or other food container made from PET	$0.00 per container
5.	Any type of lead acid battery	$0.00 per battery

5. **Deposits to Recycling Fund.** All Recycling Deposit Fees collected shall be immediately deposited in the Recycling Fund. Money in the Recycling Fund may not be used for any purpose other than funding of the Kosrae Recycling Program.

6. **Payments by the Recycling Agent.** The Recycling Agent shall make payments in the amounts specified by Schedule B of these regulations, to persons or entities delivering Recycling Materials to a designated collection point at times established for collection of Recycling Material.

(a) For each category of Recycling Material the Recycling Agent will establish a minimum number of items for which a Recycling refund will be paid.

(b) For any number of aluminum beverage containers in excess of 50 cans, the number of cans collected will be calculated by volume.

(c) Recycling Refunds will only be paid for Recycling Material that is whole and in reasonably clean condition.

Schedule B

Number	Recycling Material	Recycling Refund	Minimum No.
1.	Any beverage container made from aluminum	$0.05 per container	5 containers
2.	Any glass beverage container	$0.00 per container	5 containers
3.	Any beverage container made from PET	$0.00 per container	5 containers
4.	Any cooking oil or other food container made from PET	$0.00 per container	5 containers
5.	Any type of lead acid battery	$0.00 per battery	1 battery

7. **Responsibilities of Recycling Agent.** The Recycling Agent will be responsible for:

(a) The establishing of designated collection points; and

(b) Scheduling regular collections from designated collection points; and

(c) Payment of Recycling Refunds; and

(d) Maintaining accurate accounts for all recycling transactions; and

(e) Crushing, baling or otherwise performing necessary processing of collected Recycling Material for sale and transport off island; and

(f) Contracting with other parties for the sale and transport off island of collected Recycling Material; and

(g) Hiring such staff are required to efficiently collect, process, sell and export Recycling Material; and

(h) Deposit of all funds received for the sale of Recycling Material into the Recycling Fund.

8. **Responsibility of the State of osrae.** The State of Kosrae will be responsible for:

(a) Providing a suitable site within the Okat Port facility for the processing, secure storage of Recycling Material, and office requirements at such terms as shall be specified in any contract between the Recycling Agent and the State; and

(i) There will initially be no charge for the site.

(b) Ensuring that money deposited into the Recycling Account is not co-mingled with other State monies and is used only for the Recycling Program; and

(c) Making such monies as are required by the Recycling Agent to fund Recycling Refunds available to the Recycling Agent, in cash, within one business day of the properly documented request being submitted to the Department of Finance and Administration.

9. **Funding for Recycling Program.** It is intended that all funding for the Recycling Program shall come from the collection of Recycling Deposit Fees and the sale of Recycling Material.

10. **Reporting.** The Recycling Agent, or if KIRMA is the Recycling Agent then the Program Manager appointed by KIRMA, shall prepare and deliver to KIRMA a monthly report detailing the amounts paid as Recycling Refunds, amounts received for the sale Recycling Material, other income and expenses in sufficient detail so that Director of KIRMA can prepare the reports required pursuant to Kosrae State Code Section 9.2208.

Regulation No._____

YAP STATE ENVIRONMENTAL PROTECTION AGENCY

FEDERATED STATES OF MICRONESIA

REGULATIONS

RECYCLING PROGRAM REGULATIONS

PART I - GENERAL

1.1 Purpose and Scope.

These Regulations implement the Yap State Recycling Act (Y.S.L. 7-18) and establish guidelines, procedures, requirements and standards for the operation of the Recycling Program, including fiscal control and accountability over all monies collected pursuant to the Act and these Regulations. These Regulations shall be known and may be cited as the "Recycling Program Regulations," and all previously issued Yap State Recycling Program Regulations are hereby repealed and replaced by these Regulations. These Regulations and any amendments hereto shall have the force and effect of law.

1.2 Definitions

In these Regulations, unless the context otherwise requires:

"Beverage" means any liquid intended for human consumption by drinking.

"Designated Collection Point" means any location agreed to be a place of collection for Recyclable Material.

"Importer" means a person or entity who imports Recycling Materials to Yap State.

"PET" means polyethylene terephthalate.

"Recycling Agent" means the private entity contracted or appointed by Yap State to be responsible for the recycling of those waste materials designated as Recycling Material under these Regulations.

"Recycling Deposit Fee" means the fee charged by the State to Importers of those items designated as Recycling Material under these Regulations.

"Recycling Fund" means the fund established by Y.S.L. 7-18 known as the Recycling Collection Program Account.

"Recycling Material" means those materials designated as such under Schedule A of Section 2.1 of these Regulations.

"Recycling Refund" means the amount paid by the Recycling Agent to a person or entity in exchange for Recycling Material delivered to a Designated Collection Point.

PART II - FEES AND FUNDING

2.1 Recycling Deposit Fee.

(a) Except as provided in subsection (b), and in accordance with the time frames set forth in the Yap State Recycling Act, the Importer of any Recycling Material shall pay the amounts designated under Schedule A of this Section 2.1 per container made of Recycling Material. All payments shall be made to the Yap State Division of Revenue in accordance with Y.S.L. 7-18.

(b) Those Recycling Materials imported into Yap State for the purpose of re-export or transshipment outside of Yap State are not subject to the Recycling Deposit Fee.

2.2 Recycling Collection Program Account.

(a) All Recycling Deposit Fees collected shall be immediately deposited into the Recycling Collection Program Account, which shall be a separate account in the Enterprise Fund of the State of Yap. Funds in the Recycling Collection Program Account may not be used for any purpose other than for the funding of the Yap State Recycling Program.

(b) The Office of Administrative Services shall monitor the Recycling Collection Program Account, enter into transactions with the Recycling Agent or other eligible party involving the Account, and certify any requests for disbursement of funds from the Account. Funds from the Recycling Collection Program Account shall be used solely to fund the Recycling Program.

(c) In addition to any other information the Office of Administrative Services may require, a request for the disbursement of funds from the Recycling Collection Program Account by the Recycling Agent or other eligible party shall be submitted to Finance and shall include the following:

i. Written certification by the Recycling Agent or other eligible party that payment has been properly disbursed to those individuals who turned in Recycling Materials;

ii. Supporting documentation from the Recycling Agent or other eligible party showing a detailed list of individuals who turned in Recycling Materials; the type and amount of Recycling Materials these individuals turned in; the date each individual turned in the Recycling Materials; a copy of a receipt signed by each individual acknowledging the above information and the amount of Recycling Refund received; and the total dollar amount to be disbursed from the Account.

2.3 Recycling Refund.

(a) Recycling Refunds may be obtained by delivering Recycling Materials to a Designated Collection Point at a time established for the collection of Recycling Materials.

(b) Recycling Refunds will only be paid for Recycling Material that is whole and reasonably clean and shall be paid in accordance with Schedule B of this Section 2.3. Payment by the Recycling Agent may be made by cash or check upon delivery of Recycling Materials to a Designated Collection Point.

PART III - OPERATIONS

3.1 Recycling Site.

The Recycling Agent shall be responsible for providing a site to serve as a Designated Collection Point, and as a processing and storage site for Recyclable Materials, during his term as the Recycling Agent, provided, however, that Yap State may, if approved by the Governor, designate a suitable site to be used free of rent by the Recycling Agent for such purposes. The Recycling Agent is required to keep the site orderly at all times, and must ensure that all potential pollutants are stored in a secure and environmentally sound way.

3.2 Collections.

Collections of Recyclable Material shall be made regularly throughout the year at Designated Collection Points throughout the State of Yap.

PART IV - REPORTING

4. Reporting.

On or before the fifth business day of each calendar month, the Recycling Agent shall prepare and deliver to the Yap State Environmental Protection Agency a report detailing for the previous month all amounts paid as Recycling Refunds, amounts received for the sale of Recycling Material to third parties, and any other income and expenses.

These Regulations will be effective 30 days after filing with the Attorney General and the Chief Clerk of the Legislature.

PROMULGATED BY

Christina Fillmed
Director, Yap State Environmental Protection Agency

PROMULGATED BY

James Sarmog
Chairperson, Board of Directors
Yap State Environmental Protection Agency

APPROVED BY

The Honorable Sebastian L. Anefal
Governor, State of Yap

RECEIVED AND FILED / /2014

Jonathan Tun
Attorney General, State of Yap

RECEIVED AND FILED / /2014

Dee N. N. Libian
Chief Clerk of the Legislature, State of Yap

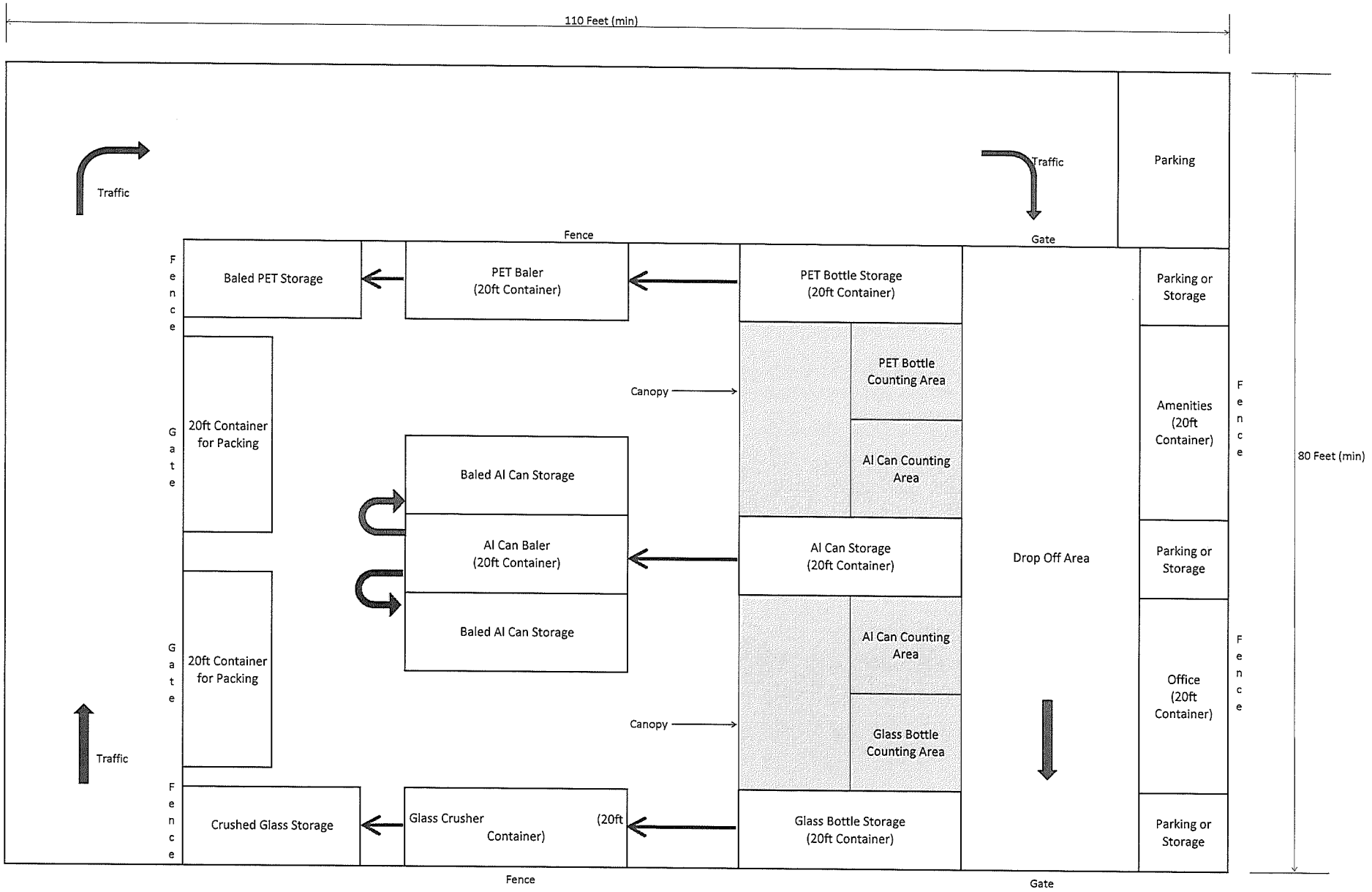
SCHEDULE A

RECYCLING MATERIAL	AMOUNT OF FEE
Any beverage container made of aluminum	$0.06 per container
Any glass beverage container	$0.06 per container
Any beverage container made from PET	$0.06 per container
Any cooking oil container made from PET	$0.06 per container
Any tin or aluminum can from canned goods	$0.06 per container
Any motor vehicle including, but not limited to, scooters, motorcycles, cars, vans trucks, buses, excavating or agricultural machinery, excavators, backhoes, rollers, cranes and tractors.	$75 per motor vehicle
Any lead acid battery	$4 per battery

SCHEDULE B

RECYCLING MATERIAL	RECYCLING REFUND	MINIMUM NO. OF ITEMS
Any beverage container made of aluminum	$0.05 per container	5
Any glass beverage container	$0.05 per container	5
Any beverage container made from PET	$0.05 per container	5
Any cooking oil container made from PET	$0.05 per container	5
Any tin or aluminum can from canned goods	$0.05 per container	5
Any motor vehicle including, but not limited to, scooters, motorcycles, cars, vans trucks, buses, excavating or agricultural machinery, excavators, backhoes, rollers, cranes and tractors.	$50 per motor vehicle	1
Any lead acid battery	$3 per battery	1

Attachment D: Draft Design of a Low Cost Materials Recovery Facility


110 Feet (min)
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for Packing
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Attachment E: UNDP Report Ejjelok Kwopej! Turning Rubbish into Resource (Leney, 2005)

Ejjelok Kwopej!

Turning Rubbish into Resource

A Waste Reduction Plan for the Urban Marshall Islands

Prepared for the United Nations Development Programme,
***Multi-Country Office*,**
Fiji

By

Alice Leney
Pacific Reef Savers,
Coromandel,
New Zealand
July 2005

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Note on Quantities and Measures:

- All dollar values are US$ unless otherwise stated;
- Exchange rate of USD to AUD is calculated at US$0.75:A$1 throughout;
- Figures are rounded where estimates are involved;
- Units used are ***metric*** units unless otherwise stated;

Preface: A Note on Report Structure

This report is produced primarily for an audience that is familiar with the problems of solid waste on atolls in general, and the RMI in particular. Conventionally, the report would commence with a detailed analysis of the existing conditions, and justification for the proposals set forth. However, as most readers will already be well acquainted with these facts, and aware of the need for action, this report goes straight into the mechanics of the proposals. This is a working document that can be used for project implementation, and as a reference document for those seeking to implement such a project. As such, it details the economics of a possible recycling operation, and the plans and costs to implement such a system. Analysis of the existing situation may be found at the back of the report, for those unfamiliar with the current situation.

This approach was specifically requested by key people in the Marshall Islands during the research phase of this report, and it is an approach with which this author fully concurs. For those interested in detailed analysis of waste streams and different options for waste management in the Marshall Islands, this information has already been laid out in several excellent reports previously produced, detailed in the bibliography at the end of this document.

This document contains five basic components:

- **The Recycling System:** how a Container Deposit System works; the income, expenditures, employment and capital equipment of a sustainable recycling business;
- **Legislation:** type of legislation required, and timeline for implementation;
- **The Public Awareness Programme:** elements required, and strategy for implementation of a concurrent program;
- **Other Waste Reduction:** simple strategies that could significantly impact quantities of waste going to landfill, principally organics;
- **Project Work Plan / Budget:** requirements of a project to put a CDL system in place, how the project management might be organised, and total budget;
- **Sustainability:** How the operation of the recycling system could be a World Class model of Sustainable Development.

The report also includes outlines of discussions with various people and organisations involved in aspects of waste management in the Marshall Islands. There are also examples of the sort of specialist equipment required for the system operation. These sections are included as Appendices.

Acknowledgements

I would like to acknowledge the assistance of many people in the Marshall Islands in the course of producing this study. The International Waters Programme, and their colleagues in OEPPC, and the Office Director Ms. Yumi Crisostomo, were very supportive throughout, with arranging meetings and providing logistical support; The Environmental Protection Authority, its Officers and Director, Mr. John Bungitak, were also invaluable in providing advice with which to produce a relevant study; and the Ministry of Public works for allowing access to the current landfill operations, and being able to closely observe the materials arriving at the landfill. The MALGOV Parks Director also provided crucial information regarding waste collections. I am indebted to Mr. Ben Chutaro for providing much insightful background information, and most of the photos used in this report. I would in particular like to thank the team at EPPSO for their hard work in extracting the essential data from the customs files; the Majuro Chamber of Commerce, who allowed me to make a presentation to their meeting, and all the many people who gave their time in the hope of improving Majuro's Solid Waste Management in the future. To you all: *Kommol tata.*

1. Summary

The Marshall Islands has a pressing need to improve its solid waste management, in particular in the urban areas of Majuro and Ebeye. There are resources in the current waste stream that can be easily turned into economic opportunities, as well as providing a solution to what is currently seen as just a problem. This approach not only saves money spent on waste management, but also creates employment and economic activity: indeed, it is even profitable.

The difficulty – and lack of - resource recovery from the waste stream is usually explained as the cost of doing so. Use of Container Deposit Legislation (CDL) can mean that the cost of separation is borne by the waste producer, and this individually is usually near zero. The resources, primarily cans and bottles of aluminium and PET plastics, are then separated at source by the people who made the waste, as these items become valuable. The design promoted here would make each can and bottle worth 5c at Refund. Items returned to designated Collection Points would thus collect Refunds. To put such a system in place requires simple legislation: an Act of the Nitijela, plus some associated regulations (examples of which can be found in Appendix II).

The system is commercially viable: a 6c Deposit is paid at import, and 1c of this 6c becomes a handling fee, which, along with the value of the materials collected, is sufficient to make the operation of the entire system economic. Running the system is projected to employ 12 full-time positions, providing employment for both sexes. The analysis of the business economics has been deliberately 'hard-headed' to avoid any unrealistic expectations; also, the ability to draw information from an existing system in Kiribati has been of great help to ensure that the resulting analysis is realistic.

A Materials Recovery Facility (MRF) must be established in order to press and pack for export the recycled materials collected. The model outline below proposes that the MRF could be run by a commercial business, under a service contract to Government. The MRF and the capital equipment would remain Government property. The recycling business would be regulated through the legislation and a contract. The establishment of an MRF, financed through CDL, in turn means that other waste materials, which would normally be uneconomic to recycle on their own, can now be recovered at marginal cost. This in turn saves more money on landfill space, and the cost of collecting and transporting waste to landfill. These savings in 'avoided costs' are considerable over time.

The introduction of CDL can also be used to encourage a new approach in the people to waste management. Much of the organic waste can be separated out, chipped, and so produce a valuable resource. The report clearly lays out how a public awareness and education campaign can be conducted that would promote and reinforce the changes. There are also several existing initiatives in the Marshall Islands that can be cooperated with to maximise this effect. Working with the IWP, for example, would allow preliminary testing and improvement on any project plan, whilst complimenting the IWP project activities.

Finally, by small extra care and effort during the MRF establishment, the project could demonstrate a World Class sustainable development model by running any diesel engines on coconut oil, by harvesting all water needs from the processing shed roof and storing in rainwater tanks, by constructing a compost toilet for human waste, and by installing a grid-connected solar power system (i.e. one without batteries) that would produce the annual electricity requirement. Thus, the entire operation can 'close the loops' on energy, water, and waste. All three of these essential elements are issues of grave concern in the urban atoll environment.

The report also contains a sample budget and implementation plan that would result in a major reduction in waste currently landfilled in the Marshall Islands.

1.2 Purpose and Scope of this Study

Dealing with today's wastes when one lives on an Atoll is a very demanding activity. Land is scarce, and the environment so very easily polluted, with the water, fresh or sea, being so close at any time. Solid Waste Management (SWM) rapidly becomes a great problem, one that is often seen as unsolvable, or else very expensive to deal with effectively. However, like most things, the solution depends on the approach to the problem.

This document comprises an Implementation Plan that uses economic tools to improve the Solid Waste Management in the Marshall Islands. Success requires a fundamentally different approach to the conventional 'problem' of waste management. Waste streams contain great resources, and the plan detailed here can capture those resources. This plan draws from similar operating systems to provide insight.

Over the last year, Kiribati – an atoll nation similar in may ways to the Marshall Islands - has put in place a large recycling operation financed through the leverage available using Container Deposit Legislation (CDL). Deposit-type systems are a recognised Solid Waste Management tool incorporating Extended Producer Responsibility (EPR), which is when the means – or cost - of dealing with the waste is included with the product. The Kiribati recycling system is financed by capturing the high value of the aluminium cans in the waste stream. This is done by giving the cans a value using a deposit system. This approach is used in many countries as a waste management strategy, and has proved very successful. The project that created the Kiribati system was financed through its implementation stage by a coalition of donors, the largest being the UNDP. Part of the Project Specification was to produce a model that could be used in other Pacific Island counties should that be feasible. The Republic of the Marshall Islands (RMI) suffers from similar waste management problems to Kiribati. This feasibility study for the RMI draws from the experience of the Kiribati model as Kiribati has now six months of full commercial operation. Also, it is apparent from the Kiribati experience that benefits to SWM are wider than just the materials included in the deposit refund scheme.

This report will thus evaluate the logistics, costs and feasibility of establishing a recycling project in the RMI. It proposes that Container Deposit legislation would provide the financial and material flows required to operate a comprehensive recycling system for the RMI, and one that requires no external financing after establishment, and one that can operate as a business, under contract to Government.

1.3 Objectives of this Study

- Develop a financially sustainable recycling operation that provides employment to Marshallese people;
- Recover resources from the waste stream, and reduce the effort required by Government to collect and landfill wastes.
- Produce an example of the Private Sector providing public services under contract to the RMI Government.
- Reverse the ongoing accumulation of waste in the sea, beaches and other land areas of the islands of the RMI.

1.4 Research Required

- Issues concerning the drafting of suitable Container Deposit Legislation for the RMI;
- Identify types of media available for a public awareness program associated with recycling, and cost typical activities using those media;
- Outline the elements of a public awareness campaign to compliment the setting up of a recycling operation;
- Identify local organizations with whom partnerships might be formed to achieve a successful recycling operation;

- Identify any current activities on SWM that any recycling project might cooperate with;
- Suitable equipment that may be required by the project;
- Analyse data from any previous waste stream analyses;
- Collect data on imports, and analyse data to indicate material flows for recycling;
- Identify current recycling activities within the RMI;
- Identify markets for materials collected for recycling;
- Identify shipping costs to markets identified;

As a result of the research conducted above, contained at the relevant sections of this report, the following is also produced below:

- ❖ A Project Implementation Plan for the practical and logistical elements of the recycling program.

- ❖ Advice as to which materials to incorporate in the system;

- ❖ Quantities of recyclable materials expected to be available;

- ❖ Cost estimates of a Materials Recovery Facility in Majuro;

The necessary research to produce this report was conducted in the twenty days between June 3rd and June 23rd 2005 in Majuro, Marshall Islands.

2. The Recycling System

Container Deposit Legislation (CDL) systems are fairly common all over the World, but have not been used much in the Pacific untill recently. They use a small deposit paid on an item at sale or import, which is then refunded when the item is bought back to a collection point for recycling.

2.1 What is a Container Deposit System?

A 'Container Deposit System' is where Beverage Containers (drink cans and bottles) have a deposit included in with the purchase price. When the cans and bottles are returned to designated collection points, whoever brings them in gets a refund. The deposits paid are usually only a few cents; and refunds commonly are slightly less than the deposit, so that the cost of collecting and processing the waste containers is paid for (a 'Handling Fee'). These systems have often been used to control litter, but as waste management becomes more and more expensive, using a deposit / refund system can massively increase the amount of cans and bottles collected for recycling, so providing employment, and saving expensive landfill space. A Container Deposit System is an example of Extended Producer Responsibility (EPR), where the producer and purchaser of a product that becomes waste is economically involved in dealing with that waste. EPR is an economic tool to make sure that those who make the waste pay for the solution. EPR puts a value on waste.

These systems can use either the shops that sell the products as collection points, or designated Collection Points that only collect the specified waste items. Using the shops is fine in a highly developed economy with sophisticated logistics systems, and Government can be completely uninvolved, save to pass legislation, but in a simpler commercial environment, with many small stores involved, this becomes harder to arrange. The model outlined below uses the designated Collection Point model, as used in South Australia and Kiribati, as this is relatively easy to set up, and operates well in a simple economy.

2.2 Advantages of CDL systems

Container Deposit systems have many advantages that accrue to Government, business, and the wider community. All these advantages are effectively financed by a tiny charge on each beverage container that participates in the system, and the resulting very low cost of recovering valuable materials. Advantages include:

- Dramatic reduction in litter where beverage container litter is a problem;
- Very high recovery rates for beverage containers for recycling;
- Increased national export income in small islands, in particular from recovered aluminium;
- Employment generation;
- Community fundraising potential by organisations who collect beverage containers from their constituencies;
- Generation of sufficient income to make a wider recycling operation self-sustaining;
- Reduce the quantity of garbage requiring collection by local Government;
- Reduce the quantity of garbage requiring landfill, thus increasing the life of the landfill, and decreasing the landfill cost per year;
- Normally 'uneconomic' materials can be include in the scheme for recycling;
- Recycled materials flows become very consistent.

The indirect effects are that that the waste stream now becomes perceived as a source of resources, fundamentally changing the way in which waste is dealt with. Also, once CDL is in place to deal with beverage containers, additional materials and items can be specified that can be recovered for recycling, through revising Regulations, at marginal additional cost.

2.3 How might a CDL system work in the Marshall Islands?

A specified deposit, let us say 6 cents, is paid at import for every aluminium drink can or PET plastic (No.1) bottle. The money, paid by the importer, is collected by the Customs when filing an Import Entry. The money is then deposited into an escrow account, often referred to as a 'Special Fund', which is set up by the legislation under an Act of the Nitijela.

The money in the escrow account is only available for refunding the items which have had a deposit paid, or associated recycling activities. The Importer has now paid 6 cents deposit per item, and must pass the 6c deposit on to the stores, who must pass it on to the consumer. *The deposit belongs to whoever owns/holds the can*. The consumer drinks the drink, collects their cans, and brings the cans to a Collection Point run by the recycling system 'Operator', and receives 5 cents per item, or effectively 25c for 5 cans and bottles. This rate of Refund is determined in the Regulations under the Container Deposit Legislation. If the minimum payout is set at 25c for five items, then this greatly simplifies refund payments and monitoring, as cash is paid out to people who bring in cans for refunds, and these cash payments must be carefully reconciled with items collected and paid for by the system. (The fact that the US$ system uses 25c coins is the determining factor in the Marshallese case.) The Deposit/Refund only needs to be large enough to encourage a high return rate of containers, as that is its sole purpose.

The recycling system 'Operator' then claims back 6 cents for every item refunded, from the escrow account administrator. Thus the 'Operator' receives a 1c 'Handling Fee' that the Operator keeps as a contribution to running costs. This Refund is claimed by completing a specified claim form, which is submitted to the escrow account administrator, (possibly the Minister of Finance), who administers the Fund. The recycling system 'Operator' crushes the material and exports and sells it for recycling, and receives payment for the value of the materials exported. The 'Operator' must pay all costs of operating the system, and crushing and exporting materials, from the income received from the handling fee and the money from selling the materials. The Handling Fee component is essential to create a system that recycles items other than aluminium cans, as only aluminium cans are worth collecting if there is no handling fee in place.

A schematic of the system proposed might look like this:

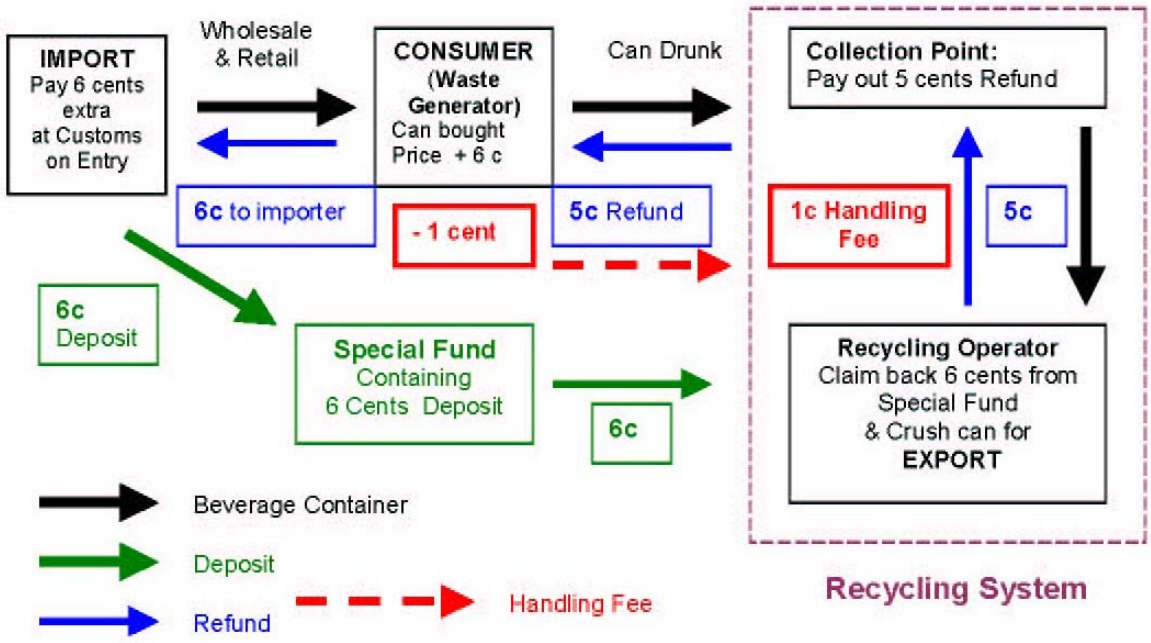

Figure 1: Container Deposit System for the Marshall Islands

Unredeemed deposits are those deposits paid into the Fund for items that are never returned (thrown in the sea for example). That money will build up over time, once the system has settled down. The legislation should specify that money in the Fund is only available for Refunds or for capital equipment replacement for the Recycling system equipment.

The recycling system envisaged would collect drink containers of Aluminium cans, glass bottles, and PET (no.1) plastic. It would also be able to recycle HDPE (No.2) plastic bottles, and cardboard cartons, although these would not be part of the deposit system, as initially there is no advantage in making the system too complicated. Aluminium will provide the bulk of the revenue, and the operation uses this high value material to effectively subsidise the recycling of less valuable materials, such as glass bottles and cardboard. The system is expected to generate about twelve full time jobs, plus generate fundraising opportunities for schools and churches and the like through collecting cans and bottles, from their constituents for refund. It will also create some informal jobs through people who make a living by searching out cans and bottles.

2.4 System Monitoring

It is essential with such a system that there is a full monitoring program. The greatest danger is that of paying out refunds twice! Kiribati has developed a simple system that is easy for all staff to comply with, yet provides a tight monitoring of material flows. This not only ensures that cans and bottles are not bought twice (by leaking out of the 'Back Door' and round to the collection point again), but also provides ongoing data for Refund Claims from the Deposit Fund, and information to the operator regarding when Full Container Loads (FCLs) will be ready for shipment. The system used in Kiribati will be readily transferable to the Marshalls, with little, if any, adjustment required.

2.5 Recycling System Economics

Below is an analysis of the practical economics of such a system as described above. Figures used have all erred to the conservative side, so that a 'hard-headed' approach is taken to the business side of the recycling operation. The next section – 3 – looks at the business expenses expected to operate the system.

2.5.1 Items in waste stream suitable for CDL and recycling

The main types of beverages widely available in the Marshall Is. are: Beer, Soda, Water, Fruit Juices, Wines & Spirits, and Mixers. Of these, soda in aluminium cans is by far the largest group, with beer in cans second. Detailed data for the other groups is not available as to quantity, but observations of bar sales, and larger stores stocks, indicate that a considerable quantity of PET (No.1 plastic) is available; also HDPE (No.2). Both materials are easily recycled. Quite a quantity of glass exists, principally as beer bottles, soy sauce bottles, wines and spirits. Glass is readily recycled, however, it is low value and difficult to handle, and also prone to shipment rejection as a high level of product quality is demanded. Glass can be used in the Marshalls, once crushed, as a construction material for non-structural concrete, displacing coral mined from the lagoon. This coral displacement effectively reduces the damage that coral mining inevitably causes to local ecosystems.

2.5.2 Potential Material Flows

Beer, Soda, and Water beverage containers comprise the bulk of the materials of interest, comprising principally aluminium and PET, and so below is an economic analysis of a potential system using only those items. If glass containers were added, income would increase without increasing costs much. Whilst there is some data for the main beverage categories, it is not systematically collected. Thus there is some uncertainty over the actual amounts of beer and soda being imported into the Marshall Islands. The following numbers all refer to FY 2004, and are extrapolated from Import Entry data for the months of May and June, and then annualised.[1]

[1] Data provided by EPPSO, pers comm Carl Hacker, Director, 26/6/05

2.5.3 Beer Cans

Discussions with Shipping Agents initially suggested that the figure for beer was perhaps twelve containers per month. Recently, beer consumption has dropped due to increase taxation of 25c per can that has been levied to support the CMI. At 12 containers per month average, this would equate to around 5.8 million cans/bottles per year.

From a brief survey by the Director of Customs of his data regarding beer imports, he estimated around 6 containers per month in FY 2004. This would equal around 2.9 million cans/bottles per year of beer. Two busy local bars surveyed consumed about 175,000 cans/bottles per year together. Much beer is consumed outside of bars.

Initial work by EPPSO indicated 44 million cans per year, however, this seemed highly unlikely. Revised work resulted in a figure of 785,000, based on figures for May and June 2004. This seems low, considering that Kiribati consumes 4.5 million per year, with a much lower per capita GDP but a similar urban population.
Looking at data for soda imports[2], May and June are quiet months, so that may be the same with beer. However, the figure of 780,000 for beer will be used, although it is expected that this is low.

2.5.4 Soda Cans

From a brief survey by the Director of Customs of his data, indications were that there were about 116 containers of soda imported in 2004, equal to about 5.9 million cans. From EPPSO data for May and June 2004 again, a figure of 4,965,000 is obtained per year.

Again the lower figure will be used, although, from the Customs data of containers of Soda, May and June do appear to be quiet months[3] (see Appendix V for raw data).

2.5.5 Water

EPPSO data indicates 765,000 bottles of water imported per year. The Director of Customs information indicated about 11 containers per annum, which is reasonably consistent with the EPPSO figure. Added to this is around 200,000 bottles produced by Pacific Pure Water, the local water bottler, to give a figure of about 960,000 bottles of water. These are all PET.

2.5.6 Totals

780,000 cans and bottles of beer, plus 4,960,000 cans of soda, plus 960,000 bottles of water give a potential flow of 6.7 million items. Given that virtually all the Soda is in cans, and all the water is in PET bottles, and most of the beer is in cans, that gives us figures of around 5.2 million aluminium cans available. This equates to over 80 tonnes of aluminium. PET is harder to calculate given the varied size of PET bottles, but would be at a minimum 40 tonnes.

2.5.7 Markets

Ready markets exist for aluminium cans, PET and HDPE plastics, and cardboard. Typical prices paid, per tonne in Australia, in mid 2005, are:

- ⇒ Aluminium cans: A$1,350[4] US$1,000
- ⇒ PET/HDPE: A$350[5] US$262
- ⇒ Cardboard: A$80[6] US$60

These represent the current prices paid to the buyer of materials from the KSWMP. This buyer buys from several PICs and accepts materials freight paid, FOB, and handles all clearance and trucking on the Australian end. Enquires with other recyclers indicate that prices are competitive, especially given that the seller in the Pacific Islands has no need to handle any operations at the receiving end.

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[2] Appendix V, Table IV
[3] ibid
[4] Macs Metals, March 24th 2005 to KSWMP payment advice
[5] Alan Morgan, Macs Metals, pers comm.15/2/05
[6] ibid: pers comm. 25/7/05

2.5.8 Expected Recovery Rates.

The experience of Kiribati, and other countries[7], is that where there is a ready system to accept the cans and bottles for refund, very high rates of return can be obtained, especially where there is high unemployment and low wages. Working on an assumption that a 90% return rate will be achieved in an economy such as the RMI (in practise this should be higher), the above figures indicate that 6 million items will enter the system. At one cent per item, this equals $60,000. Aluminium would amount to around 72t, and PET to 36t.

2.6 Price Impact of CDL as a Percentage of Retail Cost

Is this going to impact prices? Beer varies in price typically from $1.50 to $2.50, with a median price of $1.82 from the several outlets surveyed. At a 6c Deposit, this would be about 3% of the price, an amount easily lost in the 'noise of varying prices. The cheapest Soda is hardest hit, with some cans being sold for 49c. Given the huge prevalence of diabetes in the Marshalls, and the fact that a can of Soda typically contains 10 teaspoons of sugar, the price increase can only be a good thing if it discourages a little marginal consumption. Soda at a typical small store price of 75c would be hit by an 8% increase. See Appendix V for beverage price information.

Six cents might appear an odd amount for the retailers to handle. It would remain to be seen how much the price increases actually were. In Kiribati, a 5c deposit has seen price changes vary from zero to ten cents. For the operators of Bars and Hotels, places where beverages are consumed on the premises, there is no need to change prices, as they can retain the cans and bottles for Refund from the recycling system. In this case the Bar pays the 1c Handling Fee (i.e. it costs the bar 1c), but as the bar is effectively the Waste Generator, this is perfectly in order, as the bar gains from generating waste that the wider society must deal with. Bars typically charge round figures for prices for ease of operation, just as the recycling system might chose a 6c Deposit and a 5c Refund for ease of operation.

[7] Independent Review of Container Deposit Legislation 2002 Dr. Stuart White, Institute of Sustainable Futures, Sydney, Aus.

3 The Recycling Business

Taking the system detailed in the previous section as the model to be implemented, we now look at the costs of operating that business, and the potential for revenue generation. Working on an assumption that a 90% return rate will be achieved (in practise this may well be higher), the above figures indicate that 6 million items will enter the system. At one cent per item, this equals $60,000. Aluminium would amount to around 72t, and PET to 36t. This analysis below is ignoring income from glass bottle handling charges for beer, wines and spirits, and also PET Vodka bottles, which are common in Majuro. These would all add positively to the overall economics. Shipping densities have been pitched low, so as to give a maximum cost picture for shipping; these densities can easily be improved, but depend on equipment purchased. The point here is not to take an overly optimistic scenario, as this may give an unrealistic picture.

3.1 Income

At a 90% recovery rate, and using current market rates, basic income would look like this:

⇒ 72 tonnes Aluminium cans	$72,000
⇒ 36 tonnes PET bottles	$ 9,400
⇒ 1c Handling Charge 6 million items	$60,000
Total	**$141,400**

3.2 Cost of Business

Of course there are considerable expenses involved in a national recycling operation that would handle, on the above figures, about 24,000 items per day on average, or 120,000 per week. These costs fall into three basic categories of wages, shipping, and operational overheads:

3.2.1 Wages

Using the Kiribati operation as a guide, which handles about 20,000 items per day on average, it is estimated that 12 positions might be required:

- Collection Point Operators: the people who measure the items bought in for refund at the Collection Points, and pay out the money for refunds. This position has to handle, and account for, quite a quantity of cash. It is similar to those taking money behind a bar or in a busy store. In Kiribati, women fill all these positions. It is estimated that seven positions could be created, but this includes Ebeye, and perhaps Jaluit. The Collection Point Operators will also act as labourers in the MRF crushing cans and bottles when they are not at Collection Points, as many Collection Points do not require 5-day operation, opening for half days two or three times each week.
- Truck Driver: The truck that collects from the Collection Points on Majuro, and delivers to the MRF. A single position.
- Labourers: one as a Truck Driver's Assistant; one full time in the MRF, or perhaps at Ebeye crushing cans.
- Foreman: in the MRF.
- Manager: overseeing the whole operation.

Below is an estimation of the annual cost of those positions, based on PSC rates for similar government positions. This includes MISSA contributions from the system Operator. Total wage bill, per annum, at these rates, is **$78,000**.

Position	Labourer	Driver	Collection Point Operator	Foreman	Manager
No. reqd.	2	1	7	1	1
Salary	$4,600	$5,900	$5,300	$7,800	$18,000
Total	$9,200	$5,900	$37,100	$7,800	$18,000

Table I: Estimated number of positions and wage costs

3.2.2 Shipping Costs, including Container Movements

Such an operation as this requires continual movement of empty containers into the MRF for filling, and full containers to the Port for export. Empty shipping containers will need be moved from the Stevedore yard at the Delap dock, to the MRF, and then back after packing. This requires two lifts and two transports with a side-lifter. Chief Container Service, a division of Swire Company, one of the world's largest shipping companies, can offer a rate to Australia of $900, plus Bunker Adjustment Factor (BAF), which will change depending on world fuel oil prices. Experience with Kiribati indicates that if container turnover is reasonably brisk, container rental is not required. These costs are summarised in Table II below

Item	Stevedore Charges	Lifting Charge (two lifts)	Side-lifter Transport (two trips)	Freight CCS	BAF	Total
20ft FCL	$52	$80 ($40)	$220 ($110)	$900	$270	***$1522***

Table II: Cost of shipping to Australia

Shipping 72 tonnes of aluminium cans, at 10 tonnes[8] per 20ft FCL, would require seven containers. 36 tonnes of PET, if shredded, might require six containers[9]. A total of thirteen containers at $1522 each would require about **$20,000** for container shipping in total.

3.2.3 Operational Overheads: Monthly Costs

Monthly operational expenses typically include: diesel fuel, electricity, machine maintenance, workforce support (clean up soap, tea, coffee, cold water, toilet paper,) Site Office costs (paper, toner, files, account ledger books, computer repairs and support), tools, locks, vehicle repairs, site maintenance.

Some operational costs can be hard to predict. To gain an estimate, reference is made to the Tarawa MRF and associated Collection Points, where there is very comprehensive data for 6 months of commercial operation. Costs in Tarawa are on the whole lower than in Majuro, and in A$; the workforce comprises 10 persons. Annualised costs of the Tarawa System come in at A$ 9,400/yr, or just over $7,000, or around $600 per month. In Tarawa, a 2 ton truck is travelling a 40km (25 mile) road five days a week, similar to Majuro. The price of fuel is roughly comparable as Majuro, and in Kiribati the fuel cost is about $200/mth. Price of electricity is A$0.47kWhr, approximately double the Majuro cost, and the bill is around $100/mth. However, equipment in Majuro would likely be bigger due to larger volumes of material to process, so the difference might soon evaporate. Given the lower value of the A$, and the slightly larger size of the operation in Majuro, an estimated figure of **$12,000/yr,** or $1,000/mth should allow plenty of room for error.

3.2.4 Operational Overheads: Annual Costs

Land Rental

Land Rental charges are not easy to estimate, given the site is currently unknown. A suitable site would be a piece of land that has previously been a landfill site, but is still unstable enough that building cannot yet be done at the site. Using such a piece of land as an MRF for a few years would allow settling so that it would be useful for more permanent structures later. A figure of $10,000/yr per acre has been used. Perhaps two acres might be required for an MRF. Land Rental would thus be **$20,000**

Insurances

There are several insurances required for a competent commercial operation, principally vehicle, Public Liability, and Workers Compensation.

After discussions with a local insurer, based in Guam, the following figures were obtained. These are for indicative purposes, as actual insurance costs can only be obtained with a

[8] 10t/20ft FCL is using a very small press; a more suitable item would get 15t per 20ft FCL.

[9] Estimated; depends on shredder used.

working operation with specified insurance history, equipment and costs. With that caveat, the following provides an indication of costs:

New $50,000 truck, fully comprehensive,	$2,300/yr
or New $75,000 truck, fully comprehensive,	$3,300/yr
$1million Public Liability	up to $5,000/yr
Workers compensation, High Risk business (on a $80,000 annual wage bill),	up to $2,000/yr
Total Insurance per annum	**$10,300**

3.3 Total Expenditures

Annualised estimated expenditures are thus estimated at:

Wages	$78,000
Shipping	$20,000
Monthly Operational costs/yr	$12,000
Land Rental	$20,000
Insurances	$10,300
Total	$140,300

3.4 Profit & Loss Analysis

This figure is of course very close to the projected income. However, significant savings can be made by using a crushing press for aluminium cans that puts 15t per 20ft container. There are no doubt other areas where significant savings can be made, especially by an established business.

Also, experience suggests that the figure for beer consumption used is very low, and increased quantities of beer cans will add significantly to income as they provide both 1c per unit, plus the value of the aluminium at 1.5c each, whilst adding very little to expenditures. There would also be other income from glass beverage containers, primarily beer, wine and spirits bottles, and also some other PET containers, such as vodka bottles. These could easily amount to perhaps half a million per year, given that beer imported from New Zealand and Australia is almost exclusively in glass.

The projections for the Kiribati system gave a similar slim margin from the initial paper study, but once the system was operational, surplus was found to be much more in line with a commercially acceptable level, as figures used had been, as here, on the conservative side.

3.5 Capital Investment

Capital investment is required in machinery for crushing and baling; a truck for Collection Point collections; A portable site office building for MRF administration and lunch room for workers; an open shed area for processing of materials, free from sun and rain; Shipping containers for conversion to Collection Points; Signage; office equipment; pallet truck, sack trolleys, and some hand tools.

The main items comprise:

- A press for baling cans, ideally of about 3 HP suitable to gain an FCL weight of about 15-16 tonnes;
- A vertical baler of about 10 HP suitable for baling PET and HDPE plastic bottles and Cardboard cartons;
- A 12” Chipper that can chip PET and HDPE, and be used to chip Green Waste;

- A Processing Shed which can accommodate the presses and also allow truck unloading and parking in bad weather;
- A Portable Building of shipping container size, to act as a site office and workers lunch room;
- A Compost Toilet facility (to avoid expensive sewer connections);
- Water tanks to collect rainwater from roofs (to provide water without urban reticulation connection);
- Six 20ft shipping containers in good condition for conversion as Collection Points
- Five 20ft shipping containers to serve as holding / lock-up areas for tools and materials in MRF;
- Desk top Computer, and printer/scanner/photocopier/fax machine;
- Electrical wiring for shed and office;
- Water piping for rain water collection system with washing taps;
- High pressure water washer for truck and machine / processing area wash-down;
- Wool sacks for handling uncrushed cans and bottles;
- Wire frames for measures;

If the operation of the Container Deposit system is contracted out to a Private Sector Operator, who has a management contract with the RMI, *then all the capital equipment remains the property of the RMI.* Under this scenario, Capital Investment is made by the RMI, perhaps with the assistance of a Donor Agency. These items are costed out in the Project Budget in Section 7, and typical examples of equipment are detailed in Appendix III**.** A full costing analysis has not been done, but prices are indicative.

3.6 Suitable site for an MRF in Majuro

The study has identified potential sites of interest, but they are in private land ownership it is believed. No landowners were approached as part of this study, thus potential sites are not identified. Areas recently landfilled can be suitable sites whilst the land is settling, as an MRF requires no permanent structures, and the operation of containers and trucks would help settle the land for future use. A good MRF site would be close to Delap Dock for exports.

A suitable site needs good road access for large trucks carrying containers. It should not be adjacent to residential areas as it is an industrial facility. It needs to be fenced, and secure enough that cans and bottles cannot be removed at night or weekends and resold for refund. Ideally, it would not be west of the Delap dock, to avoid unnecessary container traffic through the urban D-U-D.

The site needs to be big enough to easily turn container-carrying trucks around without difficulty, and plenty of room to park containers awaiting packing. It should also be readily accessible to the public for vehicles bringing large quantities of cans and bottles in for recycling, as well as other materials that the MRF may be handling. The MRF needs access to a 3-phase power supply - for best results - and telephone lines. None of the buildings required need permanent foundations, even the big processing shed. This allows the MRF to be re-located at a later date should completed landfill space be available, and the existing site ready for reuse. In this way, the MRF can be used as a land recycling facility too.

4. Container Deposit Legislation

To put into operation such a recycling system as described in the previous section requires legislation, passed by the Nitijela, that requires a deposit to be paid on certain specified items, i.e. aluminium drink cans, PET drink bottles, and glass drink bottles. These deposits would best be paid at import by imported drinks, and at the point of import of the pellets of PET to blow bottles for locally produced water sales.

4.1 Outline of the Legislation

A look at the Kiribati example will help. In December 2004, The Maneaba Ni Maungatabu, the Parliament of Kiribati, passed the Special Fund (Waste Materials Recovery) Act. This Act set up a Special Fund, into which deposits are paid by specified items. The items that are required to pay a deposit are then specified in Regulations promulgated under the Act. A copy of the Act, is included at Appendix II**.** The specified items required to pay at import are beer, soft drink and water cans and bottles, and also lead-acid batteries. The money in the fund can only be used to pay refunds on deposits already paid. (Any money that remains in the fund, that is unredeemed deposits, is also specified to be only available for SWM activities, and in practise it is used for capital equipment replacement for the recycling system.

4.2 Process Required to Enact Legislation

In the RMI, in order to put such a piece of legislation in place, the following procedure would need be followed:[10]

- ⇒ A Cabinet Paper on the subject, proposing the legislation as an effective means to address the solid waste issue, and save the Government money in the future, needs to be presented to Cabinet for their consideration;
- ⇒ The Cabinet accepts the Paper's recommendation to draft legislation, and directs the Office of the Attorney General to draft suitable legislation;
- ⇒ Legislation is drafted, and presented to Cabinet through the Office of the President;
- ⇒ Cabinet advises the Attorney General as to any changes it requires in the legislation;
- ⇒ Final Draft goes back to Cabinet;
- ⇒ The Legislation is placed on the Government Legislative Programme for the next session of the Nitijela;
- ⇒ Nitijela conducts a first reading, and may pass the Bill for review;
- ⇒ A Public Hearing is held on the Legislation, where the Public can make submissions;
- ⇒ A Committee then reviews the legislation, and may recommend a Second Reading;
- ⇒ The Bill is presented again to the Nitijela (possibly with some amendments as a result of the previous steps) for a Second Reading;
- ⇒ If the Bill passes, it receives Assent from the President and becomes an Act and law.

This entire process can clearly take some time. However, as can be seen from the Kiribati legislation**,** the Act itself need not be complex, the detail being in the Regulations. This approach allows more flexibility both for Government, public and business to fine tune the system to achieve the best outcomes for the entire community, without having to go back to the Nitijela to make any changes, as these can be done by the Government of the day through consultations and the prescribed regulatory process.

[10] As described to the author by the Assistant Attorney General of the RMI on Tuesday 14th June 2005

4.3 Regulations

Any Regulations proposed under the Act would need to follow a similar process:

- ⇒ Regulations are presented to Cabinet for approval by the Office of the President;
- ⇒ Cabinet sends the Regulations to the Office of the Attorney General;
- ⇒ The AG checks them for administrative procedure and constitutionality;
- ⇒ The Regulations are posted, with 30 days for the Public to respond;
- ⇒ If all acceptable, the Regulations are Published and Enacted.

4.4 Time Frame for Passing Legislation

The Nitijela sits twice a year for fifty days each sitting, starting in January and again in August. It is quite feasible for the First and Second Readings, and associated Public Hearings and Committee Stage, to occur during a single sitting. This would of course require that the legislation had been agreed by Cabinet and drafted before the sitting commenced. This in turn would require that a Government Department had proposed the Paper on the subject, and done the research required to have a clear idea of what form the Act would take. It seems likely that the appropriate Government agency to present a Paper to Cabinet on CDL would be the Office of Environmental Planning & Policy Coordination. There has been close cooperation with the Director of OEPPC during the course of this study research phase.

The logistics and planning of any project to implement a CDL system in the RMI will be dictated by the schedule associated with passing the required legislation. This is an essential, and defining, element of such a project, and determines all other planning aspects.

The Kiribati model is very simple in that it allows the details to be dealt with later, and adjusted as circumstances change. This is of great advantage when initially drafting the legislation for a system not yet in operation. It also allows more time to work out the details of the Regulations, whilst the Bill is working its way through the legislative process. This allows for more time for consultations with the Community whilst the ball of CDL is already rolling.

The approach of the detail being contained in Regulations also allows the Government great flexibility in the future to deal with some other SWM issues such as scrap vehicles and scrap air conditioners, both of which are an increasing problem in urban Marshallese areas, but, as the price of metals climbs steeply, may be also recovered using the same legislation. The cost of recovery to a processing facility of such materials is frequently the limiting factor in recovery, yet the cost to the Government, and by extension, the wider community of taxpayers, is great in landfill space or pollution and health effects.

5. Public Awareness Programme

Any project of this nature requires a publicity program to run alongside it to educate the Public to the changes in waste management. The new recycling system can also be used to encourage an overall new approach to the way people create and manage waste. If conducted carefully, a public awareness program can capitalise greatly on the new mood that real change is happening. The primary element, and the one that has most effect on all other aspects of such a program, is to choose a local *Kajin Majol* name for the new system that is readily accepted by the population[11]. Once this is in place, the rest may come much easier.

5.1 A *Kajin Majol* Name

This must be short, lyrical, and ideally humourous. For example, in Kiribati, the name developed was *Kaoki Mange!*: it rolls off the tongue, and it means 'Send Back the Rubbish!' which provided a simple and humourous answer to Kiribati famous beer can litter problem. It also described the system of exporting waste for industrial recycling far more effectively than earlier attempts to develop a local language word for recycling. The name embodies both the solution to the problem, and the process of dealing with the waste. This slogan was developed though informal short workshops with local NGO educators, people who work with public education on a daily basis.

5.2 Media Used in Public Awareness

A public awareness program should work primarily through the three available media of newspaper advertisements, radio spots, and simple TV adverts for local cable TV use. Typical budget requirements can be found in the Implementation Plan in the Table at 7.6. Cost are based on a nine month saturation coverage of one newspaper advert per week in the Marshall Islands Journal, four radio spots per day on V7AB AM (free spots for community announcements) and the top FM radio Station in Majuro and Ebeye, Emon FM, and a daily slot on the Public Announcements on Marshalls Broadcasting Company (MBC) for 40 weeks.

The other area that would be very fruitful is to develop a suitable play of 20 minutes or so duration that could be shown at schools and any appropriate public event where many people gather. A crucial factor of Play development is the writing of one or two songs that contain within them the signature 'jingle' which can then be used for the radio and TV spots. This is an essential component of the whole process to develop a local name and at least one motivational slogan to tag the recycling system. This must be developed early, at the beginning of the whole program.

5.3 Communications Strategy

The overall aim of communications is to condense the activities and purpose of the recycling system to a name, and one or two slogans. For example 'Don't Drink and Drive' is well understood in many countries as to mean: 'do not drink excessive amounts of alcohol and drive vehicles as that is how people get killed, and your life will get in a big mess one way or another if you are involved in such accidents'. It does not mean "Don't drink anything and drive anything" which is literally what it says. Similarly, the aim here is to get people to participate in the recycling system because they see it as overall to their personal - and their community - advantage. Ideally, it shows that *not* to do so is being anti-social in some way as it is contributing to the degradation of life in the Marshall Islands. To do this takes a degree of skill. However, there are some simple steps along the way that can help.

[11] The title of this report is NOT proposed as that name!

Overall Objective:

Make the recycling system an integral part of daily life in the Marshall Islands.

Aim:

To provide a small set of visual and aural signs that become universally recognisable in the Marshall Islands that identify the recycling and minimisation of waste materials.

5.3.1 Give the Project a Kajin Majol Name

This is the number one most important aspect that will likely define the real success of a public awareness program to run alongside the introduction of CDL.

Step 1:

Convene a small working group of media and public awareness professionals and agree on a name for the project in Marshallese. Not more than three words. Should be snappy.

Step 2:

Test this name on a few local groups: school kids, teachers; media people; educators; then the general public through a small survey. This need not be a long process, as poor slogan will soon show up negative.

Step 3:

Run a week of two simple Radio Spots a day and then survey briefly to see if people remember the slogan at all.

5.3.2 Develop a Recycling Play

A Play is a very effective way to reach a lot of people who are not so use to absorbing information through written media. The Play will also provide songs for the Radio Spots that are developed.

Step 1:

Commence development of a recycling play once step two above is reached. Choose a local group who have experience in this kind of public awareness work.

Step 2:

Once there is confidence in the name, develop a song or two that are part of the play, but with a good 'jingle' aspect, so that it can be used in the radio and TV spots.

Step 3:

Once the play is rehearsed, play it a few times to schools to test it, and modify to suit.

Step 4:

As the theatre group become comfortable playing the song, take them to a recoding studio and record the Play songs.

5.3.3 Make Radio Spots

Radio spots are a very effective and cheap way to achieve high visibility for the project. Also, as they are not obtrusive, they provide a way to daily reinforce the message. Radio can also reach a large number of people, especially in the Marshalls where there are few radio stations.

Step 1:

Take the Play song recording, and cut out suitable bits to bracket a message that pushes the name, and contains a message on waste. Aim at 30-second spots, to keep the message snappy.

Step 2:

Make more spots, and always include the local name along with different messages.

Step 3:

Try out new slogans and see what 'sticks'.

5.3.4 Newspaper Adverts

Develop Newspaper adverts that follow a standard, easily recognisable format in which the name and slogan are dominant, but allow insertion of different messages. Develop through time a visual 'Logo' device that can be used subsequently on project sign boards and Collection Points to identify recycling activities on the street.

5.3.5 Make TV spots

TV ads in the Marshalls are primarily in the form of static public announcements on a 'endless' roll that continues for 24 hours. The TV ad can be drawn from materials used to make the Newspaper ads. Simple Community Service TV ads will use the local name and slogan predominantly. TV work will involve developing visual signs, as will newspaper adverts.

By starting with the naming process, and then the Play, and then the Radio spots and Newspaper ads, a consistent stream of experience builds up. It is very important to be consistent with messaging across all media, whilst using the particular media's strengths in creative ways.

5.4 Overall Costs

Costs for developing a play are not known at this stage, but other Media costs in Majuro are detailed in Table III below:

Media	Unit	Cost/unit	Frequency	Day or weeks	Total cost
Radio spots Emon FM	30sec	$2.25	4/day	270 days	$2,430
Radio spots V7AB	30sec	free	4/day	270	$0
Marshall Is. Journal	½ page	$200	1/week	36wks	$7,200
MBC TV	24 hr	$10	7/week	30	$2,100
Total				**9 months**	**$11,730**

Table III: Media Costs for Nine Months

6. Other Waste Reduction Strategies

The introduction of the recycling system can be used to push wider changes to the waste management system. In particular, the removal of organic wastes is a very significant step to take. Organic materials in the waste stream are a valuable resource than can be used, just as aluminium cans are. Organic materials in landfills on atolls are not just an expensive way to take up valuable landfill space, but actually contribute to the detriment of the soil. Atoll soils are so poor anyway, that any removal of plant matter from the ecosystem has a degrading effect. Most of the goodness of the soil will be locked up in plants, as the plants specifically draw this from the soil. By taking the organic materials away, and mixing them with inorganic, man-made wastes, to produce a completely useless cocktail, is absolutely detrimental to the longer term sustainability of atoll life. Plants also play a crucial role in many atoll environments by cleaning ground water lens, and to degrade the soils is to damage the quality of ground water. Typically, the poorest members of the community rely on groundwater as they often have no rainwater tanks, and probably no mains water connection. Food wastes in particular also encourage rats and flies to landfills, and again it is generally the poorest members of the community who bear the consequences (for example the most likely new site for an urban landfill in Majuro is next to Jenrok, one of the lowest income, and poorest quality housing, areas of Majuro).

Economically, to landfill organic wastes is perverse, as organics make up around half of the waste stream, and landfill space is around $35m^3$, as already noted by BECA[12]. Clearly, landfilling organics is an expensive way to degrade the environment on an atoll. Organic materials found in the waste stream do not even make good land reclamation landfill, as such land takes a long time, and a considerable amount of material, before it is stable enough for serious long-term use that can support any buildings foundations.

6.1 Push organics out of waste stream

The point cannot be made strongly enough that to collect and landfill organic wastes in an atoll environment is not only directly contributing to the degradation of the soil by removing scarce nutrients, as well as damaging ground water (where it exists) as plants are removed. It is also a very expensive business, as organics are bulky and take up expensive dumpster and landfill space.

Figure 2: Green waste content of Dumpster in Majuro

6.1.1 A 'Green Bin' System of Organic Collections

The simplest way to approach this is to start with the big pieces of organic material first. In Majuro, this comprises mostly coconut palm fronds, and tree trimmings. There are several of the existing dumpsters in use in Majuro that are highly corroded in the panelling. These are increasing unsuitable for normal household wastes, as rubbish tends to fall out of the dumpsters on route to the landfill. These could be given a brisk rub down (and perhaps a simple patch up) with a coat of green paint, and branded as green-waste only 'Green Bins'. These can be promoted to the public as such using the techniques developed in the public awareness program part of the project. A initial survey of existing dumpsters should indicate where a higher content of organics is found; the Green Bins can be placed alongside the usual dumpsters in several of those locations, and by a little trialling, a suitable system to encourage green waste to be put in these bins can be found. Once a suitable set of tools is developed, the system can be promoted in all urban areas using the public awareness program's skill and expertise.

[12] Solid Waste Management in Majuro, BECA International Consultants Ltd. August 2003, Appendix C Jenrock landfill costs.

6.1.2 Processing the collected organics

Green wastes so collected can be chipped. It may be found that in some places where there are plenty of gardens, that it can be chipped on site by a mobile chipper, so that local people can come and take the chips away for their gardens. Higher density housing areas may well require removal of green waste to another location, possibly the MRF. A mobile chipper may chip the material at the dumpster site into a truck for transport. The current recycling truck[13] is equipped with a tow bar to tow a chipper, and a hatch at the rear to accept chips blown from a mobile chipper chute. This material will again be found to be of value to anyone in the plant growing business once it is chipped. If a large chipper is used, foreign bodies that enter the green waste stream will not cause it undue concern, and the presence of odd pieces of metals or plastics in the chips will not be too serious a problem for general use, as inevitably there will be some contamination, particularly as disposable plates and aluminium foil containing food is likely in Majuro; this should not cause too much problem as the aim is *not* to produce a high quality commercial product – at least not in the early stages. The same machine used for chipping Green Waste can also be used to shred PET and HDPE plastics[14], and so increase container densities for shipping those plastics for recycling. Thus, the operation of a Green Waste Chipper could be arranged under the MRF operations, so the MRF staff would also maintain the machine. If a chipper is used increase revenues with the export of plastics waste, there is a direct economic incentive to ensure that it remains in good working order. Organics chipped at the MRF can be stockpiled so that people can come and take material for gardens. It may be found that it can be bagged and sold, if the market exists to do so. At very least, if it is removed by people for free, it still returns to the soil, and does not take up expensive landfill space.

6.2 Commercial Participation – Retail Stores and Restaurants

A significant amount of the waste in dumpsters is commercial waste. This would be much better for both generator and waste management authorities if usable components were separated at source before they reach the dumpster. This saves the business from taking the materials to the dumpster, and the waste managers from having to separate dirty wastes. Collection of these wastes of course involves cost; however, once a Materials Recovery Facility is operating, financed by a Container Deposit system, other materials and collections can be added at much lower additional cost than starting from scratch. Materials that conventionally might not appear economic can be added to the recycling, as the additional cost to the existing operation is not great. When the avoided landfill costs are factored in (costs that are readily apparent), not to mention intangibles such as improved water quality and health through better solid waste management, the economics looks increasingly attractive. Of course the systems proposed here must pay for themselves some way, but as the MRF matures, and the approach to SWM changes, this is not so hard to do.

6.2.1 Commercial Organics

A considerable amount of food waste is generated from the many restaurants in Majuro in particular. This needs to be collected and chipped in with the stringy palm and wood wastes to improve any organic materials for compost use. Targeting restaurants is much easier than trying to get all households to participate, especially in the beginning. As a system is developed and improved, households may begin to participate. Restaurants merely need to use a dedicated bin service for food wastes. The MRF operation or perhaps MALGOV could incorporate this collection on a daily basis (or bi-daily basis if the bins have good lids). Chipping food wastes with woody wastes produces a much better mix for good composting. The addition of some copra mill waste, or fish processing wastes, would potential produce an excellent fertilizer material. The Taiwanese farm at Laura has been experimenting for many years with compost mixes from available materials, and would likely be a useful local source of considerable expertise on this issue.

[13] At the time of the report this vehicle was unused and sitting in the grounds of the Capitol building.

[14] Pers. Comm. 'Bandit Industries' Laurie Pant, 20/7/05

6.2.2 Commercially Generated Cardboard

A significant quantity of landfill waste is currently cardboard carton. When it is appreciated that nearly all consumer goods – food, drink, household goods – come in cardboard cartons, it is easy to see that even small economies such as Majuro and Ebeye will create considerable quantities of cardboard. Commercially generated cardboard can be easily collected from the large generators, such as wholesalers, bars, hotels and large retail stores. This also saves the stores from taking it to the dumpsters, which saves them money, and the cardboard can be kept clean and unmixed with other wastes. Significant quantities of cardboard are not generated from households.

Figure 3: Commercial cardboard In the Majuro Waste Stream

Cardboard is not a very high value recycled material, but with a suitable sized machine, densities can be achieved to maximise container capacity. Current price in Australia for cardboard is A$80/tonne[15], and up to 30t can be put in a 20ft container, making a potential $1,800 per container, which costs A$1,500 to send. The avoided cost of landfilling the 33m³ of cardboard is $1155, at a density which landfilling would not likely achieve anyway. If the avoided cost of landfilling could be transferred to the cardboard recycling, that would result in a profit of about $1400 per container. This recycling process would also create more jobs, and other local economic activity, not to mention relieving MALGOV of the cost of carting all that cardboard to landfill. This illustrates that there are huge potential savings available at little extra cost. The introduction of a Container Deposit system can fire the necessary rearrangement of the waste management regime to dramatically reverse the current problem.

6.3 Lead-acid Batteries

Vehicle batteries, and increasing numbers of deep-cycle solar batteries, can also be accepted by a functioning MRF at very little extra cost. Removing these from the environment is major achievement as they are so toxic. It is a simple matter for the MRF to pack batteries and ship to a suitable refinery[16], and they can be shipped 'wet' with the acid inside, so avoiding any complex and dangerous acid removal and neutralisation procedures.
The Kiribati MRF collected over 4,000 batteries in the first 12 weeks of commercial operation; given the far greater number of vehicles on Majuro and Ebeye, one might expect that there are possibly around 10,000 batteries readily available for recycling, amounting to around ten containers of batteries for export, with perhaps an annual collection of three or four FCL. These batteries would not only come from the public, but such a collection would be of great advantage to a commercial automotive repair sector where old batteries are a problem. Also, keeping them out of landfill is major advantage in ensuring that the resulting landfilled land is useful in the future. The RMI EPA already runs a battery collection system, and this could easily be transferred to the MRF.

6.4 White Goods

With the dramatic increase in steel prices, an operating MRF could also take disused white goods for recycling. Air conditioners, fridges, cookers, washing machines can all have some metal parts removed very quickly and easily by semi-skilled staff. Whilst the residue might then be landfilled, again, quantities to landfill are decreased, saving Government money, and also generating economic activity. Copper and aluminium parts can be accumulated to

[15] Pers. Comm. Alan Morgan, Macs Metals, Brisbane June 25th 2005; Amcor Industries current price.
[16] Australian Refined Alloys in Sydney, NSW accepts batteries 'wet' from the Pacific Islands.

achieve very favourable prices currently, and the value of non-ferrous metals is not expected to drop significantly given increasing world demand for raw materials.

6.5 Glass

Glass can be crushed and used as a substitute for coral in non-structural concrete. Concrete work often requires areas such as non-load bearing floors, parking areas, ramps, paths, low walls; all of these types of constructions can use crushed glass in the mix. Price per m^3 would be dictated by current market value of mined coral stone. Use of glass in this way avoids the usual problems of colour separation, which is essential for correct glass recycling. Special machinery can be purchased to crush glass that can then be used as a road surface: it may be that quantities of glass available would be sufficient, in which case a very good quality road surfacing product could be made locally, although it is unlikely that sufficient glass would be produced for major road projects, such as surfacing the long stretches of road. However, it may be sufficient for side road and parking areas.

7. Implementation Plan

In order to bring a CDL-based recycling system into place, a carefully crafted plan is required. There are significant events and time frames that determine how the whole plan is structured. Primary of these is the legislative process, and the point at which legislation comes into force that requires the deposits to be paid. The other big determining factors are logistical: lead time to select, procure, order, and ship the required equipment, and time taken to create a functioning MRF that can handle the material flows that a deposit system will immediately generate once it come into force.

7.1 Key Elements

Any plan to implement a CDL-based recycling system will require several main components:

- **A Legislative component:** to ensure that required materials are drafted for Government to present to the Nitijela;
- **A Public Awareness component:** to ensure that the public is aware of the changes, how to use the new system, and also to encourage other simple waste minimisation strategies, primarily those of pushing the cardboard and Green Waste out of the landfill waste stream;
- **A Logistical Component:** that will oversee the procurement of equipment, the securing of a suitable site for the MRF, and installation of equipment on site to bring the MRF into operation.
- **A Business component:** To operate and run the MRF based recycling system in the initial stages as the Container Deposit system comes into full operation.
- **Project Support**: the necessary management and donor reporting structures to coordinate the above components.

Before any of these processes can commence, it would be necessary for the RMI Government to commit to the drafting of legislation, and commit to the presentation of legislation to Parliament. This would require the commitment of a Government Agency to promote a CDL project to Cabinet as described in the Legislation section above. Once the commitment to take legislation to the Nitijela is confirmed, a project could commence. A possible Implementation Plan can be found at Table IV. Project Implementation should be comfortably achievable in one year.

7.2 Structure of implementation

Any project of this nature requires an Executing Agency, which is a Government Agency who would oversee coordination of the Project. There is also required an Implementing Agency, who actually runs the project day to day, deals with finances, produces reports, hires personnel, and reports to the Steering Committee, Executing Agency and Donors. It is clear, from the nature of this particular program, that close cooperation between Government and the Private Sector is essential. A Public Awareness program, as part of the Implementation Plan, is a crucial component. Elsewhere, a very successful model for implementation has been where an NGO is the Implementing Agency, and the necessary personnel are contracted to provide the skills required. NGO accounting systems are primarily designed for Project Management in the non-commercial sector, and as the Implementation Phase is a non-commercial operation, this fits well. Government financial and hiring policies generally are unsuited for the kind of short-term flexibility required on a comparatively short project such as this. Once a viable business operation is established, then management of the MRF should pass to the Private Commercial Sector, as they are most experienced in this area. Government participation continues through an ongoing regulatory role, the traditional function of Government.

7.3 Tripartite Partnership of RMI, NGO and Private Sector

A project of this nature requires Government, Commerce, and NGOs to work in partnership. The proposed method of project implementation is by an NGO filling the project management and coordination roles. This allows a responsive, flexible project management to be in place.

7.3.1 Government Role

The Government sets the legal environment, and steers the outcome for the benefit of the nation. The Government can initially support applications to suitable donors who may be interested to finance the project – or parts of it. Government ensures that the Project is consistent with wider Government Policy and Planning Goals, and that the Project is on track and has responsible management. A Government Agency acts as the Executing Agency; this might be OEPPC given current RMI structures, but of course this is for Government to decide.

7.3.2 NGO Role

The NGO Project Management must also coordinate efforts between the Government work of preparing and enacting legislation, the Private Sector's work to integrate themselves with the changes, and the NGO public awareness and education efforts. One advantage that NGO project management has in a Marshallese context is that the movement has not been closely involved in the issues of the last few years concerning the ongoing SWM crisis in Majuro. The NGO is also a 'disinterested partner' who will withdraw at the end of the project, with Government and private sector having ongoing roles. The NGO acts thus to ensure that the system developed and implemented is of use to the community at large, especially the more disadvantaged members who will have potentially the most to gain.

7.3.3 Private Sector Role

Close cooperation with the Private Sector is crucial, as the project must develop in a Marshallese commercial environment, and the outcome is to provide a running business. A Private Sector Partner, supported by the wider commercial community, i.e. the Majuro Chamber of Commerce, as the Project Partner, is a very valuable component. The Private Sector Partner can hire casual and permanent labour as required, under contract to the Project, as requirements fluctuate, particularly in the earlier stages. The Private Sector Partner can also provide valuable information and knowledge about operating a business in the Marshall Islands.

7.4 Steering Committee

The overall direction of the project is monitored and guided by a Steering Committee, composed of representatives from all of the above, plus any other relevant parties, such as other projects or donors representatives whom the Committee sees fit to include. A Solid Waste Task Force already exists, with the Chair the Mayor of Majuro, and membership of the Chief Secretary, OEPPC, EPA, MIVA, MPW, EPPSO and the Chamber of Commerce. This is clearly a very good place to start, and a steering committee for a CDL project would clearly sit very well operating under, and reporting to, the Solid Waste Task Force.

7.5 Financial Management

The Donor funds can be placed in a single, dedicated account, in which only project funds are held. Money is managed from this account by the Project, using the NGO Financial Officer's expertise. With the account being dedicated solely to the project, financial reconciliation and reporting becomes a simple matter. This is very important, as once the project is rolling, delays in receiving funding can be very detrimental. Timely financial reporting is essential to ensuring that the next quarter funds are processed and sent to the Project.

Another reason for holding a separate account is that once Refunds are being paid out, and the Project is running as a recycling business, financial movements can be large. Problems in the Project finances would easily cause great troubles for an NGO if the project funds are not ring-fenced, and were inadvertently drawing on other project's funds.

7.6 Work plan and Budget

EXPECTED OUTPUTS & MONITOR-ING ACTIVITIES	Key Activities *List all the activities to be undertaken during the year*	TIMEFRAME												RESPONS- IBLE PARTNER	PLANNED BUDGET		
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12		Source of Funds	Budget Description	Amount (US$)
1.1 Set Up Materials recovery Facility System to handle 50,000 beverage containers/day	**1.1.1** obtain land suitable for MRF on industrial land near the Delap Dock															land Rental	15,000
	1.1.2 Purchase, move and set-up portable office bldg in recycling yard.															Capital Equipment	10,000
	1.1.3 Set up office in building															Capital Equipment	4,000
	1.1.4 Purchase Processing shed, ship and install															Capital Equipment	16,000
	1.1.5 Purchase used Shipping Containers & convert to Collection Points															Capital Equipment	18,000
	1.1.6 Purchase, ship and install can press.															Capital Equipment	23,000
	1.1.7 Purchase, ship and install Vertical Baler press.															Capital Equipment	15,000

	1.1.8 Purchase truck for recyclables collection.															Capital Equipment	60,000
	1.1.9 Conduct test buyback of cans and bottles at 2c each															Operation-al testing	35,000
1.2 Develop and operate recycling system to prepare for handover to Operator	**1.2.1** Yard operational costs inc. utilities															O & M	9,000
	1.2.2 Pack for export and arrange acceptance with buyer Brisbane															Income Generating	10,000
	1.2.3 Wages for MRF workforce															Operation	50,000
1.3 Create and test monitoring system	**1.3.1** Develop and test daily sheets system															NDC	0
	1.3.2 Develop database and GIS layer and update monthly															NDC	0
2.1 Public Awareness Campaign	**2.1.1** Develop Local Name for System															NDC	0
	2.1.2 Develop Play with songs															Public education	1,500
	2.1.3 Radio Spots															Public education	2,500
	2.1.4 TV spots															Public education	2,500
	2.1.5 Develop Newspaper ads and run															Public education	7,200
	2.1.6 Waste plays shows at public places															Public education	4,000

2.2 Promote separation of Organic wastes & cardboard	**2.2.1** Organic separation system development															Capital Equipment	3,000
	2.2.2 Radio and newspaper ads															Public education	3,800
	2.2.3 Procurement of Chipper															Capital Equipment	27,000
	2.2.4 Work with Commercial sector to recover resources															Public education	1,000
	2.2.5 Chipper in Operation															O &M	1,000
3.1 Functioning tripartite committee of GoK, Private sector and NGOs.	**3.1.1** Steering Committee direction of project; Monthly meeting															Meeting expenses	1,500
	3.1.2 Monitor financial and logistical activities															NDC	0
3.2 Private Sector Management Contract	**3.2.1** tender advertising															Media	750
	3.2.2 Contract signed															NDC	0
3.3 Coordination with other Programme's activities	**3.1.1** Work with IWP Pilot Area, EPA and others															NDC	0
	3.1.3 Project Newsletter to region															Production	800
4.1 Container Deposit legal framework	**4.1.1** Draft Legislation to establish Special Fund for Container deposits															Legal assistance	1,000
	4.1.2 Present an Act to Nitijela a															NDC	0
	4.1.3 Act comes into force															NDC	0

5.1 Evaluation & monitoring	**5.1.1** Quarterly reports															NDC	0
	5.1.2 Adjust / review planning and budgeting.															NDC	0
6.1 Staff	**6.1.1** Project Manager															personnel	30,000
	6.1.2 Project Assistant															personnel	14,000
	6.1.3 Technical Adviser															personnel	30,000
	6.1.4 Accountant part time															personnel	10,000
6.2 Office Costs	**6.2.2** Office equipment															operations	5,000
	6.2.2 Project Support from NGO															operations	10,000
	6.2.3 Sundries															operations	3,000
7.1 UNDP Monitoring	**7.1.1** Monitoring Visits															M & E	4,000
	7.2.2 Auditing															M & E	1,000
TOTAL														**Sub Total**			**$429,550**
														Less Project Income			**$45,000**
														Total			**US$ 384,550**
[1] NDC = No Direct Cost.																	

8. Existing Programmes on Waste

There are several existing programs and activities that are working in the SWM field. Any project implementing the proposals in this document should be coordinating with these programmes and their staff to ensure best use of resources, to avoid 'reinventing the wheel', and to draw from experience already in the community.

8.1 International Waters Programme

The RMI IWP has a pilot area in Jenrok village that is used to pilot low cost community based waste reduction initiatives. This project is part of 14 Pacific Island nation programme run through SPREP. The project is a GEF funded programme, executed by UNDP. The RMI IWP programme has great potential to trial the introduction of a CDL based system in the Marshalls. The project is run out of the Office of Environmental Planning & Policy Coordination (OEPPC).

Figure 4: IWP Recycling Station at Jenrok

8.1.1 Potential to Trial Refund System at IWP Pilot Area

There is a proposal with the IWP to set up a small recycling facility at Jenrok, in the Pilot Area. This facility, if approved, would be the ideal place to test the collection side of any Container Deposit system before it legally entered force. It is necessary to test the Refund payments and monitoring systems of any Container Deposit scheme prior to national implementation, to ensure that a viable system is available to the Public as soon as the system comes into legal force. The work already done in Kiribati, in a similar environment, would provide a very good basis for any Marshallese system; however, some fine-tuning may be required to suit local conditions.

As there is an existing beverage container litter problem, a trial program that bought up existing cans at 2c each could remove the existing litter, whilst shaking down the system, but without overall great cost to the project, as the cans would generate an income to the project of about 1.3c each after export, requiring the project to actually only pay 0.7c each after sale to the recycler in Australia.

8.2 Environmental Protection Authority

The RMI EPA has an Education Unit run by Mr. Julian Alik. Any recycling project should cooperate closely with the EPA and the education unit to share skills and expertise, as Mr. Alik has many years of experience working in this field. The school education program outlined below would be easily integrated with a public awareness program to promote a container deposit system, and organics separation in urban areas. The EPA also collects old lead-acid batteries under the POPS toxics program.

8.2.1 Schools Program

The school education programme on waste has a competition for schools to recycle cans. The top three schools by amount of cans collected are sharing $500 in First, Second and Third prizes. There are 18 schools in program, both public and private, amounting to over 2000 students. The programme has distributed 82 manual can crushers of bin collection type. Cans collected by the schools are delivered to Tang's Recycling in Delap. It is believed that there are still more can crushers to distribute.

Mr. Alik uses a 'Trash Line', a string with various common items of trash hung on a fishing line, with which he educates the children. With this device he is educating children on the

effects of different types of trash on the environment, and the time taken to degrade. The Unit has a good 'Power Point' presentation of recycling cans that is shown to schools. Some outer island schools are also participating, namely Jaluit High School and Ebeye High School. However, the Unit has no local name or slogan for the program. Only Mr. Alik works in the education unit. A JICA volunteer due in July.

8.2.2 Lead-Acid Battery Collection

The EPA is collecting disused lead-acid batteries at its Delap Dock site. These are collected under a Persistent Organic Pollutants (POPs) programme coordinated throughout the Pacific Islands by SPREP. This is a one-off program to remove toxic stockpiles in PICs. As the number of vehicles in the Marshalls is increasing rapidly, a large number of batteries are generated. The POPs program is not a long-term solution. A CDL based recycling system could act as the exporter of batteries, as a Basle Permit will be required for ongoing export, and this will require commercial contracts and arrangements that Government may find onerous in the long-term.

8.2.3 Cardboard Baler

Figure 5: EPA Cardboard Baler

The EPA also has a cardboard baling machine at its Delap dock station. It appears to have been out of use for some time, and may have been used for crushing cans, a task for which it is not really suited as densities will be low. However, filled with flattened cardboard it makes a handleable bale. This could possibly be refurbished for use in the early stages of developing a cardboard recycling system, but does not appear to be large enough to gain the required densities for an ongoing commercial removal of cardboard. Never-the-less, its use to encourage commercial collections of cardboard initially would be invaluable.

8.3 Marshall Islands Visitor Authority (MIVA)

MIVA has run regular advertisements in the *Marshall Is. Journal*[17] encouraging people not to litter for many years. They also operate clean-up crews who pick up litter in public places around Majuro, and who empty 44 gallon oil drums set out by MIVA for public litter. The experience gained through these long-running activities would be very useful to the planning and execution of any public awareness program.

8.4 College of the Marshall Islands (CMI)

The CMI has a can collection program, and cans collected are sold on to Tang's Recycling (see below). This collection is part of a fundraising program; container deposits can only increase income from recyclables based fundraising programs. The CMI collection should be promoted as a model for schools, churches and other community groups to collect can and bottles for fundraising. Co-op School has also run can recycling in the past, and promotes improved waste management behaviour to the students.

8.5 Existing Metals Recycler

Currently, all aluminium cans collected are sold in to Mr. Tang, who has a small scrap collection yard next to the Island Apartments, opposite the Nitijela in Delap. Mr. Tang pays 10c per pound for aluminium cans. He has also worked in with the EPA school program to pick up cans collected by schools as part of recycling education. It would be useful to work

[17] "The World's Worst Newspaper"

with Mr. Tang initially to process cans collected at the early stages of any project to implement a CDL system.

8.6 United States Army Kwajalein Atoll

USAKA military base operates a comprehensive recycling program, with materials collected being shipped to the USA. The recycling system operators there have demonstrated a functioning system to RMI officials in the past. However, integration with the USAKA system would likely be difficult due to the difficulties of introducing materials and personnel from off the base. It would be worth looking at their markets to see if opportunities exist there. It may be useful in the early stages if a site visit was possible with local project staff.

8.7 E-Z Price Store

E-Z Price owner Neil Skinner, and Manager Liz Roddick have been promoting better waste management to the staff and of the store wastes, but the lack of a downstream acceptance system is a handicap. However, this business would actively engage in any new initiatives, and would be very helpful to any project by having a working business environment to test out some ideas on. E-Z Price produces a large quantity of cardboard carton from its operations.

Figure 6: E-Z Price Recycling Bins

8.8 Possible Projects

The ADB has a draft proposal for a pre-project design phase, with focus on building community support for improved SWM in the urban Marshall Is.[18] This pre-project, if enacted, would focus its practical work on the Jenrok IWP site, so working in with the RMI and OEPPC for maximum effectiveness. This proposal, and its attendant resources, could be greatly increased in effectiveness if conducted in close coordination with the implementation of a Container Deposit System for the Marshall Is.

[18] Increasing Ownership and Effective Demand for Improved Urban Waste Management and Disposal in the Republic of the Marshall Islands, Draft Concept Paper, Asian Development Bank, April 6th 2005

9. Additional Benefits of A Container Deposit System To the RMI

Container deposit legislated systems can deliver many additional benefits to a nation, which are more than the decrease in litter. Some of these advantages are in 'intangibles' or economic externalities such as improved environment, improved ground water, and resulting improved health. These can be hard to quantify. However, there are benefits that can readily be quantified, and these include:

- ⇒ Improved monitoring of high revenue imports (such as beer, wines and spirits) resulting in budgetary advantages;
- ⇒ Savings in 'Avoided Cost' of landfill;
- ⇒ Savings to MALGOV in hauling less garbage to landfill;
- ⇒ Increased employment;
- ⇒ No budgetary call on Government finances yet a decrease in waste costs;
- ⇒ Ability to recycle other materials at low additional cost.

9.1 Implications for Budgeting: Monitoring of Beer Imports

The lack of readily accessible data on beer imports has some implications for government budgeting. Currently, it is very difficult for the Government to assess the effects of increasing beer taxes, such as the 25c per beer can/bottle imposed recently to raise additional funds for the CMI. The Container Deposit system would allow simple tracking of beer imports as when a beer shipment pays a deposit into the Deposit Fund, a simple code with the payment entry details will allow instant assessment by computer of the beer imports between any two days by checking the Deposit Payments. When a Deposit system includes wines, spirits and mixers, it is a very simple tracking system to see what is coming in, and thus what revenue is being generated by these imports. This would potentially allow maximisation of alcohol revenues as it is easy to see when a tax increase has depressed sales, and so reduced tax income.

For example: according the 2001 Statistical Yearbook, the RMI imported $1,652,353 worth of Beverages, Wines and Spirits. However, for Kiribati, that same year, the figure is A$1,575,920 for beer in cans alone. Even given the difference in US$:A$ exchange rate at the time, as little as 1:2 it is still surprising, given that the Marshallese economy is at least twice that of Kiribati. This suggests that the statistical data may be unreliable, an assertion whose veracity was reinforced during the data collection process for this report.

An incidental advantage of a Container Deposit system is that it becomes clear if there exists a major problem with beer smuggling. After the system has settled down to steady flows, if the Refunds are outstripping the Deposits (and investigations shows that the fault is not fraud in the refund system), then it can be demonstrated that there is beer smuggling of some sort going on by analysing the beer cans flows at the collection end. It is clearly easier to track smuggling when one knows that it is occurring, rather than if there is only a suspicion. Soda cans are not usually smuggled due to the low tariffs and low value of the product.

9.2 Potential Savings to Government through 'Avoided Costs' in SWM

Savings to Government are very apparent and easily costed in two areas: the cost of transporting waste to landfill, and the cost of landfill space. Such money saved by not doing something is termed an 'Avoided Cost', and the diversion of waste from landfill is a classic case of avoided cost. Avoided Costs are not only dollars that the Government *does not* have to spend, but in a situation of limited budgets, it means that more money is available to spend elsewhere.

9.2.1 MALGOV: Waste Transportation

Local Government, MALGOV, has responsibility to pick up waste. If there is less waste to pick up through waste reduction, then the Dumpsters will take longer to fill. This means less

effort in moving dumpsters to the dump, or conversely, improved service in turnaround times. Currently, MALGOV runs an overtime shift on the trucks picking up dumpsters, from 6 p.m. to 12 p.m. six days a week. It is quite possible that by pushing cans, bottles and cardboard from businesses out of the dumpsters, and promoting organic wastes as a resource so that some never enters the dumpsters, that this shift might be reduced or disappear altogether. Any reduction in hours not only means lower costs in garbage collection, but also, in a stretched local government budget, money available to other local government services.

9.2.2 Ministry of Public Works: Landfill Space

For National Government, who pays for and operate the landfill through the Ministry of Public Works there are major savings. A consultants' report of 2003[19] shows the costs of new landfill at between $27 and $33 per cubic yard ($35 - $43 m^3). A 20ft container of crushed cans is 33m^3, which amounts to at very least $1,155 saved for every container of cans shipped. Given that cans crushed in a press will take up much less space than cans squashed in a landfill, the actual saving would likely be considerably greater. The same applies to PET bottles, which are very difficult to squash in landfill past a simple flattening. At 10 tonnes per container of cans (and perhaps 13 containers of cans are available per year) that is a *minimum* of $15,000 saving in 'Avoided Landfill' costs per annum just from aluminium cans. Over the 21-year life of a projected landfill at Jenrok[20] that amounts to **$315,000 in savings** from aluminium cans alone. Clearly, if a CDL system could remove most beverage containers of aluminium, PET and glass from the landfill, and be used to remove some of the commercial cardboard waste, potential landfill cost savings become *very* significant.

9.2.3 Equipment Operation & Maintenance

Reduced waste also takes pressure off vehicle and landfill equipment usage, which usually results in better and longer operation as the equipment is not pressed so hard, and reduced maintenance costs. Whilst the difference might be comparatively slight with just a can and bottle system, the stage is set for improvements once the basic EPR model is shown as a real solution to solid waste management. These savings are very significant in the longer term, but may not be immediately apparent.

9.3 Equal Opportunity Employment for Ri- Majol

There are clearly employment opportunities with a Container Deposit system for the Marshall Islands. This study predicts that there would be 9 unskilled positions, plus one for a Truck Driver, one for a Foreman, one for a Manager; perhaps also a part-time position in the office (as in Tarawa); at least 12 positions. It would also create extra jobs on outer islands, where enterprising people can collect cans for 2c or 3c, and sell them in to Majuro for 5c. Ebeye would likely require two positions. (Details for such outer island satellite operations are beyond the scope of this report at this stage.) These jobs span the range of skills, and many of these jobs would be suitable for women, in particular the collection point operators (Tarawa employed 5.5 women for a total of 10.5 positions in May 2005). Many are positions easily filled by young people, especially the collection point operators, where a good understanding of basic math is an advantage, suiting High School Graduates. No positions will require non-Marshallese employees.

9.4 Advantages to Government of Private Sector Operation of the System

The system outlined this report provides a good example of how the private sector can supply services to Government (and this includes Local Government), and, in this case, not cost the Government anything. The Government can put in place a recycling system with no budgetary demands from existing budgets. Rather, the operation of the system saves the Government money as the amount of waste handled by the Government is decreased, so

[19] Solid Waste Management in Majuro, BECA International Consultants Ltd. August 2003, Appendix C
[20] ibid

requiring less Government resources in landfill construction, collecting and hauling waste to the landfill.

By arranging the economic parameters of the system correctly at the outset through regulation, the frame work in which the private business tenders for the operation of the system is clear. The Tender is for a Concession to operate the recycling system. The contracting business increases profitability by running a more efficient operation. This way, if a poor service is provided, low profits result, encouraging a better service if the business is to increase profitability. As the Government remains the owner of the capital equipment and the yard area, a contractor who provides an inadequate service can be terminated and a new operator bought in very quickly[21]. Also, as the Government effectively has control over investment, the system can be tilted toward the most suitable mix of labour and machinery to suit the local requirements. For example, in the Marshall Islands, there is a clear need for more employment of unskilled labour, whilst conversely, machinery can be a great problem when there are mechanical problems. Thus, the system designed is tilted toward being labour intensive, with equipment pitched to provide maximum safe working conditions. Whilst this may not result in the most profitable operation possible, job creation should be a central element in system design, whilst allowing for good profitability.

However, as the private operator works under a contract to Government, and as the rates of Deposit and Refund are set by the Regulations, the Government maintains ability to set the parameters of overall profitability, to ensure that the community at large, and other businesses, are receiving a fair service from the system, and excessive profits cannot be generated through a monopoly situation. Competition is provided through the Tender process, where business can compete for the Concession to run the system, and at any subsequent re-tendering rounds.

The government also only needs to become closely involved with the running of the system at the time of Tender Evaluation, and so has no need to set up additional positions or Government Departments to run the system. Ongoing oversight can be conducted as part of routine SWM activities, for example through the EPA Solid Waste Division. The operator of the system will supply ongoing monitoring information as part of the procedure for claiming Refunds from the Deposit Fund. The manner of how that information is provided is detailed in the contract to Government. It thus becomes a simple matter to monitor the system, requiring little time from Government officials.

9.5 Other materials that a CDL based system could recycle

A CDL based system could handle other materials other than beverage containers. Lead-acid batteries are easily recycled, and are part of the Kiribati system, where a $5 deposit and refund is used. Air Conditioners are very common in the waste stream in the RMI. They are bulky, yet easily recyclable, containing copper, steel and aluminium parts. A $20 deposit or similar is not going to affect the purchase price much, as this is the difference between one store's price and the next. But it would be sufficient to encourage return to a central facility to get a refund. Car tyres are another common item in the RMI waste stream, and do not compact well in a landfill. When present in sufficient quantity, they can be used to build retaining walls. They can also be baled and used as fill for walls and roads. They can be shredded and exported; they are expensive to landfill as they are bulky. Once a EPR system is set up using Beverage Containers, it is a simple matter to add other materials to the system at a later date, using the same mechanism, albeit different deposit and refund rates. The existence of a working Materials Recovery Facility means that additional materials can be added at very low overhead cost to the recycling operation, making the recycling of some materials possible that would otherwise be uneconomic in a stand-alone facility.

[21] Indeed, this very scenario happened in Kiribati in June, but a very smooth handover was obtained; the existing operator was unable to continue for reasons outside of the recycling operation, but a new operator could take over with little interruption of service to the public.

10. Brief History of Waste issues in Majuro

Waste Management in the RMI has had a difficult history. Only two atolls are heavily populated, and of these two, Ebeye Island in Kwajalein (one of the most densely populated places on the planet) grows in part by virtue of its garbage landfill. Virtually all attempts to deal with waste in a more systematic manner have taken place on Majuro Atoll, which is the nation's capital.

10.1 Majuro Landfills

The approach has been the conventional one of landfill. The landfill option is now at a point of crisis, as the current landfill is exceeding its rated capacity. The fact that the current landfill is taking quantities of garbage that exceed its design capacity has been a point of open and vigorous public debate for the last four years. There has been much community discussion on the issue, and a keenness on the part of the private sector to have a place in any improved system.

The single official landfill on Majuro has exceeded its design capacity for several years now. The landfill is a simple affair where rubbish is tipped behind a seawall, and a bulldozer does its best to compact the waste. The landfill is immediately adjacent to an area of housing that existed prior to the establishment of the site. The indication that it has exceeded its design capacity is that in many places the garbage has exceeded the height of the containment sea wall. In 2001 the Taiwanese government (Republic of China) donated seventy 15 and 20 cu m dumpster roll-offs for garbage collection, and two roll-off trucks which transport the dumpsters to the landfill where they are emptied. This has resulted in the immediate urban area of Majuro becoming visibly cleaner. People take their garbage to the nearest dumpster in garbage bags, and the dumpsters are emptied every few days. They are always full, and it is clear that there is little - if any - excess capacity in the system.

The Marshall Islands Visitor Authority (MIVA) has funded and placed red oil drums at public parks and picnic spots on Majuro in order to help keep Majuro cleaner from a litter point of view. MIVA funds a Clean-up Team of about five people that go around and pick up litter in Majuro. MIVA actively promotes litter reduction in Majuro as part of its activities to promote tourism. It is clear that the litter is considerably less that in the past.

In 2002 the RMI Economic Policy, Planning and Statistics Office (EPPSO) engaged consultants from San Diego to assist in drawing up a detailed plan to tackle the waste issue. Their report[22] stated:

"In order to extend the life span of the landfill, waste reduction and recycling activities have to be implemented. At present about 50% of the waste currently heading into the landfill could be converted into compost. In addition recycling or reprocessing of other materials (aluminium, plastic drinking containers, glass and tires) could divert another 10% - 15% of the waste stream from the landfill ".

10.2 Current Situation for Waste Collections

Currently, the collections of all household and commercial waste material on Majuro Atoll are done by MALGOV. An executive committee manages the operations of the local government. Waste collections are financed by revenue collected by MALGOV from various licences and other sources. There is no waste collection fee as such. Majuro has a current population of around 35,000 people. MALGOV is the local authority for the entire atoll.

[22] : 'Proposal for Improving Solid Waste Reduction and Recycling for Majuro Atoll': Environmental Services Division of the City of San Diego, 2003.

10.2.1 MALGOV Equipment and Staff

The waste collection division of MALGOV has approximately 23 staff members. There are currently 57 dumpsters operating, with two trucks (though at the time of report one truck is out of action for a while). The current fleet of dumpsters is nearing the end of their life as most are exhibiting severe corrosion. Also in their inventory are one heavy front-end loader, one front loader/backhoe and small dump truck. RMIEPA collects hazardous material, including lead-acid batteries, under the SPREP POPs collection regional programme.

10.2.2 Waste Disposal and Landfill Operation

The solid waste materials collected by MALGOV in the dumpsters are disposed into a landfill at Batkan/Jabele, over the bridge and about one mile toward the airport. Ministry of Public Works (MPW) is currently in charge of the construction, maintenance and management of the landfill on Majuro, but it is RMI EPA's responsibility to locate suitable landfill sites. Although RMI EPA regulations require the separation of hazardous materials such as car batteries, it appears there is no sorting of this kind at the dumpsite, potentially posing significant hazardous waste leakage/contamination into the surrounding environment.

10.3 Waste Stream Analysis

There have been several waste stream analyses done for Majuro. For considering the feasibility of a CDL system, they do not comprise primary data as the essential information is the number of potential items available that will have a deposit paid on them, and this, in a small island situation, is taken mostly from import data. However, as CDL system introduction has a far wider effect on the waste stream, and as the introduction of CDL can provide an excellent opportunity to introduce new measures for dealing with waste, the information from the most recent waste stream analysis[23] is provided below. This information is drawn from the International Waters Programme (IWP) Pilot Area in Jenrok village, in urban Majuro. Jenrok is in fact one of the most densely populated spots in Majuro (if not the World) with a population density of 87,000 people per sq. mile.

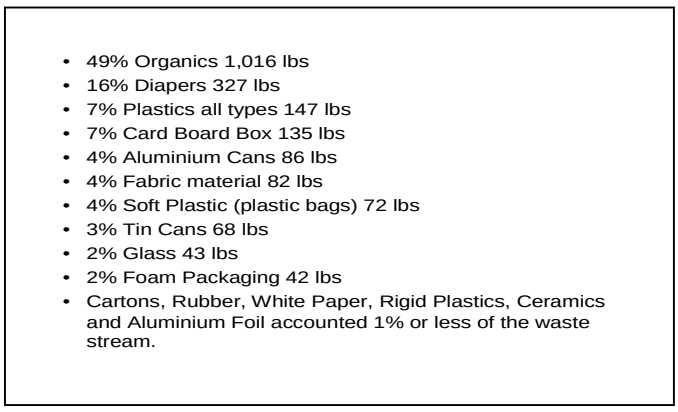

Figure 7: Waste stream analysis of Jenrok village, IWP Pilot Area, Majuro, 2004

Of particular note is that half the waste is organic, and of course is a valuable resource that should not be going into the dump at all. The 16% of diapers in the household waste stream could even be potentially chipped with other organics for composting in some applications. The 4% of aluminium cans would be low as a total component of the waste stream, as Jenrok is a high density housing area, and most beer in cans is not drunk at home. Indeed, several visits to the IWP collection points in early June bore this observation out as the IWP collection of aluminium cans showed very little beer cans in the collection bins. Not also that the cans are 4% by weight, but would be considerably more by volume. It is volume that costs money to landfill, not weight. The 86lbs of cans is worth $39 in Australia, and yet has been thrown out here as worthless; it represents 2,500 cans which would be worth $125 at 5c each refund.

[23] Jenrok Waste Stream Survey, RMI International Waters Programme; Ben Chutaro, January 2005.

11. Creating A World Class Model of Sustainable Development

The scheme detailed in this report is a classic case of sustainable development in nearly every respect. It closes the loop on the waste stream, and it does that by building the solution into the cost of the product. Thus, increase in specified wastes actually makes the system work better as economies of scale improve. Also, by recovering waste materials that would normally be lost to landfill, it is contributing to energy efficiency, and thus increased action on climate change, as climate change is driven by energy use in a world that relies so heavily on carbon based fossil fuels. This point is more than of academic interest to a nation whose very existence is threatened by climate change impacts, and whose Government spends considerable time and energy trying to persuade the larger Greenhouse Gas emitters of this world to decrease their emissions and switch to renewable energies.

By looking at the energy use of the recycling system, and principally the MRF, alternatives can be seen. It would be a simple matter to have the entire operation running on locally produced Renewable Energy. If the MRF water demand is filled through rain water tanks filled from the Processing Shed and Office roofs, and a compost toilet is erected to avoid the cost of a sewer connection and reduce water use; then if the energy demand is met by locally produced energy, the Materials Recovery Facility would become a World Class model of Sustainable Development. This can be achieved at very little cost; the only additional cost is for a grid connected Solar PV system.

11.1 Recycling System Energy Use

The system described requires two main sources of external energy, outside of human labour. They are:

- Fuel for the Collection truck;
- Electricity for the presses and office equipment.

Both energy demands can be met locally: Truck fuel from Coconut Oil, and electricity from Solar Energy. The Solar would not be a battery based stand-alone system, but a grid-connected (or grid-tie) system where the PV panels are connected to the electricity supply via an inverter. Excess energy is pumped into the Grid if not used at the point of production, and the meter spins backwards to account for this. Where electricity demand is greater than solar generation, the required amount of power is drawn in from the grid. This system is very common now in Europe, the USA and Australia, and all the necessary equipment is available of-the-shelf.

11.2 Coconut Oil As Diesel Fuel Substitute

Any Truck purchased for the Recycling system would almost certainly be diesel powered, as a 4-ton truck is required. In Majuro, this could very easily be powered by Coconut Oil with no modifications whatsoever. The Toblar Copra Mill at the Delap dock runs several different types of diesel engines on Coconut oil; and the PII construction company, also in Delap, has run a similar sized truck as that required for the recycling system on coconut oil from new; over 50,000 Km has been covered it is reported.[24] A suitable fuel is of course available at Toblar Copra Mill in Delap, for $2 per gallon, or 53c per litre. (In Tarawa diesel is USc75/litre, and the fuel bill is US$135 - $150 per month.) Current pump diesel price in Majuro is around $3.50/gallon, or $1.08/litre. Running on Coconut oil will decrease operational expenses.

Any Chipper of a size suitable for the operation described above would have its own diesel engine, and this too can run on coconut oil with no modifications. (In many locations in the world, a coconut oil powered internal combustion engine would require a heater for the oil to stop it solidifying in cooler weather. This is not required in the low-lying tropical islands of the Equatorial Pacific.)

[24] Pers. Comm. Nov 2004, Dr. Gerhard Zieroth, Renewable Energy Division, SOPAC

The Coconut oil is of course produced within the Marshall Islands, so avoiding the need to import fuel, and spend money overseas. It is a renewable energy bio-diesel resource.

11.3 Solar Energy As Fossil Fuel Electricity Substitute

The other energy requirement is for electricity. Currently, electricity provided by the Marshall Energy Company (MEC) comes from a diesel powered 12MW plant in Delap. The MRF described in this report would use two large pieces of electrical equipment, a Vertical Baler for cardboard and maybe PET (if not shredded), and a Horizontal Press for cans.

Predicting electricity use for the MRF is not easy; however, data is readily available for a similar sized operation in Tarawa. The Tarawa presses are both small, and one might expect to be less efficient as a result. Tarawa handles around 20,000 cans and bottle per day, most of it cans which require a lot of force to compress them into a suitable block. The Tarawa operation also handles cardboard. Tarawa electricity demand is typically around 200kWhr/month, with up to 250kWhrs. If we assume that a slightly larger operation in Majuro (at 24,000 items per day) would consume 300kWhr/mth, then total electricity requirement would be about 3,600kWhrs. Using data from a 512Wp PV solar system currently operating in Majuro on Kiddenen Island, and monitored closely for the past three years of operation[25], it appears that a 1kWp array of PV panels in Majuro would easily produce around 1450kWhrs of electricity in a year.

Thus, to cover the electricity demand of the MRF envisaged by this study, a solar PV array of 2.5 kWp should be sufficient to generate the annual electricity requirement. This energy would be most effectively used by grid connecting the PV system, so that no battery bank is required, thus making the system cost considerably cheaper, and far more efficient.

An array of this size could be achieved through use of amorphous silicon roofing panels, which double as a roofing material, and can be obtained in a stainless steel backing form, highly advisable for such a corrosive environment as Majuro. Using roofing type amorphous panels would also decrease installation costs as the array could be incorporated into the MRF design as a roofed area. The amorphous PV material appears to perform well in a tropical environment, as heat dose not adversely affect this type of panel. A 3 kW grid-tie inverter would be used, and many suitable examples are available on the market.

The whole system could be purchased and installed for between $20-25,000. The savings to the operation, when arranged on a net-metered one for one basis, would be around $700 per year. These savings can expect to escalate rapidly, as the cost of diesel is climbing very fast, and so the cost of electricity will increase too. It is even quite feasible to find that, should predictions of 'peak oil' arriving soon be true, that small Pacific Island Countries on the end of long supply chains for scarce fuel will suffer shortages in the not too distant future.

The demonstration value of such a grid-tie system would be great, as this would be the first grid-tie PV system in the Marshall Islands. The model that this would demonstrate to a wider audience would be World Class, at very little extra cost.

11.4 Rainwater Harvesting

Rainwater could be easily collected off the large processing shed roof, which, coupled with suitable size tanks, could cover the fairly low water use requirements for the MRF. Water is a commodity often in short supply on an Atoll, indeed, Majuro water is usually only supplied certain days of the week, so tank storage is essential anyway. Couple rainwater harvesting with a compost toilet, and the external water requirements of the MRF can easily become zero. A compost toilet at the Tarawa MRF has proved to be excellent, as the MRF yard area in Tarawa has no sewer connection.

[25] Kiddenen Solar System Service Report, Pacific Reef Savers, June 2005

APPENDIX I: Container Deposit Systems in the Region

Australia
The oldest example in the region is that of the state of South Australia, which has operated for 30 years. The deposit rate there is 5c per beverage container, and the recovery rate from the deposit system is around 85%[26]. The New South Wales Government is looking closely at putting in place a CDL system, and has lobbied the Australian Federal Government to introduce a nationwide system.

United States
California introduced such a system in 1986, and is achieving recovery rates of 80% for aluminium, 60% for glass, and 65% for PET plastic bottles[27]. Deposits are 5c and 10c. Ten US states have CDL systems, whilst nearly all Canadian states use the system to increase recycling. In January 2005, Hawaii introduced CDL system[28] to control litter and increase recycling, expecting an 80% plus recovery rate of beverage containers.

Pacific Islands
In the Pacific Islands, **Nuie** has a deposit system on cans, and **Samoa** has one on some bottles. The Fiji Department of the Environment is pursuing a policy of introducing a container deposit system to deal with the rapidly increasing PET plastic bottle problem.

In February 2005 **Kiribati**[29] introduced a Container Deposit based recycling system to assist in efforts to deal with the dire waste problem of the urban areas of the country. The effect has been dramatic in removing all drink can and bottle litter from the street. The system also includes lead-acid batteries and removed over 4,000 disused batteries from the environment in the first three months. But the Kiribati system has had a far greater effect than just those materials targeted for recycling under the deposit system. A Materials Recovery Facility set up to handle materials to be recycled also collects cardboard from retail outlets on Tarawa, and is also collecting scrap metals at its site next to the container port.

Figure 8: Customers at Bonriki in Tarawa bring in cans for Refunds

[26] Independent Review of Container Deposit Legislation, Institute of Sustainable Futures, Sydney, Aus. Vol 2, section 3 pg. 17
[27] Ibid, section 2, pg. 13
[28] Honolulu Solid Waste Integrated Management Plan, 5.4.2, p 69.
[29] Government of Kiribati: Special Fund (Waste Materials Recovery)Act 2004; Assented and passed into law February 3rd 2005.

APPENDIX II: Kiribati Container Deposit Legislation

REPUBLIC OF KIRIBATI
(No. 9 of 2004)

I assent,

Beretitenti
3/2/2004

AN ACT TO LEVY DEPOSITS IN RESPECT OF THE RECOVERY OF WASTE MATERIALS IN KIRIBATI; AND FOR CONNECTED PURPOSES

Commencement:
2004

MADE by the Maneaba ni Maungatabu and assented to by the Beretitenti.

PART I
PRELIMINARY

Short title

1. This Act may be cited as the Special Fund (Waste Material Recovery) Act 2004.

Interpretation

2. In this Act unless the context otherwise requires –

"deposit" means a deposit leviable under this Act;

"the Special Fund" means the Special Fund established pursuant to section 7.

PART II
DEPOSITS

Power to levy Deposits for waste material recovery

3. (1) The Minister responsible for environment acting in accordance with the advice of the Cabinet may, subject to the provisions of this Act, levy Deposits in respect of prescribed materials for waste material recovery.

(2) Deposits levied under subsection (1) of this section shall be laid before the Maneaba ni Maungatabu within forty-eight hours of the day on which the next meeting of the Maneaba commences and shall come into operation on publication unless the Maneaba by resolution amends it or rejects it as the case may be.

Orders relating to Deposits

4. (1) The Minister responsible for environment acting in accordance with the advice of the Cabinet may by order make provision as to the classes of materials for recovery in respect of which the Deposits are to be levied and as to the scales and other provisions in accordance with which they are to be levied.

(2) An order made under subsection (1) of this section shall be laid before the Maneaba ni Maungatabu within forty-eight hours of the day on which the next meeting of the Maneaba commences and shall come into operation on publication unless the Maneaba by resolution amends it or rejects it as the case may be.

(3) Any such scales or other provisions may provide for Deposits to be levied at different rates by reference to such circumstances or combination of circumstances (whether relating to classes of materials, seasons of the year, days of the week, times of day or otherwise) as the Minister may consider appropriate.

(4) An order under this section may provide that materials of any description specified in that behalf in the order (notwithstanding that they are materials of a class specified in the order pursuant to subsection (1) of this section) shall be exempted from the payment of Deposits.

Regulations for waste material recovery scheme

5. (1) Provision may be made by regulations made by the Minister responsible for environment acting in accordance with the advice of the Cabinet, under this section –

(a) for the designation of one or more places at which Deposits are to be paid;
(b) as to the persons by whom such Deposits are to be paid and the manner in which they are to be paid;
(c) for ensuring that materials in respect of which Deposits are leviable do not enter Kiribati without payment of the Deposit;
(d) for regulating the recovery of materials, including expenditure on recovery of materials;
(e) for general administration of waste material recovery in Kiribati.

(2) Regulations made in pursuance of paragraph (c) of subsection (1) may include provisions for prohibiting or otherwise preventing any such material from entering Kiribati or further entering Kiribati until any Deposit leviable in respect of the material has been paid.

(3) Any regulations made under this section may provide for a notice, specifying the classes of materials in respect of which Deposits are leviable, to be displayed at each place designated in accordance with subsection (1)(a) of this section.

PART III
FINANCIAL PROVISIONS

Establishment of Special Fund

6. A Special Fund to be known as Waste Material Recovery Fund shall be established in accordance with section 107(2) of the Constitution and section 13 of the Public Finance (Control and Audit) Ordinance.

Payments into the Special Fund

7. There shall be paid into the Special Fund –

(a) any money appropriated by the Maneaba ni Maungatabu for the purposes of the Fund; and
(b) any monies collected as Deposits under this Act or orders or regulations made thereunder; and
(c) any other money lawfully available to the Fund.

Payments out of the Special Fund

8. (1) There shall be paid out of the Special Fund –

(a) the amount of any expenditure by the Republic on the costs of recovering waste materials; and

(b) the expenses, as approved by the Minister responsible for finance with the concurrence of the Minister responsible for environment, of the administration and carrying into effect of the provisions of this Act.

(2) No money shall be paid out of the Special Fund except in accordance with a Warrant under the hand of the Minister responsible for finance authorising the Chief Accountant to issue the money to the accounting officer responsible for operating the Fund.

Control of the Special Fund

9. In the performance of his functions under this Part of this Act and under section 13 of the Public Finance (Control and Audit) Ordinance in relation to the Special Fund the Minister shall use his best endeavours to manage the Special Fund in such a way that, taking one year with another, the income of the Special Fund is not less than sufficient to meet its outgoings including depreciation charges.

Annual reports

10. (1) The Minister responsible for finance shall, before the end of each financial year, submit to the Mancaba ni Maungatabu –

(a) a statement showing the estimated income and expenditure of the Special Fund for the current financial year; and

(b) estimates of the income and expenditure of the Special Fund for the next financial year.

(2) The Minister responsible for finance shall, within six months after the end of each financial year, lay before the Mancaba ni Maungatabu a report dealing generally with the operations of the Special Fund during the preceding financial year and containing the audited statement of accounts for that financial year.

PART IV
SUPPLEMENTARY PROVISIONS

Offences

11. Any person who –

(a) wilfully refuses, or without reasonable excuse neglects or fails to pay a Deposit which he is required to pay under this Act or order or regulations made thereunder or wilfully avoids payment of any such Deposit; or

(b) wilfully, with intent to defraud, claims or takes the benefit of any exemption from the Deposit (whether the exemption in question subsists by virtue of section 4(4) of this Act or otherwise) without being entitled to that benefit; or

(c) in circumstances not falling within either of the preceding paragraphs, contravenes provisions of this Act or any orders or regulations made under this Act,

shall be guilty of an offence and liable on summary conviction to a fine not exceeding $1,000 and in default of payment of such fine, to imprisonment for a term not exceeding 2 months.

Civil proceedings

12. Without prejudice to any proceedings under section 11, any Deposit which remains unpaid after it has become due for payment shall be summarily recoverable by the Republic from the person liable to pay the Deposit as a civil debt.

SPECIAL FUND (WASTE MATERIAL RECOVERY) ACT 2004

EXPLANATORY MEMORANDUM

This Act seeks to empower the Minister responsible for environment, acting in accordance with the advice of the Cabinet, by order to levy deposits for the recovery of waste materials from the importers of waste materials.

An order made by the Minister responsible for environment in respect of the levying of deposits shall be laid before the Maneaba ni Maungatabu within forty-eight hours of the day on which the next meeting of the Maneaba commences and shall come into operation on publication unless the Maneaba by resolution amends it or rejects it as the case may be.

Section 4 of the Act empowers the Minister responsible for environment to classify materials in respect of which deposits are to be levied and prescribe the scales and the criteria in accordance with which deposit are to be levied.

An order made by the Minister responsible for environment under Section 4 of the Act shall be laid before the Maneaba ni Maungatabu within forty-eight hours of the day on which the next meeting of the Maneaba commences and shall come into operation on publication unless the Maneaba by resolution amends it or rejects it as the case may be.

Sections 6, 7 and 8 establish a Special Fund (outside the Consolidated Fund) into which shall be paid, among others, all deposits collected in respect of the materials. All monies by the Republic to meet or defray costs of recovering the materials shall also be paid out of the said Special Fund.

Section 11 makes it an offence wilfully to refuse or neglect to pay a deposit which is required to be paid under this Act.

Titabu Tabane
Attorney General
4 May 2004

LEGAL REPORT

I hereby certify that in my opinion none of the provisions of the above Act conflict with the Constitution and that the Beretitenti may properly assent to the Act.

Titabu Tabane
The Attorney General

5

Appendix III: Examples of Suitable Equipment for the MRF.

Horizontal Baling Press for Aluminium Cans

Manufactured by Alert Engineering in New Zealand, this machine will comfortably handle the quantities of cans available in the Marshall Islands, whilst giving a good FCL density and low power consumption.
Current price ex-works, Auckland, NZ is NZ$26,000

Vertical Baling Press

Suitable for baling PET & HDPE plastic bottles, and cardboard cartons into bales for shipping in Containers.

This particular model is made in the USA by Harris-Selco, and is about US$11,000 ex-works Alabama, USA.

A larger model might push cardboard densities to a commercially profitable level

12 inch Chipper

Suitable for chipping organics and PET plastics. This machine has its own diesel engine, is hand fed, and can be towed by a light truck.
Made by Bandit Industries, USA
Price, depending on options,
Ex-Works West coast USA,

Appendix IV: List of Consultations and Contact Details

1. RMI Government

Customs Division:
Chief, Division of Customs: Daniel Timothy
mhcustoms@ntamar.net Capitol Building ground floor
PO Box 29 Majuro, Tel 625 8606, Fax; 625 5730

⇒ Using HS96 6 digit system at the moment, expecting to move to HS6 full 8 digit system and electronic entries in September, (or at least by the end of the year).

Office of Environmental Planning & Policy Coordination (OEPPC)
Director: Yumi Crisostomo,
oeppc@ntamar.net yumikocrisostomo@yahoo.com Tel: 625 7944 fax: 625 7918
Marshall Islands Development Bank Building,

International Waters Programme RMI
National Coordinator, Lowell Alik; l_alik@hotmail.com operates from OEPPC office.

Environmental Protection Authority:
John Bungitak, Director; rmiepa@ntamar.net
Coastal Management Officer; Caleb McClennen, caleb.mcclennen@tufts.edu
Education Unit: Julian Alik rmiepa@ntamar.net
Solid Waste Officer, Coordinator for the Waste and Pollution Division; Roney Arelong, Roney_arelong123@hotmail
National Coordinator POPs Programme: Steven Lepton rmiepa@ntamar.net
Hazardous Waste Officer; Milton Clarence, rmiepa@ntamar.net

Economic Planning, Policy and Statistics Office (EPPSO)
Director, Carl Hacker, Office of the President
planning@ntamar.net 625 3802 / 625 3801

Office of the Attorney General
Deputy Attorney General: S.Posesi Bloomfield
agoffice@ntamar.net possesi@gmail.com
Tel: 625 3244 / 625 8245 Fax: 625 5218; PO Box 890 Majuro

Majuro Atoll Local Government (MALGOV)
Executive Director Dept of Parks and Recreation: Jisam Kaisha
malgov@ntamar.net Tel:625 3415 / 625 8186 Fax: 625 5714; PO Box 796 Majuro

Ministry of Public works
Solid Waste Officer, landfill manager of Batkan / Jabele landfill, Craig Karben
Site Visit 22/6/05

2. Private Sector

Majuro Chamber of Commerce
Presentation to the monthly meeting at Marshall Islands Resort on CDL system for the Marshall Islands, June 9th.
Contact: commerce@ntamar.net , Chair: Carlos Dominick
Majuro CoC has an ongoing interest in solid waste. Has continually met with the government over the SWM situation. Frequent topic at meetings over the last few years. Has made several submissions to RMI over the last few years.

Shipping agents:

Micronesian Shipping agencies Inc. Phil Walsh: shipping agent for Chief Container Service
msaiship@ntamar.net Tel: 625 2021 Fax: 625 2020; 3396 Lagoon Rd, Delap MI 96960

Matson: Bori Ysawa Manager CENPAC (Central Pacific Maritime)
administration@rreinc.com www.rreadmin.com Tel: 625 3250 ext 281 Fax: 625 3505
PO Box 1, Majuro part of Robert Reimers Enterprises Inc.

Metals Recycler:

Tangs Recycling: Mr. Tang, next to Island Hotel, Opposite Nitijela, 625 4384 / 625 7068

Hotels and Bars:

Marshall Islands Resort
Manager: Bill Weza,
625 2525 mir@ntamar.net
supportive of concept.

Marshall Island Club / Flame Tree
Bar and hotel owner Joe Murphy, also major beer importer.
journal@ntamar.net, 625-3142
Complained that recycling cans and bottles was depriving the country of valuable landfill materials. Noted the recent tax increase of 25c per can of beer, additional costs on beer likely to hurt sales he said.

3. Non-Government Organisations

Marshall Islands Council of NGOs (MICNGOs)
Director: Marie Maddison WUTMI (Women United Together in the Marshall Islands).

Community Members at the IWP Pilot Site
Alab Anwel Biranej: Jenrok Weto Alab[30]. Very supportive the system when explained to him through IWP coordinator interpretation. Already collecting cans.
Jebarke Heran: Vice-Chair Na Weto Women's Club, house behind Home and Garden store, Na Weto, Jenrok. Very supportive of proposed system. Collects cans for women's group fundraising.

4. Development Professionals

BCI: Ben Chutaro. Consultant to IWP and ADB. BCI Consultants
Has conducted a Waste stream analysis from Jenrok. Provided invaluable support during field study, including logistical assistance. High level of understanding regarding SWM in Majuro. Accountant by profession, project management abilities.
Completed Socio-economic study of Jenrok.
bako@ntamar.net

Steve Pollard, ADB Senior Economist (Poverty Reduction) Pacific Dept.
Frequent visitor to Marshall Islands on ADB missions. Interest in SWM issue for Majuro. ADB has a study proposal on SWM for the RMI.
spollard@adb.org

[30] Weto: parcel of traditional land; Alab: midlevel traditional community leader.

Appendix V: Selected Beverage Data

Imports:

Customs Data

A brief survey from the Director's computer: average 2140 cases per FCL soda cans

Table IV: Soda Imports FCL only, FY 2004

Month	Soft Drink	Cola
Dec	4	13
Jan	1	7
Feb	8	3
Mar	8	5
Apr	5	6
May	N/A	7
June	N/A	7
July	N/A	6
Aug	3	4

Beverage Prices:

Table V: Beer Prices in some Majuro stores

Stores	**product**	**Price**
Payless	Bud 355ml	$1.99
	Miller lite 355ml	$1.69
	XXX 340ml	$1.39
MapVision	Budweiser 355ml	$1.75
RRE	BUD 355ml	$1.55
	XXXX 375ml	$1.24 (case 24)
Small Stores Majuro	Bud 335ml	$2
Ebeye	Bud 355 ml	$3 +
Average Store		**$1.82**
BARS		
Tide Table	Bud 355ml	$2.80
	Bud Lite 335ml	$2.50
	Speight's 375ml	$2.30
Flame Tree	Bud 355 ml	$2.25
	XXXX 375 ml	$2.50
MIC	Bud 335 ml	$1.50
Nite clubs	Bud 355ml	$2.50
Average Bar		**$2.33**

SODA

Table VI: Soda Prices some Majuro Stores

Store	**Product**	**Price**
Payless	All Soda 355ml	$0.69
MapVision	All Soda 355 ml	$0.75
RRE	Western Fam. 355	$0.49
	Other Soda 355 ml	$0.65
	(Fruit juice in cans	$1.15 - $1.25)
Small stores Majuro	Soda 355 ml	$0.75 or $1
Ebeye	Soda	$0.75 - $1
Average store		**$0.72**

Water

Table VII: Water Prices some Majuro Stores

Store	Bottle size	price
Payless	500 ml	$0.59
MapVision	500ml	$0.50
RRE	355ml	$0.59
	3.57litre	$1.59
Small Store	500 ml	$0.60

Appendix VI: Terms Of Reference for this Study

A Feasibility Study to Investigate the Potential to use the Principals of Extended Producer Responsibility and Product Stewardship to Improve the Economics of Solid Waste Management in the Marshall Islands

Over the last year, Kiribati has put in place a recycling operation financed through the leverage available using Container Deposit Legislation (CDL). This is a recognised Solid Waste Management (SWM) tool, incorporating Extended Producer Responsibility (EPR), and Product Stewardship. The leverage occurs from capturing the high value of a recovery most of the aluminium component through giving the beverage containers a value using a deposit system. This approach is used in many countries as a waste management strategy, and has proved very successful. The Project that created the Kiribati system was financed through its implementation stage by the UNDP. Part of the Project Specification was to produce a model that could be used in other Pacific Island counties should that appear feasible. The Republic of the Marshall Islands (RMI) suffers from similar waste management problems to Kiribati. The information from a feasibility study in the RMI could use the Kiribati model in order to develop a suitable design for the RMI. It is apparent from the Kiribati experience that benefits to SWM are wider than just the materials included in the deposit refund scheme.

Objective

Evaluate the logistics, costs and feasibility of establishing a recycling project in the RMI, based on CDL, which would:

- Reverse the ongoing accumulation of waste in the sea, beaches and other land areas of the islands of the RMI.
- Develop a financially sustainable recycling project that provides employment to Marshallese people;
- Through privatization, produce a model of the Private Sector providing public services to the RMI.

Tasks will include:

- Research issues concerning the drafting of suitable Container Deposit Legislation for the RMI;
- Identify types of media available for a public awareness program associated with recycling, and cost typical activities using those media;
- Outline the elements of a public awareness campaign to compliment the setting up of a recycling operation;
- Identify local organizations, and key people in those organisations with whom partnerships might be formed to achieve a successful recycling operation;
- Identify any current activities on SWM that any recycling project might be required to cooperate with;
- Research suitable equipment that may be required by the Project;
- Identify previous studies involving SWM that might be useful in developing a recycling system;
- Analyse data from any previous waste stream analyses;
- Collect data on imports, and analyse that data, for relevant items that would indicate material flows for recycling;
- Identify current recycling activities within the RMI;
- Identify possible markets for materials collected for recycling;
- Identify shipping costs to markets identified;
- Develop a Project Implementation Plan for the practical and logistical elements of the recycling program;
- Advise as to which materials to collect;
- Research and report on quantities and types of recyclable materials likely available on Majuro;

- Identify uses for materials that it may not be feasible at this stage to export for recycling, but are locally reusable in some form;
- Produce and initial Design, and cost estimates of a Materials Recovery Facility in Majuro;
- Present outcomes to civil society and relevant Government authority for feedback on proposed strategy; and
- Finalize proposal in UNDP format and advise UNDP on appropriate/possible resource mobilization strategy (if approved by Government)

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Jenrok Waste Stream Survey, International Waters Programme, RMI; Ben Chutaro, January 2005.

Jenrok Socio-Economic Report, International Waters Programme, RMI; Ben Chutaro, June 2005.

Independent Review of Container Deposit Legislation
Dr. Stuart White, Institute of Sustainable Futures, Sydney, Australia
Report to the NSW Minister of the Environment, 2002.

Kiribati Solid Waste Management Project Quarterly Reports to UNDP July 2004 to July 2005; and associated data.

Proposal for Improving Solid Waste Reduction and Recycling for Majuro Atoll; Environmental Services Division from the City of San Diego, 2003.

RMI Infrastructure Development and Maintenance Plan Vol 12:
Solid Waste Management in Majuro, BECA International Consultants Ltd. August 2003

'The Real Rubbish News'
Kiribati Solid Waste Management Project Newsletter, Vol 1 & 2, 2004, Vol 3: 2005;

List of Acronyms

ADB	Asian Development Bank
BAF	Bunker Adjustment Factor
D-U-D	Delap – Uliga – Darrit (Majuro urban area)
EPPSO	Economic Policy, Planning and Statistics Office
EPR	Extended Producer Responsibility
FCL	Full Container Load
HDPE	High Density Polyethylene
IWP	International Waters Programme
KSWMP	Kiribati Solid Waste Management Project
KWp	Kilowatt peak (a measure of solar panel output)
MALGOV	Majuro Atoll Local Government
MISSA	Marshall Islands Social Security Administration
MPW	Ministry of Public Works (RMI)
MRF	Materials Recovery Facility
OEPPC	Office of Environmental Planning & Policy Coordination (RMI)
PET	Polyethylene Terephthalate (Number 1 plastic bottles)
POPs	Persistent Organic Pollutants
PSC	Public Service Commission (RMI)
PV	Photovoltaic (solar electricity)
RMI	Republic of the Marshall Islands (often refers to the Government of)
RMI EPA	RMI Environmental Protection Authority
SOPAC	South Pacific Applied Geo-Science Commission
SPREP	South Pacific Regional Environmental Programme
UNDP	United Nations Development Programme.
USEPA	United States Environmental Protection Agency

Attachment F: Republic of Palau Manual for Beverage Container Deposit Fee Program

Number

1

SOLID WASTE MANAGEMENT

Republic of Palau

Manual for Beverage Container Deposit Fee Program

WRITTEN BY BOTH

Solid Waste Management
Bureau of Public Works
Ministry of Public Infrastructure, Industries and Commerce
Republic of Palau
Tel.: 680 488-2850/ 2480
Fax. : 680 488-2536
Email : bpw@palaunet.com

AND

Solid Waste Management Office
Koror State Government
Republic of Palau
Tel.: 680 488-8076/8077
Fax.: 680 488-8078
Email : ksg-swm@palaunet.com

FUNDED BY

Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management in Pacific Island Countries (J-PRISM)
Japan International Cooperation Agency (JICA)

Table of contents

1. Background

One of the main impacts of tourism and infrastructure is the disposal of solid waste in Palau. And one of Palau's most visible forms of pollution is the dumping of beverage containers throughout the island. In 2005, a survey showed that eleven (11) million aluminum cans are imported into Palau annually, not to mention other beverage containers such as, plastics, glass, etc. **These containers are recyclable and should not be dumped in landfills as our landfills are over capacity and sites for landfills are limited. In 2008, the national landfill (M-dock landfill) was projected to reach its capacity in 2013.** Availability of funds appropriated annually to solid waste management was inadequate, however, the recycling law created a recycling fund designed to sustain the recycling program and its 3R activities. Accordingly, **the recycling fund is projected as a sustainable financial mechanism for solid waste management in the Republic.**

Brief History:

The recycling program was first introduced by the Senate Committee on Youth Affairs and Social Welfare during the Seventh Olbiil era Kelulau. The recycling program passed its final readings on October 10, 2006 by the Senate and on October 17, 2006 by the House of Delegates. The President of the Republic then approved it on October 22, 2006.

The law states that this Act shall take effect upon its approval by the President, or upon its becoming law without such approval. However, during this time, the solid waste management office, under the Bureau of Public Works-national government was just in its second year of operation and lack capacity and resources to implement the recycling program. In addition, the solid waste management office was in the middle of a 3 year project with JICA, a Project for Solid Waste Management Improvement in Palau, and Koror State Solid Waste Office was also a counterpart. This Project had three outputs, (1) to develop a national solid waste management plan, (2) to rehabilitate existing disposal site (M-dock landfill), and (3) to train personnel of relevant agencies.

Therefore, a decision was made to hold the implementation of the recycling program until personnel from relevant agencies are trained through the JICA project which ended in 2008. In addition, Koror State was in the process of establishing its own recycling programs including the construction of recycling facility which is now known and became the initial redemption center for the implementation of the recycling program.

Several events took place before full implementation of the recycling program as follows:

- In 2009, President of the Republic of Palau approved and signed the Beverage Container Recycling Regulations mandated by the law.
- In March 2011, the Attorney General's (AG's) Office and Customs Office held a workshop with the Ministry of Public Infrastructure, Industries and Commerce and all stakeholders including major importers of beverage containers to review the law and its contents.
- In April 2011, the Customs Office started the collection of the deposit fee.
- In October 2011, Memorandum of Understanding (MOU) between Ministry of Public Infrastructure, Industries & Commerce and Ministry of Finance and Koror State Government was adopted to make the recycling facility of Koror State Government a initial Redemption Center for the recycling program.

- In October 2011, after six months of fee collection, the redemption center opened its doors to the public.

- In July 2012, the Ministry of Public Infrastructure, Industries and Commerce (MPIIC) awarded a service contract to Palau Waste Collection Company to buy the redeemed containers from the government and export off island for final treatment.

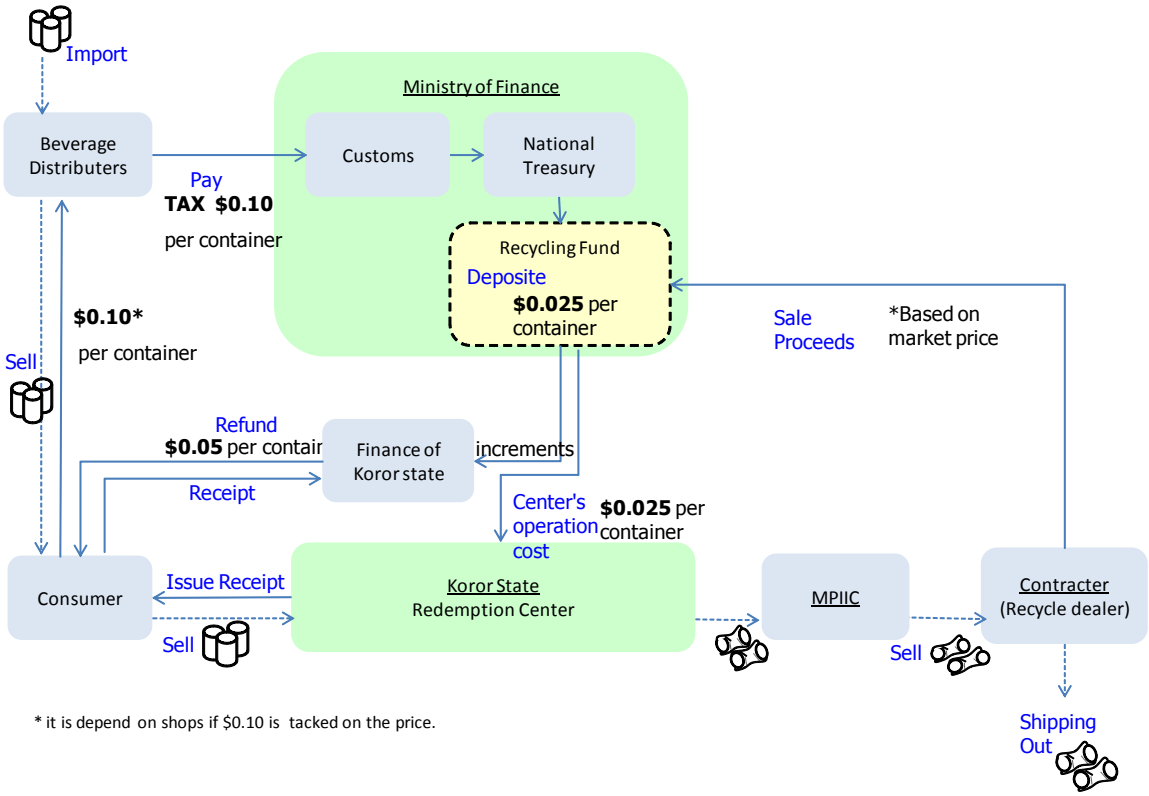
Now, the recycling program is in full operation.

2. Feasibility Study

The financial feasibility study was not done by any agencies. However, when the Bill for the recycling program was introduced by the Senate Committee on Youth Affairs and Social Welfare, a deposit fee on beverage container was set at $0.15 per container. By going through the process of lawmaking, the Committee solicited comments from the general public including environmental agencies of the government and all were favorable comments. However, many of the public comments did suggest that the deposit beverage container fee was set too high at $0.15 and recommended reducing it to $0.10.

Based on the recommendations from the public, the Committee agreed to lower the deposit fee to $0.10 per beverage container and also agreed to split the fee between the program participants as follows: $0.05 to the consumers who recycle as redemption, $0.025 maximum to the redemption center(s), and $0.025 minimum retained by the government as the recycling fund.

3. Overview of the Program



4. Responsibility of Concerned Organizations

The agencies involved in the Deposit Program in Palau are shown below;

Name of organization	Responsibility
Ministry of Public Infrastructure, Industries and Commerce (MPIIC)	Implementation of the recycling program Approve and monitor redemption center(s) Export or find ways to export redeemed containers
Ministry of Finance (MOF)	Management and maintenance of fund Monitoring of Fund Collection of deposit fee by the Customs Office under MOF
Koror State Government	Operation of the Redemption Center

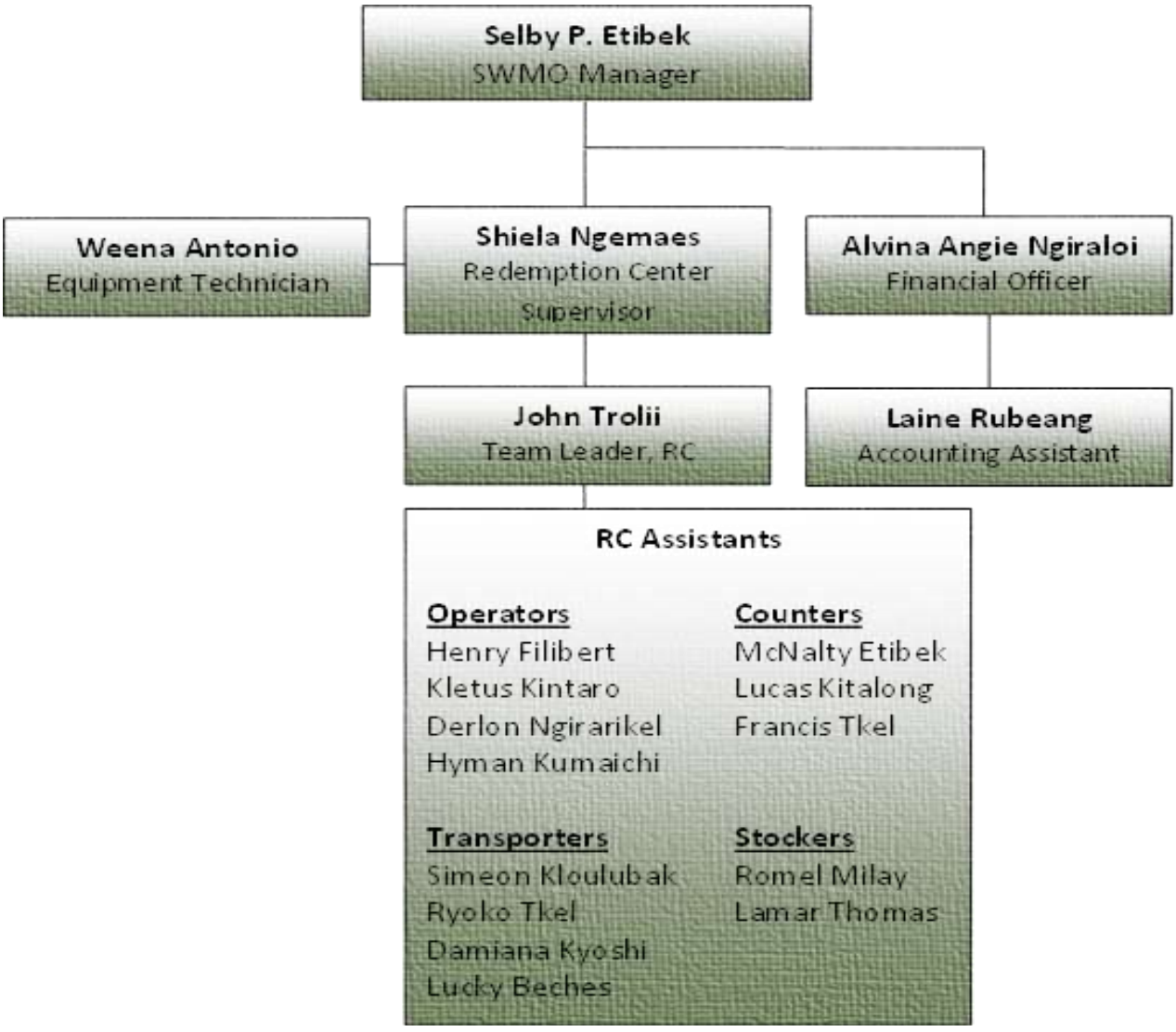
5. Law and Regulations of the Program

The following law and regulation were developed, and Memorandum of Understanding was adapted subsequently as needed.

- **The Republic of Palau Public Law (RPPL No. 7-24):**
    - Establishing a recycling program for the Republic of Palau, establishing a beverage container deposit fee, creating a recycling fund, and for other related purposes.
    - RPPL 7-24 places responsibility for differing aspects of the national beverage container recycling program on two Ministries of the National Government, the Ministry of Public Infrastructure, Industries and Commerce (MPIIC), and the Ministry of Finance (MOF).
- **Beverage Container Recycling Regulations:**
    - These regulations assign respective duties responsibilities over the beverage container recycling program to both MOF and MPIIC.
- **Memorandum of Understanding (MOU):** between Ministry of Public Infrastructure, Industries & Commerce, and Ministry of Finance, and Koror State Government (KSG).
    - Ministry of Finance will advance funds to KSG for redeeming the beverage containers while retaining the $0.025per container redeemed as compensation.
    - Before exhaustion of the fund by KSG, KSG will submit proof of refunds paid to MOF and request for additional funds.
    - KSG will operate the redemption center under the directives of MPIIC.

6. Staff Arrangement and Responsibility

The Redemption Center consists of a total of 18 employees, under the Solid Waste Management Office Manager, who are assigned to different sections and job duties. Below are the employees and their respective positions and general responsibilities.

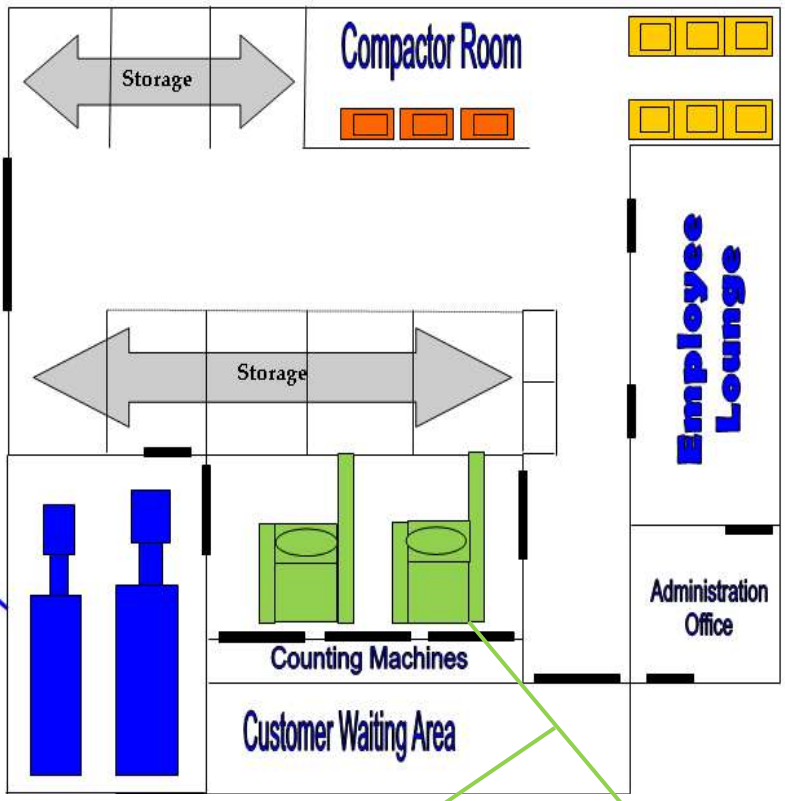


Info.(example)
Total number of handled/redeemed containers at the center per month
2.7 million in September 2012

7. Outline (Design) of the Redemption Center

Compactor

Glass Bottle Crushers



8. Schedule of Daily Operation

Daily Operation Routine is as shown below;

Time	Activity	Who
7:30	Equipment and Personnel Preparations	All staff
8:00	Commence Operations	All staff
11:00	Clean up	All staff
11:30	Lunch Break	All staff
12:30	Equipment and Personnel Preparations	All staff
13:00	Commence Operations	All staff
16:00	Clean up and secure equipment's and facility	All staff
16:30	End of work day	

9. Operational Flow

10. Counting Method

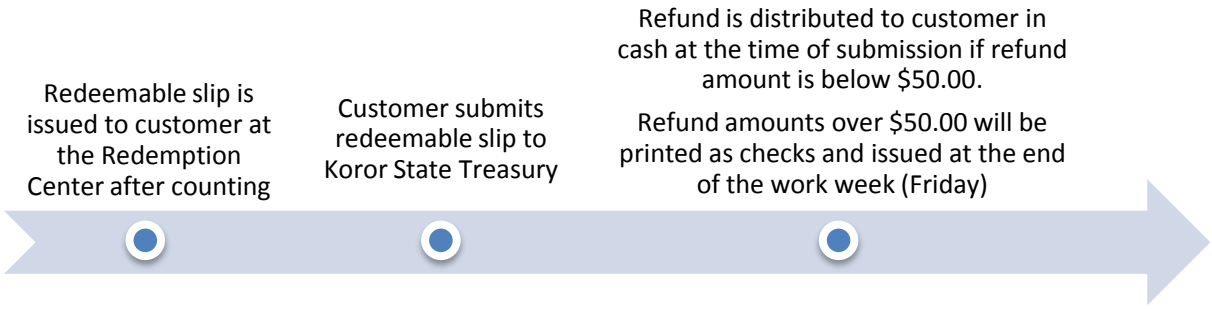
Initially, the counting of containers was done manually. This method required many counters in order to speed up the process. In this case, ten workers were used to count containers for the whole day. This was a physically demanding task and it was later changed to lessen the workload for the workers as well as increase efficiency in other areas of the operation.

The current counting methods being employed is mechanical counting along with manual counting. **Manual counting is only employed when counting glass bottles and tetra packs/ army packs (juice pouches and cartons). Mechanical counting is specifically used for counting aluminum cans, metal cans and plastic/PET bottles.** This method requires at least three personnel to operate. Two counting machines have been commissioned by Morimoto Corporations of Japan with designs created by Koror State Government via Mr. Katsuo Fuji, SWM Consultant. Each of these counting machines has the capability to count as much as 26 aluminum or metal cans per second and 14 PET bottles per second. The counting is done by laser beams and sensors, where once a container interrupts for an instance the contact between the beam and the sensor then the counting is engaged.

It should be noted that this upgrade in the counting method is made possible through the financial mechanism provided by this program.

11. Accounting

Refund Procedures;



Following is an example of the Redeemable Slips issued to customers at the Redemption Center

Koror State Government
P.O. Box 116
Koror, Republic of Palau 96940

Department of Public Works
Solid Waste Management Office

Tel. No (680) 488-8076/488-8077
Fax (680) 488-8078
Email kegswm@palaunet.com

DATE:_____ NO:

Customer:_____

Redeemable Items:

_____ Cans (# of cans x $.05) $_____ _____Pet Bottles (# of p. bottles x $.05) $_____

_____ Glass (# of bottles x $.05) $_____ _____Others (# of others x .05) $_____

_____ Tetra Box/Army Pack (# of tetra/army pack x .05) $_____ Total Amount: $_____

Issued By: _____ Customer Signature: _____
Alvin Angie Ngirake
SWMO Financial Officer

"Thank You for Keeping Palau Clean!!"

12. Facility and Equipments (Capitol Cost)

There were three Phases to invest the facility.

Facility	Description	Cost (US$)	Funding
1st Phase	Construction of Machine Room to house compactors and storage spaces	$30,000.00	KSG
2nd Phase	Construction of additional storage spaces and Administration offices	$110,000.00	KSG
3rd Phase	Construction of receiving & counting platform and supply storage room	$30,000.00	KSG
4th Phase	Construction of Glass Bottle Crusher Room and Roofing of customer waiting area	$30,000.00	KSG
Total Cost of Facility		**$200,000.00**	

The following table shows the machines list installed.

Machine Name	Purpose of the Machine	Description	Cost (US$)	Funding
Single Compactors (3 ea.)	Used to compact/bale cans and bottles to reduce volume	Orwak	$10,000.00 ea. Total: $30,000.00	$26,270.00 (Japan Government Grant) $3,730.00 (KSG)
Multi-Chamber Compactors (2 ea.)	Used to compact/bale cans and bottles to reduce volume	Orwak	$14,000.00 ea. Total: $28,000.00	KSG
Needle Equipped Compactor	Specifically used for compacting PET and Plastic Bottles	Orwak	$17,000.00	KSG
Glass Bottle Crusher (Small)	Used to crush and sand glass products	Glass Aggregate Co.	$37,735.00 (Used)	Japan Government Grant
Glass Bottle Crusher (Big)	Used to crush and sand glass products	Glass Aggregate Co.	$89,000.00 (Brand New)	KSG
Counting Machines (2 units)	For counting Cans and Plastic Bottles	Morimoto Corp.	$32,500 ea. Total: $65,000.00	KSG
Electric Forklift	Used to stock bales and transport other equipment's and supplies	NBK Corp.	$46,000.00	KSG
Industrial Roof Fans (2 ea.)	For circulation of fresh air into the center	NBK Corp.	$7,000.00 ea. Total: $14,000.00	KSG
Solar Panel	Renewable Energy to reduce electricity cost	SANYO	$86,000.00	UNCCD Grant
Weighing Scale	Used to weigh and record incoming and outgoing recyclable materials	NBK Corp.	$8,000.000	KSG
Total Cost of Equipment's			**$420,735.00**	

Total Investment into Redemption Center:
$620,735.00 including Donations

13. Reporting

Data's are recorded daily during operation of all equipment's and machinery.

Types of reports:

- Equipment Reports – Records of each machine's operation and maintenance. This report includes daily operational hours, number of treated materials produced, maintenance checks (equipment and component conditions including repair and replacement parts request if applicable).

- Daily report on redeemed materials – This report is prepared daily for verification and is used to monitor the program's fund. These reports are also compiled at the end of each month to compare redemption rate vs. monthly importation.

- Supervisors Report – This report is submitted and presented during a regularly scheduled supervisors meeting that takes place each month. This report covers operational procedures evaluation, employee evaluations, and requests pertaining to operational needs.

- Outgoing Report – This report is prepared for record keeping and monitoring of the weight of recyclable materials being exported through the Beverage Container Deposit Fee Program.

These reports are very crucial as they can identify flaws within the operations. Through identification of weak points and flaws within the operations, it makes it possible to further improve and strengthen the program through amendment of the law and regulations as well as adjustments to operational procedures.

14. Training

Newly hired employees are required to go through what is called "**fundamental or basic training**". This training is usually conducted by the Recycling Center Chief Operator, Recycling Center Supervisor and the Consultant. It is basically an orientation in which the trainees are briefed on the basic information's on work procedures, equipment operation and maintenance procedures, and the law and regulations governing the Beverage Container Deposit Fee Program. Newly hired personnel are to be in training for the full extent of their 3 months probationary period.

Other trainings:

1. **General training on Safe Operation and Maintenance of Equipment's**
   - By request from KSG-SWMO.
   - Conducted by Mr. Eugene Uehara, certified by U.S Department of Interior (DOI)
     **Employees whose job duties require them to operate forklifts, loaders and trucks must attend this training.*

2. **Work Zone and Personal Safety Training**
   - Conducted through Palau Community College
   - By U.S Federal Program (MAP) Maintenance Assistance Program. (Mr. Don Hanser, Coordinator and Mr. Johnny Kintaro, Instructor).

15. Awareness and Promotion

Before commencement of the program:
Because this program was introduced and necessitated through enactment of National Law, it was seen as essential to hold televised public hearings to explain the reason for the 0.10 cent tax increase on imported beverage containers and present the intentions and overview of the program. These televised public hearings were the first efforts in promoting and raising awareness for this program.

After commencement of the program:
After the appointment of the Koror State Recycling Center as the initial National Redemption Center, the Koror State Solid Waste Management Office took on the role of promoting and raising awareness for the program by disseminating information's through paid advertisements (Television talk shows and commercials, Newspaper ads, and Radio talk shows). Also through initiation of the Community Workshop Program, information's were presented to local communities firsthand through interactive presentations, informational brochures and handouts. The effort to promote and raise awareness for the program is ongoing as long as the program is operational. It is also important to continue this effort as there may be necessary modifications to be made to improve the program. Example of improvements: amendments or addendums to the law and regulations, operation schedule and refund procedures.

This program can be easily promoted because of the incentive which it provides.

16. Challenges Experienced

There are many challenges that have been faced in regards to the operations of the Redemption Center. Some of the challenges experienced are very difficult to resolve once the program is operational. For instance, **the calculations of existing beverage containers on hand before the actual commencement of the program.** This is critical as it will determine the grace period in which to collect tax and build up funding which in turn will determine the financial sustainability of the program. In this case, 6 months was the allotted period for tax collection and after one year of operation it was deemed necessary to implement a monthly limitation on the rate of redemption to sustain the fund. **Another challenge is weather. This is an external condition which cannot be fixed. For example, towards the end of 2012 Super Typhoon Bopha barely struck Palau and tore off the roof of the National Redemption Center and put a halt to the operations.**

As mentioned previously, counting method was a challenge in the beginning of the operations as human errors became a factor due to exhaustion. This method is also very difficult to monitor as there are many counters. **The lack of an effective monitoring system for this counting method can have a devastating impact as inaccurate counting can take place.** This is why counting machines have been employed to do the majority of this task.

Another challenge faced was the underestimation of the redemption rate in the beginning of the program. This ultimately led to shortage of capacity in human resource, equipment's and facility. This challenge prompted the Government of Koror State to expand its Solid Waste Management Office into its current state; from less than 20 employees to now employing more than 50, and more than a million dollars of investment into its facilities and equipment's. And this is all made possible through the financing mechanism to which this program and its governing law and regulations provide.

17. Exporting the Redeemed Containers

The Ministry of Public Infrastructure, Industries & Commerce, as the responsible agency, the Ministry may, from time to time, delegate or contract out the administration of the recycling program to other governmental agencies of the national government, state governments or private companies; PROVIDED that the ultimate responsibility and authority for the recycling program shall rest with the Ministry of Public Infrastructure, Industries & Commerce (Source RPPL 7-24 §4).

MPIIC decided to use a private contractor for exporting the redeemed beverage containers for the following reasons:

- Recycling companies already exist in Palau.
- Experience in exporting recyclable materials.
- These companies have the capacity in terms of tools, equipments, personnel, facilities and know how.

Hence, MPIIC went through the process of bidding out a service contract to interested parties and the bid was awarded to Palau Waste Collection Company based on qualifications.

The Contractor shall perform the following services:

- Buy redeemed containers from the National Government.
- Be responsible for picking up compressed and redeemed containers from the Redemption Center at their own expense.
- Ship out of Palau compressed and redeemed containers (aluminum, plastics, and metals) **within six (6) months** after pick up from Redemption Center at its own expense.

18. Plans to improve

Recommendations for improvement of the recycling program of Palau:

- Amend the law to include all sizes of beverage container. Existing law only calls for 32 oz. and lower.
- Existing law exempt milk and dairy derived products. Need to include them as there are many milk products in aluminum/ metal cans and glass bottles.
- Need to revise the Beverage Container Recycling Regulations to fit the needs of the operation of the Redemption Center and the overall recycling program.
- Need to create a better monitoring system for the import- redeemed- export amount of beverage containers to monitor the amount of import vs. export so that we can understand the effectiveness of the program and make improvements as necessary.

19. Tips: Steps to Start Program

Steps to start recycling programs;

1. **Data collection:**
    a. Survey of waste generation rate
    b. Composition of waste
    c. Survey of imported goods
2. **Make a decision on what kind of waste is recyclable based on the survey and choose a program that is attainable.**
3. **Feasibility study:**
    a. What amount of deposit fee should be imposed on the recyclable items? Is the amount adequate to sustain the program?
    b. Check the price in the recycling market.
    c. Agencies involved in the program should have capability implementing such program. For example, they must have the right equipments, program for collection of fee, way for exporting and personnel capacity.
4. **Make a proposal to the leadership.**

The following items should be considered during the planning;

ITEMS TO CONSIDER		ONE PROPOSAL
Target Item	Reference Law and Regulation	Must pass a Law Develop regulations according to Law
	Target items as objects of the deposit	Choose which items to target
	Restriction of the target items	It is best not to limit the size or product types of target items
Deposit	$ of deposit or tax of the item	Should be set when doing financial feasibility
	How many months required to collect deposit fee before starting refund	3 months, 6 months or 1 year. It depends on your data of imported goods.
	Training to be considered	Must hold workshops for implementing agencies importers/ distributers of the target items to assure them of the program purpose and fees involved.
	Training to Staffs of office of Custom	Must hold workshops for staffs who are responsible for collecting deposit in the office of Custom
	Program/System at Office of Custom	Any agency responsible for collection of deposit fee should have capacity to perform the task.
	Deposit of container imported	Any container imported through any port, airport or by postal package shall be paid.
	Empty container imported for the purpose of exporting	Shall pay deposit fee and off-set the fee at the time of export
	Plastic pellet imported for the purpose of exporting	Shall pay deposit fee and off-set the fee at the time of export
	Time to pay the deposit fee	Before release the product. It is best not to allow releasing all products in the container until the deposit is paid even tax for other product is paid.
	Monitoring and Reporting by the responsible agency	Responsible agency of collecting deposit should record and share the data among involved agencies at least monthly base.

Fund	Creation of recycling fund	% of deposit fee should be used to create a recycling fund as financial source for Solid waste management.
	Account of recycling fund	The fund should have separate account from other funds.
	Purpose of the fund	The law should specify the use of fund. The fund should be used for solid waste activities.
	Monitoring and Reporting by the responsible agency	Responsible agency for managing the funds should record and share among involved agencies at least monthly basis.
Refund	$ of refund	Should be set when doing financial feasibility
	How many months from passing the law to start refunding	Shorter is better to avoid accumulation of untaxed items to be redeemed.
	Rule of refund	1 refund per container
	Condition of container to be redeemed	Should be clean, empty and not pressed or pretreated from a recycling company.
	Counting method	Double monitoring should be taken to prevent double counting.
	Responsible agency for refund	Redemption center under the monitoring of the agency which manages the deposit fee.
Redeemed containers	Sales and export of redeemed containers	Recycling program should support local recycling companies, thus, the implementing agency should contract out to the private company to buy and export the redeemed containers.
	Monitoring	Implementing agency should monitor the amount redeemed, sales and export of the containers.
Redemption center	Creation of the redemption center	The law should call for a redemption center and the responsible agency.
	Redemption center operation	Operation plan should be approved by the responsible agency. Redemption center could be government agency or private contractor.
	Operation cost of the redemption center	The center should receive $ per container redeemed for compensation (operation cost).
	For outer islands or community in the distant	(Item to consider)
Other	Report	Annual Report should be prepared at end of each fiscal year by the responsible agency.
	Monitoring/ Audit	Responsible agencies and activities concerning recycling program shall be audited at least once a year by the Public or Private Auditor.
	Roles of the redemption center	Refund $ per container Recording of redeemed containers
	Roles of implementing agency(s) according to law	Example, MOF- management of deposit fee, monitoring of funds, check financial reports from redemption center and collection of deposit fee. MPIIC- implementation of the program, approve and monitor the redemption center(s), and export or find ways to export redeemed containers.

Thank you very much for taking the time to read this manual.
Please contact Solid Waste Management, Bureau of Public Works or Koror State Solid Waste Management Office for any queries regarding the information's presented in this educational manual.

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This is an educational manual created with the experiences of the Solid Waste Management, Bureau of Public Works, MPIIC and Koror State Solid Waste Management Office to educate and help those who wish to start a container deposit fee program as a form of solid waste management activity. We sincerely hope it will benefit you.

Appendix H

End of Life Vehicle Costed Design

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

Recycling EOL Vehicles - Sierra RB5000

Assumptions (Annual Recycling of EOL Vehicles)		
Number of EOL vehicles	500	per year
Amount of scrap ferrous	700	t based on 1.4t per vehicle
Achievable container weight	20	t/20ft container
Days to process	20	based on 25 EOLs per day
Shipping per 20ft	$ 2,000.00	
Shipping per tonne	$ 100.00	

Operating Expenses		
Operation staff (x2)	$ 2,400.00	Hourly rate $2.50, 8hrs/day
Administration (0.05 FTE accountant)	$ 500.00	Accountant salary $20,000, 0.2FTE
Fuel for baler	$ 12,500.00	25L/hr diesel = 6.6gal @ $5/gal
Shipping expenses (export of scrap)	$ 70,000.00	Based on 20t container weights and $2000/container
Rental of Sierra RB5000	$ 11,050.00	2 months rental (to allow for shipping time)
Transport of Sierra RB5000	$ 15,000.00	Auckland - Majuro - Auckland
Interest on bond	$ 2,500.00	$100,000 at 15% for 2 months
Rental of truck with Hiab crane	$ 10,000.00	2-3 months (used to collect EOL vehicles and load/unload baler)
Total Expenses	**$ 123,950.00**	

Revenue		
Sale of ferrous	$ 133,000.00	$190/t
Total Revenue	**$ 133,000.00**	

Profit (Loss)	**$ 9,050.00**	Profit

Assumptions (Bi-Annual Recycling of EOL Vehicles)		
Number of EOL vehicles	1000	per 2 years
Amount of scrap ferrous	1400	t based on 1.4t per vehicle
Achievable container weight	20	t/20ft container
Days to process	20	based on 25 EOLs per day
Shipping per 20ft	$ 2,000.00	
Shipping per tonne	$ 100.00	

Operating Expenses		
Operation staff (x2)	$ 4,800.00	Hourly rate $2.50, 8hrs/day
Administration (0.05 FTE accountant)	$ 1,000.00	Accountant salary $20,000, 0.2FTE
Fuel for baler	$ 25,000.00	25L/hr diesel = 6.6gal @ $5/gal
Shipping expenses (export of scrap)	$ 140,000.00	Based on 20t container weights and $2000/container
Rental of Sierra RB5000	$ 16,575.00	2 months rental (to allow for shipping)
Transport of Sierra RB5000	$ 15,000.00	Auckland - Majuro - Auckland
Interest on bond	$ 3,750.00	$100,000 at 15% for 2 months
Rental of truck with Hiab crane	$ 20,000.00	2-3 months (used to collect EOL vehicles and load/unload baler)
Total Expenses	**$ 226,125.00**	

Revenue		
Sale of ferrous	$ 266,000.00	$190/t
Total Revenue	**$ 266,000.00**	

Profit (Loss)	**$ 39,875.00**	Profit

Assume that the only costs for disassembly are for the removal of engines and transmissions. Further disassembly is assumed to be on a cost recovery basis (minimum).

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

Recycling EOL Vehicles - Alert RJ100

Assumptions (Annual Recycling of EOL Vehicles)			
Number of EOL vehicles		500	per year
Amount of scrap ferrous		700	t based on 1.4t per vehicle
Achievable container weight		20	t/20ft container
Shipping per 20ft	$	2,000.00	
Shipping per tonne	$	100.00	

Operating Expenses			
Operation staff (x3)	$	15,600.00	Hourly rate $2.50, 8hrs/day
Manager (0.2 FTE)	$	9,000.00	Manager salary $45,000
Administration 1 (0.1 FTE)	$	2,000.00	Accountant salary $20,000
Administration 2 (0.1 FTE)	$	1,000.00	Accountant assistant salary $10,000
Supervisor (0.2 FTE)	$	3,000.00	Supervisor salary $15,000
Equipment Technician (0.2 FTE)	$	3,000.00	Equipment Technician salary $15,000
Operational Overheads	$	15,000.00	Includes fuel, electricity, maintenance, tools, consumables, etc
Depreciation (Equipment)	$	20,000.00	Straight line, 10%, 10 years, on RJ100
Shipping expenses	$	70,000.00	Based on 20t container weights and $2000/container
Total Expenses	**$**	**138,600.00**	

Revenue			
Sale of ferrous	$	140,000.00	$200/t
Total Revenue	**$**	**140,000.00**	

Profit (Loss)	**$**	**1,400.00**	Profit

Capital Costs	**Total**		
Administration set up	$	10,000.00	
EOL Processing Facility set up	$	50,000.00	Buildings/Shipping containers for RJ100, power supply, amenities
Equipment	$	200,000.00	RJ100 (CIF)
TOTAL CAPITAL COSTS	**$**	**260,000.00**	

Assume that the costs for disassembly are offset in part by the sale of spare parts and more valuable non-ferrous metals.
Additional operating and capital costs will be incurred if the EOL Processing Facility is not located on the landfill or with the MRF.

ASSESSMENT OF SWM ON MAJURO ATOLL
JOB NO: A02753600

Recycling Ferrous Stockpile at the Landfill

Assumptions		
Amount in stockpile at landfill	2500	tonne based on volume of stockpiles and 0.5t/m3 (lots of void space)
Achievable container weight	20	t/20ft container
Days to process	50	days to process at 10t/hr and 5hrs/day
Shipping per 20ft	$ 2,000.00	
Shipping per tonne	$ 100.00	

Operating Expenses		
Operation staff (x5)	$ 10,000.00	Hourly rate $2.50, 8hrs/day
Manager (0.1 FTE)	$ 4,500.00	Manager salary $45,000
Administration (0.1 FTE accountant)	$ 2,000.00	Accountant salary $20,000
Fuel for baler	$ 31,250.00	25L/hr diesel = 6.6gal @ $5/gal
Shipping expenses (export of scrap)	$ 250,000.00	Based on 20t container weights and $2000/container
Rental of Sierra RB5000	$ 22,100.00	4 months rental (to allow for shipping)
Transport of Sierra RB5000	$ 15,000.00	Auckland - Majuro - Auckland
Interest on bond	$ 5,000.00	$100,000 at 15% for 4 months
Rental of excavator or crane	$ 20,000.00	2-3 months (used to load/unload baler)
Total Expenses	**$ 359,850.00**	

Revenue		
Sale of ferrous	$ 500,000.00	$200/t
Total Revenue	**$ 500,000.00**	

Profit (Loss)	**$ 140,150.00**	Profit

RB5000
BALER/LOGGER

The Most Portable Baler/Logger Around!

Features

170 HP Cummins Turbo Diesel Engine

Continuous Rotation Crane

Automatic Baling and Logging Cycles

Hardox Liners

Production

Baling

10 - 14 Tons per hour

Logging

16 - 22 Tons per hour

SIERRA

RB5000 Specifications

Engine:	Cummins 6 Cylinder Turbo Diesel 170 HP Tier III
Baler Hydraulics	1 Rexroth Variable Displacement Pump 1 Vane Type Pump Maximum Operating Pressure of 4020 PSI 100% Filtration with 20 Micron Fibers Complete System Relief Protection Automatic Cycles (Baling & Logging) Hydraulic Cooling System
Crane Hydraulics	Full Functioning, Independent of Baler Continuous Rotation 2200 Lbs Capacity Fully Extended 24' 8" Boom Reach Four Point Orange Peel Grapple on X With Rotator
Cylinders:	(2) Main Compression (6) Folding Box Rams
Cylinder Forces:	Main Compression, 170 Tons Folding Box, 6 Cylinders - 90 Tons each, 270 Tons Per Side
Folding Box Dimensions Open: Closed:	 16 Ft. 5 In. X 8 Ft. 6 In. 16 Ft. 5 In. L X 40 In. W X 24 In. H
Bales:	Size - 40 In. X 24 In. X Variable Weight - 850 Lbs. Average
Logs:	Size - 40 In. X 24 In. X Variable Weight - 1200 - 1400 Lbs. Average
Tank Capacities:	Diesel Tank - 80 Gallons Hydraulic Tank - 300 Gallons
Weight (Approx):	81.000 Lbs.

*Sierra Reserves the right to change specifications without notice. Rev. 02-07-12

SIERRA

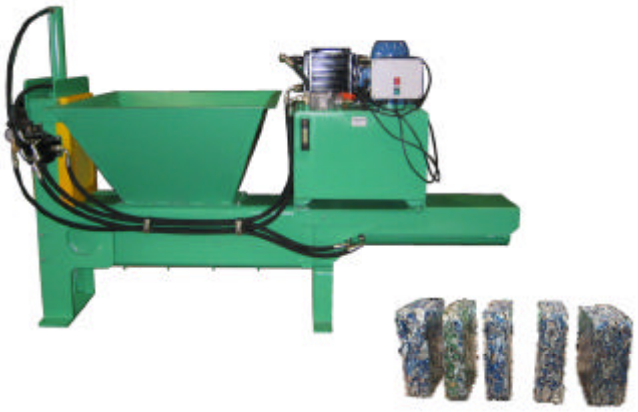
www.sierraintl.com
Ph: (661) 327-7073 | USA - (800) 343-8503
1620 E. Brundage Lane | Bakersfield, CA 93307

Appendix I

Recycling and Waste Disposal Equipment Information

ALERT ENGINEERING CO LTD CanBalers

Alert Manual & Automatic Midi Balers



Automatic Midi Baler
(Shown with optional Large Custom Hopper)

The Alert MIDI-Balers are the smaller Can Balers suitable for Beverage Can Manufacturers, Beverage Canning Plants and small Refuse / Recycling Stations.

The AUTOMATIC MIDI-Baler operates on a pre-determined cycle controlled by a built-in PLC.
When the hopper is filled up to the level and the optical beam is broken, the press starts and cycles through it's programme including Pre-Compaction which cycles the packer-head at a lower pressure, then the Full Compression which makes the Bale, after this the door opens and the bale is ejected onto the Exit-Table. The Door closes and the MIDI-Baler is ready for the next cycle. (The amount of Pre-Compaction cycles can be changed by the operator to suit the type of material / size of bale required.)

The MANUALLY Operated MIDI-Baler, which is more suitable for operations with small to intermittent volumes of Aluminium cans, is controlled by a trained operator. The machine has a manual Hydraulic Control Valve mounted on the side of the machine, controlling the Compaction Cylinder and the Door Cylinder. A Pressure Gauge mounted adjacent to the controls indicates the when maximum Compaction is reached.

- ✓First in Quality
- ✓High Productivity
- ✓Smooth Operation
- ✓Full Service Support
- ✓Tomorrows Design

Alert Engineering Co Ltd have over 30 years experience in the design, manufacture and servicing of Transport Solutions. We manufacture & Supply a large range of Ferrous and Non-Ferrous Balers, Shears, Compactors, Scrap Metal Industry Related Equipment, etc. (The Sky is the Limit!)
With In-house State of the Art Design, Development and Manufacture our expertise is second to none, and quality is controlled in an ISO9002 environment.

ALERT - Diversity in Engineering

Due to the Alert Engineering Co Ltd' continuous product improvements, specifications and dimensions may change without notice. Alert Engineering Co. Ltd shall not be held responsible for any errors in their catalogues, brochures or any other printed material.

For more information contact:

ALERT ENGINEERING CO LTD
7 Gabador Place, Mt Wellington,
PO Box 58-411, Greenmount
Auckland, New Zealand

Or, visit our website:
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Phone: ++64 - 9 - 573 1008
Fascimile: ++64 - 9 - 573 1004
E-mail: sales@alertnz.com

ALERT ENGINEERING CO LTD CanBalers

Alert Manual & Automatic Midi Balers

Technical Information, Main Features & Options

TECHNICAL INFORMATION:

Description	*MIDI-Manual*	*MIDI-Automatic*
Compaction Force	25 Tonnes	36 Tonnes
Electric Motor	4 kW / 5.5 Hp - 3 Phase	7.5 kW / 10 Hp - 3 Phase
Voltage:	415V AC-50Hz (Asia-Pacific) 460V AC - 60Hz (U.S.A.)	415V AC-50Hz (Asia-Pacific) 460V AC - 60Hz (U.S.A.)
Bale Size	318mm x 318mm x variable	318mm x 318mm x variable
Frame Opening (in-feed)	520mm x 260mm	520mm x 260mm
Shipping Weight	appr. 560 Kg (1235 lbs)	appr. 850 Kg
Overall Dimensions	3800 x 1300 x 1850mm	3800 x 1300 x 1850mm ***LxWxH***
Hydraulic Oil / Grade	appr. 120 Ltrs ISO 46	appr. 240 Ltrs ISO 46

Main Features:

- Compact Design - small footprint
- Manual and Automatic Versions
- Suitable for Destruction of reject material
- Good Compaction - saves space
- Increased Material Value
- Suitable for Canning Plants and small recycling facilities
- Key Lock Master Switch
- Another QUALITY Alert Product!

Optional:

- Extra Large & Custom Design Hoppers
- Magnetic Separator Conveyor
- Single Phase Power Option (240 VAC) for manual Baler only

For more information contact:

ALERT ENGINEERING CO LTD

7 Gabador Place, Mt Wellington,
PO Box 58-411, Greenmount
Auckland, New Zealand

Or, visit our website:
WWW.ALERTNZ.COM

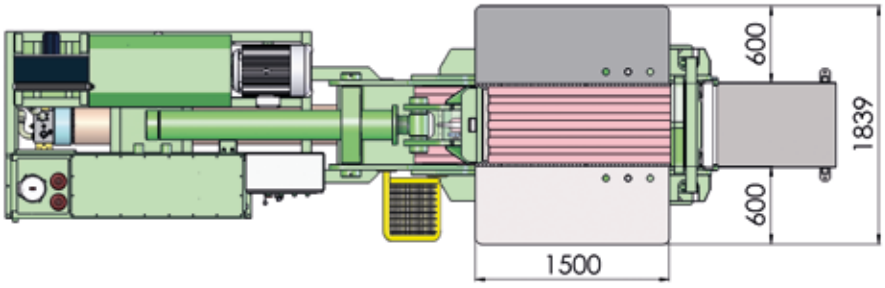
Phone: ++64 - 9 - 573 1008
Fascimile: ++64 - 9 - 573 1004
E-mail: sales@alertnz.com

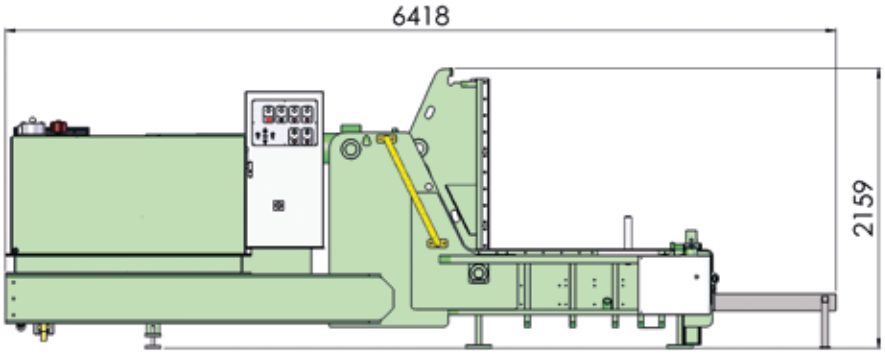
RJ100

Specifications:

Dimensions	Metric	US
RJ100-5 Chamber size (W x D x L):	600 mm x 480 mm x 1410 mm	24" x 19" x 55"
Bale size (W x D x L):	600 mm x 200 mm x variable	24" x 8" x variable
Shearing force:	120 tonnes	132 tons
Face pressure:	85 Bar	1242 PSI
Auto cycle speed (approx.):	38 seconds	
Electric motor:	30 kW	40 Hp
Power:	415 VAC 50 Hz 3 Phase	460 VAC 60 Hz 3 Phase
Hydraulic oil (ISO 46):	900 litres	240 gallons
Shipping weight (approx.):	8.5 tonnes	9.4 tons
Footprint (l x w x h):	6.2 m x 1.5 m x 2.3 m	21' x 5' x 7.5'
Equipment supplied: Operation and service manual. Machine shipped dry.		
Warranty: 12 months materials and labour.		

Specifications may change without notice.





Your local agent:

ALERT ENGINEERING LTD

Engineering a better future for you and the environment

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NEW ZEALAND

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E: sales@alertnz.com
www.alertnz.com

ALERT ENGINEERING LTD

RJ100 Shearing Press

Turns light gauge ferrous and non-ferrous scrap into high density bales - Fast

Designed and manufactured in New Zealand by experts with over thirty five years experience in the scrap processing business, the Alert RJ100 beats the competition hands down for performance, reliability and ease of use.
The RJ100 shears and bales in one operation, saving valuable floor space and time-consuming double handling. While other machines may look the same, none can match the RJ100 for efficiency and long-term reliability. Easily operated by one person, this machine is the smart choice for increasing your scrap processing capacity.

The Alert RJ100 shearing press gives you:

High output

- Semi-automatic cycle - Allows operator to prepare the next load while pressing
- High performance hydraulic system - For fast cycle times
- Large pressing chamber - For quick and easy loading
- Front cutting blade - Shears any overhanging scrap

Versatility

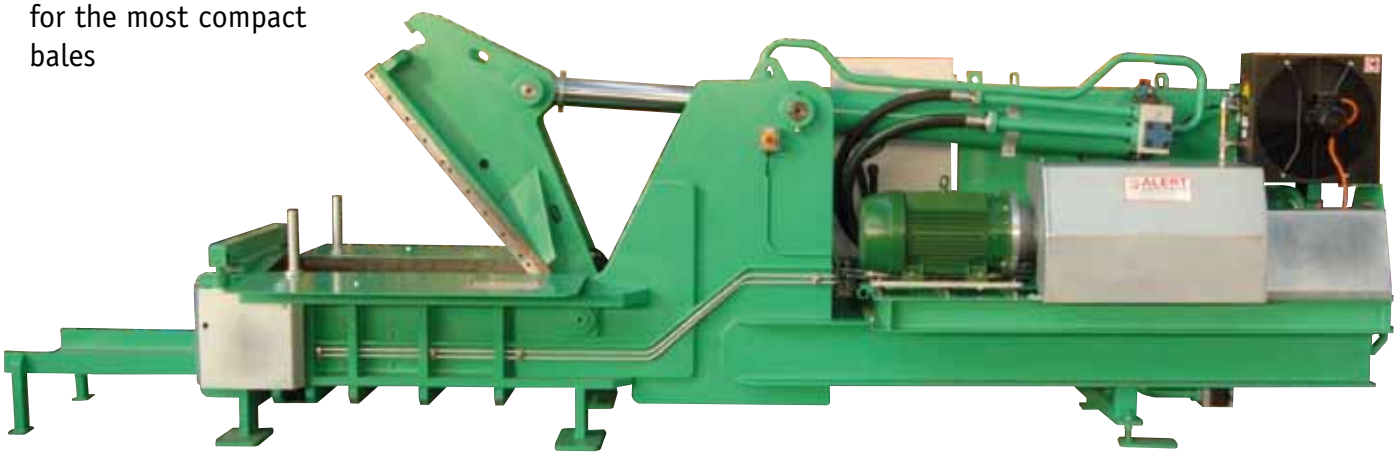
- Processes ferrous and non-ferrous scrap
- Variable bale size to suit your needs
- Can be used as either a shear, a baling press or both

Compact bales

- 600mm x 200mm x variable
- 85 bar face pressure for the most compact bales
- Bales won't fall apart - Safer handling and stacking
- Easily handled bale size - Fast loading of pallets or containers
- Convenient size bales for small foundries weights

Reliability

- Highest quality shear blades - Saves downtime for resharpening
- Pressure release valves prevent accidental damage
- 400 and 500 brinell hardened wear surfaces - Stands up to the harshest treatment
- Quality brand hydraulic and electrical components - Proven long-term reliability
- All wear parts are replaceable - The machine can be completely rebuilt if required



Alert RJ100 Shearing Press

Design features

- Combined shearing and baling
- Semi-automatic cycle function
- Large side loading tables
- Replaceable wear panels
- Lifting eyes for easy positioning or relocation
- Small footprint
- No special foundations required

Options

- Wireless remote control
- Out-feed conveyor and handling equipment
- Manual lever control

Baler

- 120 ton ram generates 85 bar (1242 PSI) face pressure
- Compact bales make for easier handling and won't fall apart
- High capacity chamber - can take a 200 litre drum
- 600mm x 200mm (24" x 8") bale for easy handling
- Variable bale depth - adjust the weight of the bale depending on your requirements
- Hardened steel surfaces for extended life
- Wear surfaces are all replaceable
- Non-return gate prevents bales from sliding back into machine

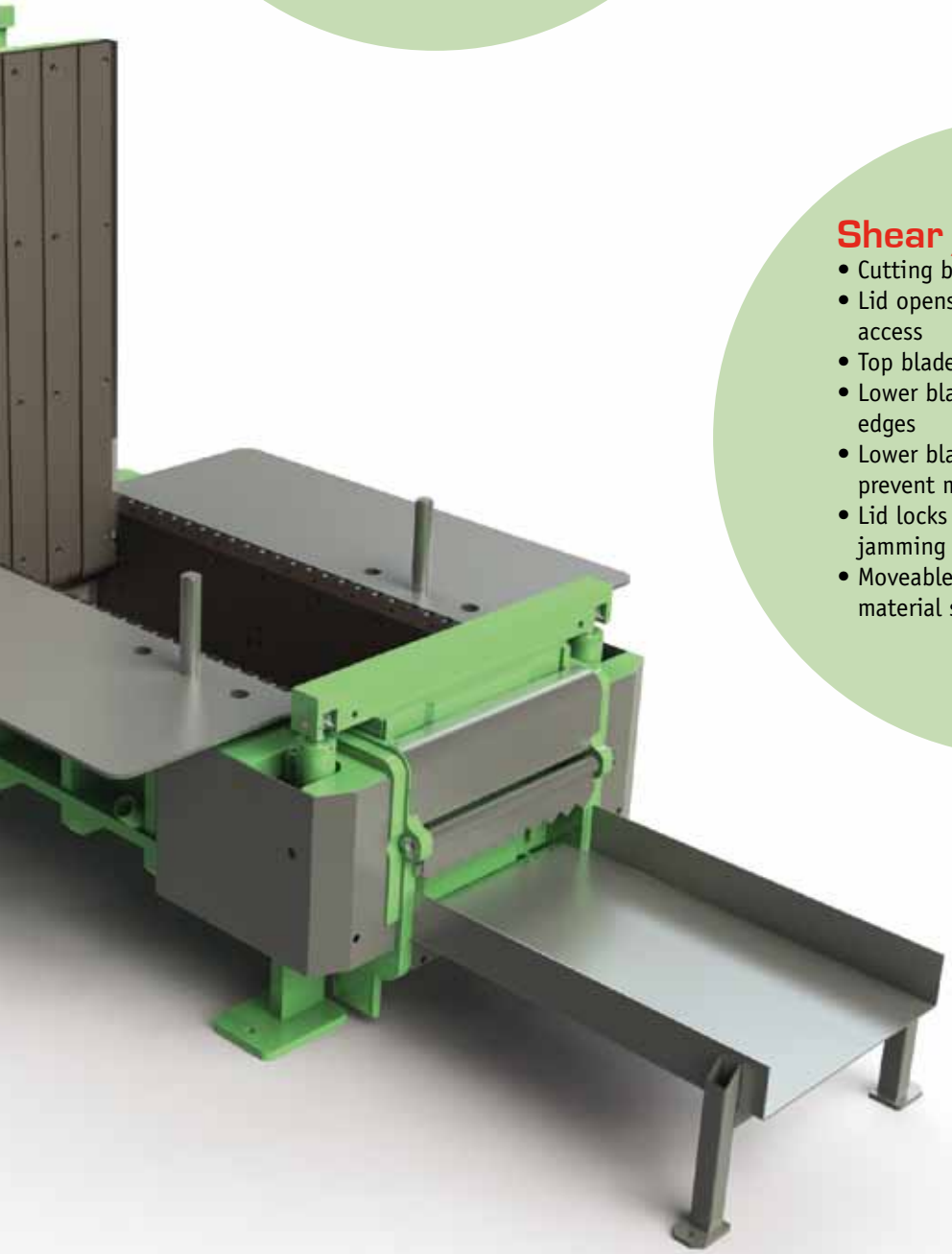
RJ100

Controls

- Simple to operate with minimal training required
- Semi-automatic cycle: Advances ram to form bale, opens door, ejects bale, fully retracts ram, closes door
- Joystick and button control for manual operation
- Optional wireless remote control

Hydraulics

- High pressure variable piston pump for fast cycle times
- Alert manufactured manifolds
- Aeroquip hoses
- High capacity hydraulic pump
- Thermostat controlled oil cooler



Shear / Lid

- Cutting blade on end of lid
- Lid opens to 90 degrees for easy access
- Top blades have four cutting edges
- Lower blades have two cutting edges
- Lower blades are serrated to prevent material moving
- Lid locks when closed to prevent jamming
- Moveable stops to help stop thicker material sliding

ALERT ENGINEERING LTD

GLASS CRUSHING PLANT & EQUIPMENT CATALOGUE

SILACA GLASS CRUSHERS LTD REGISTERED DESIGN CRUSHER

CONVEYOR, SCREENING EQUIPMENT, FEED UNIT, DRYER,
MOBILE & STATIONARY OPTIONS

www.crushedglass.co.nz

GLASS CRUSHER

Made in New Zealand

Body:
Fabricated 5mm gauge steel

Crushing mechanics:
20-25mm gauge steel

Petrol/Diesel/Electric power options

Stationary and mobile option

Registered design held by Silaca Glass Crushers Ltd (IPO411867)

Load / Output capacity:	1 tonne/hour
Load opening (mm):	300 L 400 W
Crusher output adjustment:	<25mm
Power (petrol):	13hp stationary
Power options:	Petrol / diesel / electric
Weight:	750kg
Dimension (mm):	1000 L 1000 W 1400 H
Body:	5mm gauge steel
Crushing mechanics:	20-25mm gauge steel
Pulleys:	Multiple cast
Vee belts:	Multiple
Maintenance:	
Regular	Easy access grease points
Annual (1500 hrs)	Basic resurface lathe
Parts warrantee:	Standard 12-months on motor

CONVEYOR

Synthetic troughed belt

Sidewalls with cover option

Electric roller motor

Belt:	Synthetic troughed
Sidewalls:	Light fabric sheet steel
Cover:	Optional
Power:	2hp Electric motor
Drive:	Roller motor with reduction box
Speed:	40rpm
Minimum pulley diameter:	120mm
Dimension (mm):	2400 L 450 W
Parts warrantee:	Std 12-months on belt & motor

(Conveyor – back view)

(Conveyor – side view)

TRAILER / TRANSPORT UNIT

Trailer:	Single axle
Suspension:	Duratourque
Wheels:	13”
Frame:	C-section SHS posts & supports
Dimension (mm):	3765 L 1540 W
Transporter (extra load option):	Double axle

(Silaca Glass Crushers, Otaki NZ, current operating crusher)

ADDITIONAL EQUIPMENT

Vibrating screens:	Framed mesh 1000 W 1200 L
	2hp Electric motor
	Variable speed drive
Rotary screens (picture below):	Rotating drum type
	Various grading mesh size options
	Max 5hp Electric motor
Crusher Feed Units:	<4m2 loading bin
	Shuffle board to base
	Pitman arm operated
Dryers:	Drum with natural gas burner
	Electric blower
	Up to 104Kw thermal capacity
	Max 10hp Electric motor
	Excludes cylinders

(Rotary screen with 3mm mesh)

(Glass Crusher – pre mounting)

CONTACT DETAILS

Sales enquiries to:

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+64 275 881 970
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New Zealand

100% NZ OWNED
& OPERATED

Appendix J

Terms of Reference

ATTACHMENT

TERMS OF REFERENCE

Assessment of Status and Options for Solid Waste Management on Majuro Atoll

Background

1. Climate change and waste management are among the top sustainable development priorities for the Republic of the Marshall Islands (RMI)[1], particularly in the urban centre of Majuro, which is home to just over half of the nation's total population. With an area of only 9.7 km^2 and an average height of only a few metres above sea level, Majuro simply lacks suitable land space to accommodate landfills. Furthermore the predicted climate change impacts such as sea level rise and increased annual rainfall exacerbate the land disposal challenges.

2. Concrete actions must therefore be taken to introduce an integrated, sustainable waste management system in Majuro that includes waste diversion from landfills through the 4Rs (Refuse, Reduce, Reuse, Recycle). Unavoidable disposal to land must be done using best practice to minimize environmental impact and preserve the integrity of the coastal marine environment.

3. The ***Atoll Waste Management Component*** of the Pacific Hazardous Waste Management Programme (PACWASTE) aims to demonstrate the establishment of an integrated sustainable solid waste management system in the RMI which improves and expands on existing 4R practices, improves existing waste collection and disposal practices, and which is founded on user-pays and polluter-pays principles.

Location of the Work

4. Majuro Atoll, Republic of the Marshall Islands.

Scope of Work

The scope of work for this consultancy covers the following tasks:

5. Compile available information on current waste management costs and allocated budgets across the agencies involved in waste management, including the RMI Environmental Protection Authority (EPA), Office of Environmental Planning and Policy Coordination (OEPPC), the Majuro Atoll Waste Company (MAWC), the Ministry of Public Works, and the Office of the Chief Secretary.

6. Compile available information on current and planned activities of active donors in Majuro on waste management.

7. Complete surveys of community awareness levels, community preferences for waste services, and the public's ability and willingness to pay for waste management services on Majuro Atoll, with recommendations.

8. Assess the quantity, type and condition of waste storage, collection and transportation equipment, and determine the cost of a replacement/maintenance programme, with costed recommendations for improvements.

9. Complete a time and motion study of the waste collection process, with costed recommendations for improvements.

[1] Republic of the Marshall Islands Vision 2018 - The Strategic Development Plan Framework 2003-2018.

10. Complete a costed design of a prepaid garbage bag waste collection system for Majuro Atoll.

11. Complete a costed design of a container deposit programme for feasible items such as ferrous and non-ferrous cans, glass, plastic product containers (e.g. beverage, cooking oil, etc), lead-acid batteries, and vehicle tyres. The design should: include a pilot (test) phase and full implementation plan; identify potential private sector operators; propose management and contractual arrangements; identify possible recycling markets for the recyclable goods; and identify and cost the recycling equipment and other resources required for operation of the programme.

12. Determine the extent of current stockpiles of end-of-life vehicles, and prepare a costed design proposal for an incentive mechanism to support the ongoing recycling of current stockpiles and future end-of-life vehicles.

13. Assess the quantity, type and condition of existing recycling and waste disposal equipment, with costed recommendations for improvements.

Deliverables

14. A Final Report that includes the following sections:
    - Executive summary
    - Introduction
    - Current status of solid waste management on Majuro
        - Financial/economic (costs and budget, willingness to pay)
        - Collection system (time/motion study results, equipment status, etc)
        - Recycling activities (activities, equipment, etc.)
        - Awareness (community awareness levels)
        - End-of-life vehicles
    - Waste collection system improvements
        - Costed design of the prepaid garbage bag
        - Additional costed recommendations
        - Community preferences for waste management services
    - Recycling programme improvements
        - Costed design of the container deposit programme
        - Additional costed recommendations
    - Summary of recommendations

Timeframe

15. All tasks and final reports completed and submitted to SPREP within **8 weeks** of the date of the last contract signature.

Appendix K

People Contacted

People Contacted

Person	Position	Comments
Jorelik Tibon	General Manager MAWC	
Joan Quijano	Accountant MAWC	
Wilbur Allen	Secretary of Public Works Chairman of Board, MAWC	
Ben Chutaro	Resident Completed IWP project for Jenrok in 2005. Involved with ADB SWM project in mid/late 2000s.	Concerned about burdening the poor with more costs. Concerned about the proposed Jenrok landfill being next to one of the poorest parts of Majuro, and the environmental damaged caused by sand mining material to construct the necessary sea wall.
John Henry	EPPSO	Prepared random household survey locations and provided import data.
Hiroshi Yamamura	Minister of Public Works	
Stacey Samuel	Secretary of Finance, MALGov	
Alan Fowler	US Embassy	Provided advice on Compact and process for accessing infrastructure money yet to be drawn down.
Carl Hacker	Former director of EPPSO President of CMI	Involved in SWM in late 1990s and early 2000s
Glen McKinley	Statistics Consultant	
Morina Moke	RMI EPA	
Antonio Heilu	OCS	
Brenda Maddison	MIVA Board of Directors, MAWC	
Gee Bing	OCI	
Steve Wakefield	Chief Technical Officer, Marshall Islands Combined Utilities (including MEC)	
Veronica Wase	Board of Directors, MAWC	
Bruce Kijiner	Director, OEPPC	Concerned about the proposed Korean gasification plant.
Joseph Cain	OEPPC	
Bruce Chapman	Marine and Pacific	ADB Consultant
Anoop Kumar	Majuro Motors, Inc	CEO/General Manager
Yen Tsung Sheng	RMI Recycling Company	Manager
Romeo Reimers	Manager, Central Pacific Maritime Agency	Interested in and actively pursuing metal and used oil recycling opportunities
Mr Hideki Tomobe	Resident Representative, JICA	Discussed JICA/JPRISM/JOCV activities on Majuro
John Arthur Stovall Jr	Operations Manager, K&K Island Pride Supermarket	
John Mason	Triple J Pacific Basin Payless	
Mr Mitsushi Hyodo	JICA Senior Volunteer, Majuro Atoll Waste Company	
Kathryn Relang	Director, Women United Together Marshall Islands	Facilitated the survey by WUTMI surveyors Possible partner for implementation of any changes to the SWM system on Majuro (through women's groups)