



Waste Audit Methodology

A step-by-step manual to conduct comprehensive waste audits in SIDs

Author(s): Amardeep Wander

Issue Date: 31/10/2019



Document Control

Submitted to:	Jack Whelan (PRIF)
Date submitted:	31/10/2019
Project Manager:	Jack Whelan (PRIF)
Report compiled by:	Amardeep Wander
Quality control by:	
Approved by and date:	
Version:	Draft v1

Version Control History

Version	Author	Date	Comment
Draft Version 1	Amardeep Wander	31/10/2019	Draft method
Final Version 1			
Final Version 2			



Executive Summary

PRIF (Pacific Region Infrastructure Facility) is a multi-agency coordination mechanism aimed at improving the delivery of development assistance from donors and development partners to the infrastructure sector in the Pacific region.

As part of its applied research activities, PRIF has been researching the benefits and challenges of establishing a regional recycling network for the Pacific. Among the benefits considered are a gradual evolution of Pacific Island countries (PICs) from linear economies to more sustainable circular economies.

In 2017–18 PRIF commissioned a research study to identify and quantify the opportunity to improve the resource recovery of 15 primary recyclable commodities present in the solid waste stream in 15 PICs and territories. The recommendations of the project were a pre-feasibility study to determine the viability of establishing a regional network to allow for recovery, consolidation, processing and shipment of recyclables from a network of surrounding islands.

Whereas the PRIF (2018) study focused mostly on the export and import material flows of PICs, more information is required on standardised country data regarding solid waste production, collection, treatment and disposal, including more detailed analysis of institutional readiness and the infrastructure required within individual countries to ensure a viable recycling network. Over the course of 2018–19, it has also become apparent that there are a number of organisations currently working in this space with very similar requirements for waste data.

Therefore, based on waste audits commissioned by PRIF in Tuvalu, a waste audit methodology has been developed that incorporates the materials required for baseline data collection for the following projects as a minimum:

- SPREP – PacWaste Plus
- PRIF – Regional Recycling Network
- JICA – J-PRISM-II
- EU – EDF11
- CCOA – Commonwealth Clean Oceans Alliance
- World Bank – Regional Recycling Network
- UNE – GEF

This report presents a comprehensive data collection methodology that makes provision for the data collection requirements for the above projects.



Table of Contents

1	Introduction	5
1.1	The benefits of a standard methodology.....	7
1.2	Confidentiality.....	7
2	Checklist for audit methodology	7
2.1	Project scope and information.....	7
2.2	Audit competency.....	7
2.3	Insurance.....	8
2.4	Sample methodology based on:	8
2.5	Waste audit site	9
2.6	Auditing methodology	9
2.7	Validation procedures.....	9
2.8	Reporting structure.....	9
3	Waste auditor responsibilities.....	10
4	Occupational Health and Safety	11
4.1	Potential hazards	11
4.1.1	Sample collection process.....	11
4.1.2	Physical audit process	11
4.2	Health and safety guidelines for undertaking waste audits	12
4.2.1	Responsible personnel.....	14
4.3	General safety procedures.....	15
4.4	Personal protective equipment (PPE).....	15
4.5	Medical monitoring.....	15
5	Audit Sample.....	15
5.1	Audit timing.....	17
5.2	Sample selection	17
5.2.1	Households.....	17
5.2.2	Commercial samples	19
6	Sample collection	20
6.1	Areas with a collection service.....	20
6.2	Collections from areas with a collection point	21
6.3	Collections from areas with no collection service	22
6.4	Litter	22
6.5	Landfill.....	22
6.6	Stockpile assessment	26



6.7	Interviews.....	26
7	Waste sorting	27
7.1	Audit site set-up.....	28
7.2	Sorting procedure	28
7.3	Data Recording.....	29
7.3.1	Data recording	29
7.3.2	Data collection sheet	29
7.3.3	Audit validation.....	29
8	Customs data	29
9	Currently available waste data	29
9.1	Current recycling and reuse data.....	30
10	Analysis to be undertaken	30
11	Potential other benefits to PICs.....	Error! Bookmark not defined.
12	Readiness matrix	31



Acronyms

ACRONYMS	
APWC	Asia Pacific Waste Consultants
CDS	container deposit scheme
DMP	Department of Marine and Ports
DOE	Department of the Environment
DoW	Department of Works
DWM	Department of Waste Management
EU	European Union
EEZ	Exclusive Economic Zone
J-PRISM	Japanese Technical Co-operation Project for Promotion of Regional Initiative on Solid Waste Management
JICA	Japanese International Co-operation Agency
Kaupule	Executive arm of island assembly of elders, similar to a local council
MHARD	Ministry of Home Affairs and Rural Development
MSW	Municipal Solid Waste
NGO	non-government organisation
NZ	New Zealand
PET	polyethylene terephthalate
PICS	Pacific Island Countries
PRIF	Pacific Region Infrastructure Facility
PV	photo-voltaic
SAMOA	Small Islands Developing States Accelerated Modalities of Action Pathway
SID	Small Island Developing States
SPREP	Secretariat of the Pacific Regional Environment Programme
SPC	Secretariat of the Pacific Community
SWAT	Solid Waste Agency of Tuvalu
SWM	Solid Waste Management
TIWPAP 2017–2026	The Tuvalu Integration Waste Policy and Action Plan: Towards Cleaner and Healthier Islands 2017–2026
TLD	top-level domain
UNEP	United Nations Environment Program
uPOPs	unintentional persistent organic pollutants
WMPC	waste management and pollution control



1 Introduction

In 2017–18, the Pacific Region Infrastructure Facility (PRIF) commissioned a research study to identify and quantify inadequate solid waste management, and the resulting marine pollution, in Pacific Island Countries (PICs). The aim was to develop sustainable solutions and improved resource recovery of 15 primary recyclable commodities present in the solid waste stream in 15 Pacific Island countries and territories.

The recommendations of the project were a pre-feasibility study to determine the viability of establishing a regional network (or hubs) to allow for recovery, consolidation, processing and shipment of recyclables from a network of surrounding islands. Based on the initial assessment of port facilities, capacity, shipping networks and other economic aspects, the study recommended recycling hubs in two sub-regions:

- Western Pacific Islands, servicing Solomon Islands, Papua New Guinea and Timor-Leste; and
- Eastern Pacific islands, servicing Cook Islands, Fiji, Kiribati, Niue, Samoa, Tonga, Tuvalu and Vanuatu.

(Further consideration of Northern Pacific countries was deferred, given existing recycling regimes established in those countries.)

The network/hub would involve construction of a processing and trans-shipment facility to receive, process and ship recyclable materials recovered from the eight countries in the Eastern Pacific sub-region.

Following these results, PRIF's Urban Development Sector Working Group recommended a 'Scoping Study' investigating a potential pilot regional recycling network in the Eastern Pacific sub-region with Suva presenting an obvious hub location. Other cities would also be considered for potential hub locations given recoverable materials and shipping routes. Whereas the PRIF (2018) study focused mostly on export and import material flows of PICs, more information on standardised country data for solid waste production, collection, treatment, and disposal is required, along with more detailed analysis of institutional readiness and the infrastructure required in each country to make the recycling network viable. This data is to be collected through detailed waste audits to inform the viability of the broader PRIF 'Scoping Study for the Regional Recycling Network for the Eastern Pacific Region'.

There are compelling reasons for PRIF, World Bank, SPREP and governments in PICs to have access to accurate, reliable and consistent data in order to plan future waste reduction strategies. The key message is 'what cannot be measured cannot be managed'.

The purpose of this manual is to provide a standard methodology for aid organisations funding the scoping study and others to undertake audits that cover the following:



- Household kerbside waste;
- Commercial premises;
- Landfills;
- Assessment of the current collection systems;
- Assessment of current infrastructure;
- Assessment of the current legislation and policy framework;
- Assessment of the current range of financial mechanisms available in the country.

Importantly, by adhering to the set methodology, performance comparisons can be made with other countries when undertaking the feasibility analysis for movement and processing of material at a network hub location. Also, all future data collected using this methodology can be used to determine the impact of any programs or projects implemented in the region which aim to improve participating countries' waste management and recycling performance.

The main purpose of the data collection program is to be able to determine:

- Material composition of the domestic and commercial waste stream;
- Current total diversion of materials from landfill;
- Availability of materials for diversion and the supporting legislative and policy mechanisms; and
- Types and quantities of materials that are currently being recovered, recycled or stockpiled.

This will then guide the development of programs to improve current levels of performance in maximising diversion of waste from landfill and the recovery of valuable resources for potential processing at the recycling hub. To achieve this, it is paramount that accurate data is collected.

The Manual is structured as follows:

- Section 2 provides a checklist for the audit process;
- Section 3 summarises the auditor's responsibilities;
- Section 4 provides an outline of the OHS aspects of the audit program;
- Section 5 discusses audit sample size criteria;
- Section 6 outlines the specific methodology for sample collections;
- Section 7 summarises the actual audit procedures;
- Section 8 and 9 list the other datasets that are required to be collected
- Section 10 summaries the analysis to be undertaken
- Section 11 lists the criteria used to assess readiness for a country to be a part of the recycling hub
- Appendices provide pro-forma documents and other essential information.
- All pro-formas have been provided as attachments



1.1 The benefits of a standard methodology

Data collection in the field of waste management has become complicated and disjointed in recent times, with a range of agencies collecting information to inform specific projects. The data collected is often very specific, employing variable waste stream definitions and classifications. As such, a fit-for-purpose dataset that can be used for a range of situations is not currently available. This standard methodology is designed to simplify that process by providing all involved agencies with a common collection data methodology. All data will be stored in the INFORM database curated by SPREP and made available to the project partners.

1.2 Confidentiality

Audit reports should not contain individual tenement information. Adequate notice should be given to the residents about the audit in order to enable them to notify the local government should they choose not to participate. It is important to ensure such notification is provided with sufficient time allowed before the audit is conducted. It is important to ascertain that the data collected represents a “typical week” in terms of “waste generation” outcomes. Therefore, holiday periods should specifically be avoided.

2 Checklist for audit methodology

The following provides a list of requirements that must be addressed in preparing for, conducting and analysing data for the audit program.

2.1 Project scope and information

- Scope of the audit program finalised
- Plan requirements
- Additional scope requirements
- Timing for audit program finalised
- Waste collection systems and schedules determined
- Available data on weights collected (including weighbridge weights for landfill)
- Demographic data for the local government area (LGA) obtained
- Customs department contacted for customs data

2.2 Audit competency

- Qualified auditors
- Training/briefing program for all auditors developed
- Confidentiality agreements signed
- Quality assurance program



- Data forms – controlled distribution, use and recovery
- Data input protocols designed to minimise error and highlight errors
- Data verification process in place
- Procedures developed to report any adverse findings (e.g. illegal disposal of waste materials)

2.3 Insurance

- Public liability details provided to local government
- Professional indemnity insurance details provided to local government
- Appropriate workers' compensation insurance in place
- Occupational health and safety program
- Full risk assessment conducted for this audit
- Developed and submitted an OHS plan prior to commencing auditing
- OHS plan contains information including, but not limited to:
 - sample collection procedures – kerbside collections
 - waste handling and sorting procedures
 - waste storage and collection
 - specific responsibilities
 - medical monitoring program
 - required vaccinations identified (minimum Hepatitis A and B, and tetanus)
 - first-aid provision
 - training
 - specific audit site issues
 - audit site evacuation procedures
 - personal protective equipment – requirements, use and maintenance
 - risk matrix with hazard identification and risk management program
 - program developed to monitor ambient conditions

2.4 Sample methodology based on:

- Plan requirements
- Timeframes
- Streets and houses nominated for sampling
- Process communicated to sample collectors to account for households that do not place waste/recycling containers out for collection as well as households without a collection system in place
- Procedures adopted to ensure confidentiality of origin of materials (i.e. household street and number)
- Public notification issued a minimum of six weeks prior to audit
- Letter provided to sample collectors authorising collection



- Landfill staff consulted on the logistics of landfill auditing
- Collection staff briefed on the litter audits if required

2.5 Waste audit site

Has the following attributes:

- Adequate space for segregation of pre- and post-audited waste, staff and equipment
- Protection from environmental conditions such as weather/wind
- Protection of stormwater drains and other environmentally sensitive areas
- Adequate ventilation
- Power and water provided
- Secure to ensure audited materials are not tampered with

2.6 Auditing methodology

- Maintains integrity of sample size so that:
 - samples are not removed prior to being analysed
 - materials and/or streams are not mixed
 - Planned to ensure efficient workflow and that audited and non-audited materials are not mixed
 - Equipment available, including first-aid equipment
 - Process to ensure correct disposal of audited materials
 - Timing adequate for estimated quantity of waste sample
 - Sorters instructed on process and categories
 - Materials sorted according to audit requirements
 - Material data recorded in weight (to 0.01 k) and volume (this is conducted by estimating the litres for each type of material)

2.7 Validation procedures

- Compares quantity audited against historical data – variations explained
- Participation rate
- Data collected in accordance with plan protocols

2.8 Reporting structure

- Provided in the specified manner
- Validation data and analysis provided
- Comments provided in report for any issues identified



- Draft report to local government
- Comments integrated into final report

3 Waste auditor responsibilities

The funding organisations are relying on the waste auditor's expertise, not only for the efficient delivery of the audit process and for the expected outcomes but also for their experience and ability to identify what information is required and request it in a timely manner.

To ensure that the selected audit meets all projected outcomes in a safe and efficient manner, all parties have clear responsibilities and separate roles. However, to meet these responsibilities fully, the co-operation of all parties in supplying data and information is vital.

The waste audit team/the auditing firm is responsible for the following:

- Requesting in writing all relevant information and providing advice as to where the information may be available;
- Agreeing on the audit objectives and outcomes;
- Performing the audit in an efficient manner so as to achieve the stated objectives;
- Advising the client if timeframes cannot be met and providing a rationale as to why they cannot be met, as well as when they can be met;
- Ensuring that all audit samples are collected in accordance with the developed methodology and in a safe manner;
- Ensuring that waste is transported to the audit site in a safe and environmentally responsible manner;
- Conducting the audit in a safe manner and co-ordinating with the supervising waste auditor to ensure good practice at the audit location. The supervising waste auditor is responsible for ensuring the safety of waste auditors, the environment surrounding the audit area, and site personnel that may come in contact with the audit process. The audit area should be secure at all times and waste must at all times be securely contained;
- Ensuring the audit team is familiar with the site, taking note of any environmental issues that may need to be considered during the audit (e.g. close proximity of stormwater drain; close proximity of public places). Also, the availability of necessary utilities such as power, water and amenities;
- Estimating how much waste will be collected for sorting and ensuring adequate resources are available to effectively process this quantity. This will be related back to the audit scope;
- Ensuring all necessary equipment and resources are available as required and are in good order. Scales used for measuring should be calibrated and any electrical equipment used on-site must be compliant;
- Ensuring that staff employed on the waste audit have the necessary competencies and skills to effectively complete the tasks assigned to them;



- Ensuring the audit site manager/local government has agreed in advance to the use of any on-site facilities or resources. This will include the actual sorting area, access to power and water;
- Advising the client immediately of any potential environmental issues that come to light as a result of the audit, even if this is outside of the scope of the audit;
- Ensuring all post-sorted waste is deposited into appropriate containers for final disposal/recycling in line with legislative and regulatory requirements and/or site licensing conditions;
- Maintaining confidentiality; and
- Preparing all reports as required.

4 Occupational Health and Safety

4.1 Potential hazards

The sample collection and physical audit processes pose risks to personnel involved in these activities. The following are some possible hazards that may occur during the physical sorting of solid waste.

Consultants should ensure that a full risk assessment is conducted for each audit. This assessment should be signed off by the waste audit supervisor and used as the basis of the OHS plan.

4.1.1 Sample collection process

- Effects of exposure to hazardous materials
- Back injury
- Slipping and falling
- Heat stress and fatigue
- Traffic
- Heavy equipment movement

4.1.2 Physical audit process

Physical hazards

- Cuts and punctures from sharp items in the sample (e.g. hypodermic needles, broken glass, razor blades)
- Effects of exposure to hazardous materials such as medical waste, aerosol cans, chemicals (powder and liquid), bottles of unknown/unlabelled substances, plastic bottles containing used syringes, and other hazardous materials
- Back injury
- Slipping and falling
- Heat stress and fatigue
- Traffic or heavy equipment movement
- Noise exposure from operation of heavy equipment



- Animal and/or insect bites
- Airborne contaminants
- Dust from solid waste
- Fire

Chemical hazards

- Liquid spills from containers
- Household and hazardous chemicals

Biological hazards

- Household hazardous wastes
- Medical wastes and sharps
- Blood-stained rags or objects
- Hypodermic needles

4.2 Health and safety guidelines for undertaking waste audits

Due to the potentially hazardous nature of waste auditing, the preparation of a site-specific Occupational Health and Safety (OHS) Plan should be considered an essential component of any waste auditing process. These protocols for health and safety have been developed with reference to previous audits undertaken.

A waste-auditing exercise involves a number of activities that can potentially be hazardous to the participating personnel. It is therefore critically important that local governments and other relevant organisations prepare a site-specific OHS plan to address these risks before starting an audit. Such a plan should address at least the following:

- Occupational Health and Safety policy
- Sample collection procedures
- Specific responsibilities – safety officer and waste auditors
- Medical monitoring
- Vaccinations required (minimum Hepatitis A and B and tetanus)
- First-aid provision
- Training
- Specific audit site issues
- Audit site evacuation procedures
- Personal protective equipment – requirements, use and maintenance
- Risk identification management program
- Monitoring of ambient conditions



To assist in preparation of this plan, Appendix A contains a risk management matrix and forms that can be used for the development of the risk management strategy.

Appendix B and Appendix C summarise the more common hazards that may arise during both the audit sample collection process and the physical audit. Management strategies have also been included in these appendices as a guide.

Essentially, a risk assessment should be conducted that allows for all hazards and aspects of the program to be identified and acceptable management strategies implemented.

The following information should be made available to all auditors. This will assist in timely resolution of any issues that may arise during the sample collection and/or waste audit process.

Occupational Health and Safety Plan

On-site contact

- Main point of contact and telephone number
- Facility manager and telephone number(s)
- Location of site resources
- Site map
- Toilet facilities
- Drinking water
- Telephone
- Emergency assembly area
- First-aid facility
- Designated smoking area (if required)
- Water and soap for washing

Medical information

- Local emergency medical facility
- Telephone number

Important telephone numbers

- Fire department
- Police department
- Local ambulance
- Local medical practitioner



Appendix G and Appendix H contain the safety induction checklists that are to be used for the audit processes. Appendix I contains a pro-forma statement that should be signed by audit project staff when receiving the project OHS plan.

4.2.1 Responsible personnel

The following section lists some of the duties and responsibilities of personnel who are supervising and conducting a physical sort of solid waste.

Supervising waste auditor's/project manager's duties and responsibilities:

- Delegate health and safety responsibilities to the site safety officer;
- Ensure that qualified personnel implement proper procedures in a safe manner;
- Make available proper personal protective equipment (PPE);
- Make available adequate time and budget;
- Ensure all field personnel have read, understood and signed the master copy of the OHS plan;
- Check all the auditors have received training on waste characterisation methods, recognising hazardous wastes, potential risks from handling hazardous materials, managing site traffic, controlling dust/airborne contaminants, and back injury prevention; and
- Ensure staff have a good understanding of incident/emergency procedures and assembly areas.

Site Safety Officer's duties and responsibilities (may be the same person as above):

- Prepare a site-specific OHS plan (including evacuation and assembly area procedures) prior to the start of any activity onsite;
- Ensure that the plan is approved by the local government officer responsible for managing the audit;
- Duty and authority to stop unsafe operations, supervise the delivery of appropriate first-aid, and decide when to contact emergency services;
- Ensure that the guidelines, rules and procedures in this document are followed for all site work;
- Be familiar with local emergency services and maintain a list of emergency phone numbers. Provide a map with the quickest route to a medical facility;
- Conduct health and safety meetings before each shift and a summary meeting at the end of each shift to discuss safety issues, possible solutions, and notify personnel of all changes associated with health, safety, and related protocols;
- Maintain and inspect PPE. Ensure proper use of PPE by all employees;



- Monitor onsite hazards and the early health warning signs of auditors (e.g. heat stress/stroke, dehydration or fatigue). It is recommended that in hot weather, outdoor sampling should be done during the cooler hours of the day;
- Has completed appropriate OHS training (including an appropriate waste-auditing course and has a current Level II First Aid Certificate).

4.3 General safety procedures

Appendix D contains a summary of the general procedures that should be followed to ensure a safe audit program.

It is essential that a risk management process has been undertaken and an OHS plan prepared for all separate audits that are to be undertaken so any specific issues are identified and appropriate strategies implemented.

4.4 Personal protective equipment (PPE)

Appendix E contains a list of the recommended PPE, which is essential for the safe conduct of the audit program.

It is important that those conducting the audit recognise that the use of PPE does not replace the need to observe other aspects of safe-handling procedures. PPE should be seen as an essential part of an overall safety plan.

4.5 Medical monitoring

All staff must ensure that they are medically fit to perform any duties requested and that these duties will not aggravate any existing conditions. Should any issues be identified that may impact on the physical well-being of a staff member, the safety officer will discuss such issues with the individual staff member.

Contact numbers of local medical practitioners, the hospital and ambulance service must be provided to all auditors and site supervisors. The safety officer must be contactable by all site supervisors in order to provide prompt responses to any incident.

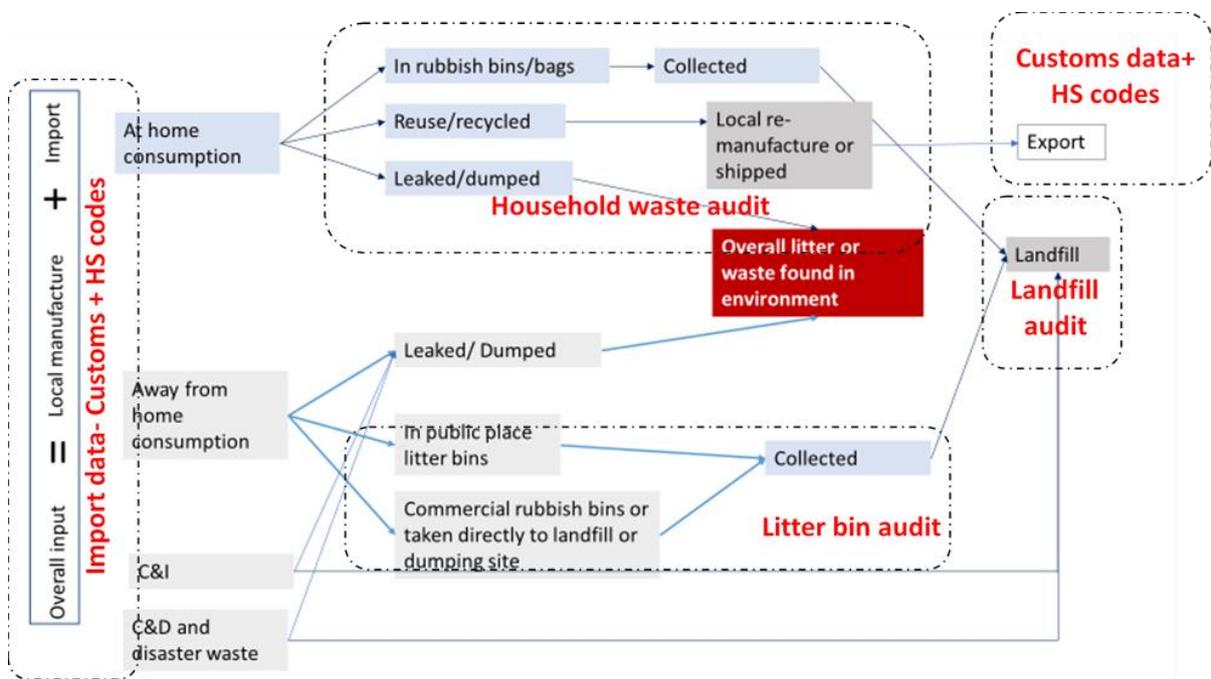
5 Audit Sample

The following section provides an overview of the sampling criteria to be followed for conducting household, commercial waste-stream audits and the landfill audits. This section also provides a checklist of all other audit variables that must be considered to generate a comprehensive assessment of the waste management situation in each country.

It is essential that the indicated sample selection process be followed so that the audits are valid and data can be used as required.

As an overview, there are a number of methods and points where waste can be intercepted in the waste cycle, based on its disposal route. The diagram below shows some of the pathways that waste generated can follow. Waste data can be gained from intercepting the waste after generation and at the point of disposal.

Figure 1: Waste flows



Based on the figure above, the following data points will need to be collected in order to fully understand the waste management system in a country. However, a study might require to only partially collect the requested data. Data points required include:

- Customs data for the amount of materials imported and exported
- Household audits and household interviews
- Commercial audits and commercial interviews
- Litter bin audits (if litter bins exist)
- Current data on recycling
- Current data on reuse
- Current data on local manufacturing/re-manufacturing
- Landfill audit



This section provides an audit methodology by type of audit, including;

- Household collection
- Commercial auditing
- Litter auditing
- Landfill auditing
- Stockpiling

It is essential for accurate extrapolation of data collected through the audits that this methodology be followed precisely.

5.1 Audit timing

The following periods should be avoided for auditing of residual waste and recyclables.

- 1) 1 December to 1 February (to minimise the impact of Christmas holidays)
- 2) Easter
- 3) Public holidays and long weekends
- 4) Major local events or festivals
- 5) Extreme weather conditions

It has been demonstrated through many kerbside audits that the types and quantities of materials generated during these periods can be significantly different from what is 'normally' generated. Therefore, to conduct the audits during these times and then extrapolate data could lead to incorrect assumptions regarding issues such as potential diversion rates.

- If possible, green organics should be audited in the autumn months (in March, April and May of any given year);
- If this is not possible, data should be requested for green waste collected over the course of the year;
- The seasonal data should be taken into account;
- The standard methodology allows for the audits to be conducted consistently between countries as well as over time within the same country.

5.2 Sample selection

5.2.1 Households

To gain information on household generation, a bin/bag audit will provide valuable data about both consumption and disposal behaviour. The following details provide the methodology to be followed in determining your sample and ensuring a safe audit. Waste collection and sorting from households will be undertaken to determine the following:



- Per capita waste generation by urban and rural communities and by income level;
- Per household waste generation by urban and rural households and income level;
- Composition of waste disposed;
- Weights and volumes of waste generated by material.

To ascertain the above, the following steps must be taken:

Step 1: Sample location – where to collect the sample from?

Determine the different socio-demographic regions within each local government collection area. This can be ascertained using the following criteria as a guide:

- The number and size of islands within the PIC
- The type of service being provided to the communities on each island (if there are different types of collection services within each island, e.g. door-to-door and collection point, samples must cover both types of service provision)
- A minimum of two islands is recommended to be sampled for each country.

On each island, the following criteria should be considered while undertaking sampling:

- Income levels of various communities
- Tenement size and structure (e.g. average number of people living in houses)
- Home ownership
- Type of dwelling
- Tenement income
- Block size and vegetation cover (pertinent for the green organics audit)
- Rates valuation
- Feedback from the local government.

This information can usually be accessed from areas within the local government, department of environment or bureau of statistics. The waste collection manager (or operations manager or waste truck drivers) able to provide some input to this process as they will be aware of areas where the households use collection service appropriately and the areas that need improvement. The detailed sampling plan should be developed with support from the local government.

Step 2: Sample size – how many samples should be collected?

Domestic waste samples are collected by premises to determine the waste generation and disposal rate per household/commercial premises. Waste collection methods must be modified based on the area that was being assessed and whether or not a collection service is available. Then number of samples to be collected must be statistically selected based on the following:

- household numbers;
- population distribution;
- regional split; and
- the variability found in any previous waste audits.

The methodology is designed to ensure that the variance within the samples is taken into account.



We aim for minimum variance in national waste generation estimates. This might mean that our estimates for individual sites are not as precise as possible.

Population	Per household generation rate
Rural (<1000)	0.6
10,000	1.7
100,000	2.6
1,000,000	3.5

We also use the following values to estimate variance in samples:

Population	Within town variance	Between town variance
Rural	0.4	0.05
10,000	1.5	0.05
100,000	3.7	0.01
1,000,000	3.7	0.01

Total variance from rural areas, for example, is equal to

$$Var(Rural) = W \left(\frac{0.4}{\text{number of people per town} \times \text{number of towns}} + \frac{0.05}{\text{number of towns}} \right)$$

where W is the estimated proportion of national waste coming from rural areas.

As a general rule, a sample size of 200, distributed as per population distribution, is recommended.

5.2.2 Commercial samples

Expectations for commercial samples have not been studied to the same extent as household samples and change quite substantially between countries. For this reason, we adopt a uniform sampling strategy, assuming no manufacturing for the places in question.

The strategy recommends gathering as many supermarket, hotel and resort samples as possible as these premises often generate the largest amount of waste. Therefore, samples from these establishments serve to reduce error as much as possible. The following sampling split is recommended as a minimum.

If 50 samples can be taken:

Admin/office	10
Food outlet	10
Retail	10
Hotel	10
Supermarket	10



This would yield a (very crude) estimated error of 1.0 kg/business/day or 17% at 80% CI.

If 70 samples can be taken, the following sample split is recommended:

Admin/office	14
Food outlet	14
Retail	14
Hotel	14
Supermarket	14

This would yield a (very crude) estimated error of 0.87 kg/business/day or 15% at 80% CI.

If a higher sample can be achieved, we recommend taking as many samples as possible and spreading them evenly among the provided categories.

A sample size calculation calculator is provided as an attachment.

6 Sample collection

6.1 Areas with a collection service

Prior to the finalisation of the audit plan, a sampling plan must be prepared, providing the number of samples to be collected by area and the resulting confidence in the data. Typically, random streets are selected from each area where the samples will be collected.

1. The audit team typically works alongside the collection service provider to determine the best method of collecting samples prior to the normal collection. It is important that premises are unaware that their waste will be sampled as both households and premises can change behaviour. Methods of sample collection vary based on the number of samples, days over which the samples are to be collected, number of collectors and equipment available.
2. It is imperative to have a local staff member accompany any sample collection. Local knowledge ensures smooth running of the operation, subject to the level of support provided by the client or local authority and the method of collection and sample size as to the number of staff required. Normally a team of at least three undertakes the collection.
3. Samples should be collected from every third to fifth house in each street from a street corner with no more than five samples from the same street. This is not always possible and local conditions need to inform sampling protocols.
4. The following data should be collected for each house sampled. A sample run sheet is provided at Appendix K.
 - a. GPS location
 - b. Address, if known
 - c. Number of bags sampled per household



- d. Interview tag provided
- e. Photo
5. The collection supervisor is to be instructed to bypass any resident raising an objection to the process.
6. The collection supervisor is to have a letter authorising them to undertake the process, to provide to residents as required.
7. The collection supervisor is to be instructed to contact the audit supervisor immediately if any issues arise in relation to sample collection.

The major challenge in collecting waste that has been placed outside premises for collection is ensuring that the household or commercial premises could be identified readily by the interviewers later that day or week. To circumvent this, as well as recording a GPS coordinate and taking a photo, the premises where the samples were collected from could be tagged using a coloured thread or ribbon. Any similar method that allows for the correct identification of the household to be interviewed can be adopted.

We recommend at least three members be part of the collection team:

- A collection supervisor and recorder to mark the location of a sample using the GPS coordinates and at the same time take photos of the premises for follow up interviews and to insert notes on the nature of the collected samples (g.g. bin fullness, how much waste collected for sampling, how much was left, types of waste, etc.);
- The second member(s) of the team to identify the nature of the waste and provide information to the recorder as well as to collect the samples using the trash bags by emptying the contents of the bins into the trash bags and placed in the truck for transportation to the sorting area at the landfill;
- The third member marks the households or commercial premises using ribbons (as tags) tied to a nearby tree, property fence or gate for easier identification later during follow-up interviews. The household numbers recorded by the recorder must be the same as the numbers written on the trash bags and the ribbons (tags). This task can be done by a local staff or worker.

6.2 Collections from areas with a collection point

Some PICs have areas where an entire locality might have a collection point for locals to bring their waste prior to the collection day. In this instance, the collection crew arrives at the village the night before the collection service and approaches each household for their bag. Where the household still has the bag, it is collected, and the house tagged for a future interview.

However, in some cases, the samples can be collected from the sampling point and a number of households can be interviewed based on the sample required.



6.3 Collections from areas with no collection service

In this situation, three separate visits are required to ensure that the collection could take place.

- On day one, staff approaches the community chief and seeks permission to undertake waste data collection in the village, providing the community chief/administrator with a briefing on the community involvement requested
- Staff returns the next day and provides each household with a bag to use to dispose of their waste from that day onwards. Twenty per cent (20%) more than required bags are distributed and information on which wastes are acceptable and not acceptable is provided. It is expressly forbidden to dispose of any bulky waste or problem wastes into the bags.
- The team returns after day 1 to retrieve the bags from each household. Waste in bags from day 1 is discarded, as experience shows that most people use the bags provided to them to dispose of items that they often find other ways to dispose of. Another bag is provided to each household to accumulate waste for the rest of the week.
- The team returns on day 3 or 4 or 7 (depending on available time) and collects bags back from the household that they were provided to on day 2. As each household brings their waste bag, the bag is labelled and provided to the sorting team. An interview is conducted with the member of the household depositing the bag. Refreshments are often provided to all members of the village/community during the interview stage
- The tagged bags are sorted at the community centre in the village rather than bringing them back to the sorting site

6.4 Litter

Where litter bins are provided, the contents for a maximum of 10 litter bins will be collected and sorted in the same manner as the household sector above.

6.5 Landfill

Although the household waste generation audit covers the waste generated through the everyday consumption of products, a landfill audit will be undertaken to generate data around materials that are not usually found in the household bins, i.e. batteries and renewable energy equipment. The landfill audit methodology is described below.

Step 1 – Number of days of assessment

The consultant team will determine the minimum number of loads to be audited to ensure that the results are statistically relevant. In order to do so, all landfill vehicle movement data will be collected as per landfill records and provided to the statistician to ensure that the minimum number of vehicles to be audited can be determined and provided to the auditors. In terms of the total loads to be assessed, it is important to ensure that all the different kinds of vehicles that are incoming to the landfill are audited over the course of the assessment.

Step 2 – Assessment protocols



Each day the auditors should aim to assess as many loads as possible delivered during opening hours, within safe and practical limitations. Ideally, it is important to cover a whole week of incoming landfill waste. Peak days at landfill tend to be mid-week whereas peak loads at the transfer stations are weekends. The consultant team should seek guidance from the site partner and can vary staffing to cover this if needed. The landfill assessment protocol is provided below:

1. The audits will need to work with each site to fully comply with their site rules. Any load directed to other designated areas, e.g. recycling drop-off, garden waste, nappy disposal should be assessed and recorded accordingly. A landfill assessment sheet is provided at Appendix N.
2. Consulting team will need to ensure that the staff are in attendance from opening to closing time each audit day at each site. Based on the advised opening hours information, a maximum of 9.5 hours per day at each site should be allowed. Our experience in Australia is that no loads could be assessed before 7 am in winter.
3. Every effort should be made to record every load, however it must be acknowledged that this will be subject to the timing of the deliveries, the number of loads at any one time it is not always possible to record all loads and worker requirements e.g. staff amenity breaks.
4. Staff safety is paramount at all times.
5. Staff should endeavour to take breaks at appropriate times when the number of vehicles is expected to be low.
6. If multiple vehicles arrive at one time the assessor should obtain as much information as is safe and practical for each load.
7. If at any time the site manager believes the site conditions are unsafe, consulting staff must follow their advice and direction. This could occur in prolonged wet weather, storm or fire events.
8. The team may have two to three staff at the landfill tip face at all times due to the anticipated number of loads, size of the loads, time to assess and to minimise the movement of staff at the tip face between trucks movements and deliveries.

Step 3 – Data recording

All staff are required to be provided with a clear set of instructions in relation to consistent data recording and to assist a vehicle and load type identifier is provided to ensure consistency between assessors.

1. Auditors should be equipped with mobile phones, high-visibility safety vests, sunscreen, wet weather gear and safety boots (with steel base to prevent any penetration).
2. Data sheets need to be contained in specifically designed all weather clipboards. Staff are equipped with printers and scanners.
3. The number of categories to be recorded as well as the information that is required to be recorded in provided at Appendix N.



4. All data should be recorded in a consistent manner (as litres of the load) on a standard data sheet.
5. Space must be provided on the form so that should any other items be found in significant quantities they can also be recorded as appropriate.
6. All sheets should be pre-numbered to ensure all recording sheets are accounted for after the audit.
7. Each auditor using any pre-numbered sheet should enter their name at the top of the sheet.
8. All completed hardcopy visual audit recording sheets are to be kept in a secure location prior to data entry.
9. Online systems where available can be used to collect data in the field.

10. All auditors will record the following information:
 - Date and time of the vehicle arrival
 - Registration number
 - Vehicle type
 - Vehicle volume
 - Composition of the load
 - Degree of compaction
 - Photographs of specific loads of interest are taken by the assessors.
11. Some common industry sectors are summarised below in the table based on experience.
12. The categories should be updated based on the types of load coming into a landfill for each site.
13. A person should be dedicated to the weighbridge to record specific information in relation to source and origin of load by ANZSIC codes. Industry sectors to be used are listed below.
14. This list should be agreed upon during project planning for each country.

Industry sector	Examples of business types within the division
Manufacturing	Manufacturers of: food products, beverage and tobacco products, textile, leather, clothing and footwear, wood products, pulp, paper and converted paper products, printing, petroleum and coal products, chemical and chemical products, polymer products, non-metallic mineral products, metal and metal products, machinery and equipment and furniture.
	Meat and meat product manufacturing, seafood processing, dairy product manufacturing, fruit and vegetable processing, oil and fat manufacturing, grain mill and cereal product manufacturing, bakery product manufacturing, sugar and confectionery manufacturing, other food product manufacturing



Industry sector	Examples of business types within the division
Retail trade	Food retailing, store and non-store retailing, fuel retailing, motor vehicle and motor vehicle parts retailing.
	Supermarket and grocery stores, specialised food retailing, liquor retailing
	Retailing of: furniture, floor coverings, housewares, textile goods, electrical and electronic goods, hardware, building and garden supplies, recreational goods, clothing, footwear, personal accessories, department stores, pharmaceutical, and other store-based
Accommodation and food services	Accommodation, hotels, hostels, bed & breakfast, restaurants, cafes, take-away food services, pubs, taverns and clubs
	Cafes, restaurants and takeaway food services, pubs, taverns and bars, clubs (hospitality)
Education and training	Pre-school, school and tertiary education. Adult, community and other education and associated support services
Charity	Non-for-profit organisation – Vinnies, Mission Australia
Trade	Electrician, builder, plumber, carpenter
Landscape	Gardener
Mixed small businesses	Any other small business that does not fit above categories
Shopping centres	Groups of shops centrally managed
Offices	Office-based activities
Unknown	
Other	Known but not any of the above

Plastic bag audit

Experience indicates that up to 30 to 60% of commercial loads and up to 85% of kerbside collection loads delivered to landfills are bagged. A visual only assessment of loads in these cases does not present a value-for-money proposition as significant unknowns result as to the nature of the bag contents.

Based on the NSW EPA (Australia) methodology where loads contain plastic bags in excess of 20% of the load, the assessor will randomly select two to 10 bags per load where it is safe to do so for auditing. At the landfill frequently, bags are sighted on discharge however other loose material is then discharged on top and the bags are not redeemable. Where the bags are not accessible due



to other waste being in the way, the support of the plant operator (if available) should be requested.

For domestic self-haul deliveries, samples of bags will be retrieved proportional to the amount delivered to determine the content of the bags. The number of bags selected for auditing will be recorded. On collection of the sample bags the samples are transported for sorting. If a household audit is being undertaken at the same time as the landfill audit, a plastic bag audit of the domestic stream is not necessary.

The composition of the bags is then applied to the bagged material noted during the entire audit.

It is assumed that a suitable area will be available at the landfill for sorting of contents of plastic bags.

The consulting team with help of local staff will sort and record as many plastic bags each day as can be physically achieved within the time and with our experienced staff in 7.5 hours per day. The bags of waste will be weighed on electronic floor scales and the weight recorded prior to placing on sorting tables. Bags will be opened and the contents will be separated into the specified categories and placed into sorting bins or trays. Each bag and contents will be weighed on a set of electronic scales. The weight for each material will then be entered into the appropriate space on the data recording sheet. The same categories will be used for the bags as for visual for seamless integration of the data.

Disposal of the sorted waste will be negotiated with each site.

6.6 Stockpile assessment

One of the major challenges facing PICs is their inability to move material, leading to stockpiling. Therefore, a simple assessment of stockpiles should be undertaken:

- GPS location of the stockpile
- Material stockpiled
- Volume or count of material
- Photograph

A stockpile assessment sheet is listed in Appendix O.

6.7 Interviews

Interviews are required to be conducted to match households sampled to ascertain household behaviours towards waste, i.e. percentage of waste landfilled, dumped on land or in water and/or burnt, composted or upcycled. This data can also be used to model waste generation for the whole country, including islands, to determine the amount of type of material that will potentially be available for shipping.

The interviews cover the following:

- Demographic information



- Income levels
 - Disposal behaviour by material type
 - Willingness to pay for collection/disposal systems
 - Current recycling behaviours including further source separation
 - Level of awareness about the current waste service
 - Type of premises
 - Access to amenities (electricity, sanitation, stormwater infrastructure, etc.)
 - Consumption habits
1. The questionnaires should be designed specifically for each country based on the local conditions, language and culture etc as long as they cover the above criteria.
 2. A decision should be made with feedback from the local council if it is better to have the questionnaire in English and undertake the interviews with the help of interpreters. In cases where the questionnaire is translated, it is important to ensure that the language is not too academic, and the questions can be answered easily by households from all walks of life.
 3. The interviews should be conducted in pairs with at least one member of the team being a local and able to speak the language accompanied by a member of the consulting staff.
 4. As per this methodology, during collection, a GPS location is recorded for each household that the sample is collected from as well as a photograph and a piece of ribbon or string is used to mark the house.
 5. GPS location should be used by the interview team to locate the house.
 6. The piece of ribbon or string should then be located, the sample number from the string should be matched with the one on the collection sheet and the ribbon should then be removed from the premises.
 7. It is important to ensure that the interviewers take their time undertaking the interview.
 8. Interviews are the most time consuming part of the process.

7 Waste sorting

The audit is led by an audit supervisor and typically a team of at least three staff are required. The in-country co-ordinator will arrive prior to the sorting team, undertake stakeholder engagement, obtain permits from local governments, find an appropriate sorting site, engage translators, and engage three local staff who will undertake the household interviews under our direction as will seek to employ additional council staff who will be trained to undertake waste sorting and data entry in the field.



7.1 Audit site set-up

Sorting should be undertaken in a dedicated shed or a marquee. The sorting area should be dry, ventilated and well protected from natural elements. Place traffic cones or high visibility warning tape around the active sorting area.

Include waste storage areas for pre-sorted waste and post-sorted waste to be kept separate and away from main traffic areas and the sorting table.

Place plastic sheeting or tarp over the surface where the solid waste is to be sorted. Tape the edges of the cover down with duct tape or safely weigh it down. The cover will protect the surface from stains.

Each site supervisor is responsible for the monitoring of ambient conditions (e.g. air quality, temperature, humidity) before starting the working day and at regular times during the day. If the ambient conditions are found to be causing discomfort to the auditors, then the site supervisor should direct appropriate changes to auditing and sample collection procedures to ensure the health and safety of all personnel.

7.2 Sorting procedure

Bags from individual households must be weighed separately. Contents of individual bags should be sorted separately into the sorting categories provided (see Appendix L). Separated materials should be placed in appropriate containers, weighed on a set of electronic scales and the weight recorded.

The consulting team must have multiple pairs of electronic scales onsite at any one time to ensure the project can continue if the scales malfunction. All scales should be stored in pelican hard cases to provide protection. All scales must be calibrated regularly and supporting documentation should be kept on record and available to be provided to the contract manager if requested.

All staff must sign a confidentiality agreement which prohibits them from removing anything from the material they sort or from revealing any information they might obtain while sorting or auditing.

Trays, baskets or cardboard boxes can be used to sort the material by category.

A waste data sorting sheet should be developed in close collaboration with the project manager committee to ensure that the project objectives are being met. The sorting sheet should comply with the following criteria:

- a) Comply with previous audits conducted in the region to ensure comparability
- b) Comply with the Tangaroa Blue marine litter database to ensure comparability to sites around the world
- c) Ensure that it encompasses the entire waste stream and is comprehensive
- d) Ensure that the waste streams of importance to different projects are covered.



7.3 Data Recording

7.3.1 Data recording

All waste quantity measurements should be conducted in weight (mass) units (to 100 g) using standard metric units. All waste volume estimates should be recorded in litres (to 100 ml).

7.3.2 Data collection sheet

Data collection sheets are designed to be photocopied and used to record weights and volumes during the auditing process. A blank data collection sheet is provided as Appendix K. Copies of this sheet should be made to allow for recording of data during the audit.

Some extra lines are provided to allow you to enter items that are not covered in the list but are particularly relevant for your sample.

Use the comments section of the report form to assist in further describing the type and condition of materials that are not otherwise listed in the datasheet.

7.3.3 Audit validation

You may wish to check your data against previous audit reports (if available) and other state and national waste indicators. You may also wish to extrapolate the audit data and compare it to the information on total tonnages provided through the landfill and customs.

8 Customs data

The import/export data should be collected by directly contacting the customs departments as well as relevant energy companies and distributors of whitegoods and other materials depending on the country. A list of materials that should be used for requesting customs data is provided at Appendix L.

The data from customs is one of the most crucial elements of this survey. However, experience dictates that it takes a significant amount of time to collect this information. It is therefore advisable that the customs department be contacted as the first port of call when the data collection study is commissioned.

9 Currently available waste data

The methodology provided here provides an estimate of waste generation as a snapshot in time. Therefore, gaining an understanding of waste generation behaviour over time provides for a cross-reference for ensuring seasonal trends are taken into account. Therefore, the following data should be requested from each council/municipality and landfill to understand how the generation rate of waste might change over time:



- a. Amount of total household waste collected daily (period = 1 year)
- b. Amount of green waste collected daily (period = 1 year)
- c. Any source separation that is being carried out (period = 1 year)/ include waste data for the source separated material

9.1 Current recycling and reuse data

Any data available on the current recycling and reuse of materials available. Data to be preferably collected directly from the recyclers. The data to be collected must cover the following:

- Different types of materials being recycled
- The amount per annum of each material recycled
- The source of the materials being recycled
- The destination of the recycled materials
- The processing being done within the recycling facility (i.e. compaction, shredding, washing, etc.)
- The current challenges being faced by the facility.

10 Analysis to be undertaken

The collected waste data above can be used to undertake a number of analyses. However, a basic list of analyses to be performed are listed below and the analysis methodology defined.

The aim of the feasibility study is to determine the total amount of material being generated in various parts of each country so that the quantities to be collected, compacted and moved can be projected as accurately as possible. Based on the household and commercial as well as disposal data collected, a model of waste generation rates can be constructed to find out what the data may tell us about how waste generation varies with characteristics of households or the commercial sector.

The following features must be investigated as predictors of household waste generation:

- Household-level predictors:
 - Total monthly household income (from all employed members of the household)
 - Monthly household spending on groceries
 - Number of people in the house
 - Number of children in the house
 - Household rating of collection service
- Town-level predictors
 - Whether or not there is a collection service in the household area
 - How often waste is collected if there is a service
 - Average household income for the town the house is in
 - Average grocery spending for the town the house is in
 - Population of the town the house is in



In a previous study, after comparing the variability in the data with the above variables, the best results were obtained using only a single predictor: *the town population*. The log-linear model trained on the whole dataset was given by

$$\text{Generation Rate} \left(\frac{\text{kg}}{\text{hh} \cdot \text{day}} \right) = 0.4 \times \ln(\text{Town population})$$

The models that best fit the generation data are different based on the variability of waste generated versus the characteristics measured. Therefore the model that fits the data will be different for each country but can be easily determined by modelling the data collected vs potential predictors of generation. The generation rates thus generated are then checked against actual disposal rate data made available through the landfill/dumpsite audits as well as the incoming material data using the information provided by customs.

The landfill audit results are used to determine the following:

- a) The type and quantity of material being dumped at the landfill from various sectors
- b) The composition of waste (weight and volume) being brought into the landfill from each sector
- c) The amount of recyclable material available from the various waste streams
- d) The potential recovery of material possible based on the available recyclable materials

Further analysis can be performed to answer the following questions:

- a) The potential of recovery of materials based on new/proposed legislations like levies and deposit schemes
- b) The actual recovery available after substitution and doing through the consumer cycle

Finally, the impacts of all recycling and recovery options on the landfill life for each country should be modelled.

11 Readiness matrix

Further to the availability of materials for recycling, the ability of a country to participate in a regional recycling network is dependent on the following:

- a) Its current legislative and policy regime
- b) Staff capacity and resourcing
- c) Infrastructure availability



Based on the above criteria, a readiness matrix has been created that is listed in the table below. A detailed matrix will be developed and refined based on the country-specific information collected by the in-country co-ordinator.

Theme	Gaps
Policy/legislation	<ul style="list-style-type: none"> • Signatory to international treaties allowing movement of waste • In-country deposit legislation and the extent • Ability to legislate swiftly if required • Local by-laws and implementation • Responsibilities and power of implementation and compliance • EPR schemes
Data collection and decision making	<ul style="list-style-type: none"> • Responsible entities for ongoing data collection • Responsible entities for decision making • Responsible entities for implementation and compliance
Economic instruments	<ul style="list-style-type: none"> • Financial instruments for collection of different materials • Local laws supporting/inhibiting import/export of materials • Bans or phase outs in place
Collection services	<ul style="list-style-type: none"> • Current availability and effectiveness of waste collection service • Ability to diversify to multiple collection types • Ability to expand • Recyclers and small scale players for possible future collections
Equipment and maintenance	<ul style="list-style-type: none"> • Number, type and quality of equipment available for collection, compaction, cleaning and re-manufacture of different material types • Ability to acquire such equipment in future • Ability to successfully use (including available ongoing funds) and maintain such equipment
Private sector readiness	<ul style="list-style-type: none"> • Current recycling capacity of the recycling sector • Current collection/recycling contracts in place • Equipment available or capacity to deploy
Education and engagement	<ul style="list-style-type: none"> • Education and engagement requirements for the potential hub concept to work • Stakeholders to be engaged • Champions in relevant departments • Gaps in capacity



Monitoring	<ul style="list-style-type: none">• Capacity for ongoing monitoring and evaluation: staff, technical capability
Training	<ul style="list-style-type: none">• Technical capacity of both the private and public sector to undertake the activities required for the successful movement of material to be accepted at a hub• Potential areas of training and skill gaps

Appendix A – Risk management form

The following form is an example of a risk management process. There are many variations of this form.

1. IDENTIFY THE HAZARD (s)

(a) Describe the hazard (s):

	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	High	High	Very High	Very High	Very High
Likely	Moderate	Moderate	High	Very High	Very High
Possible	Low	Moderate	High	High	Very High
Unlikely	Low	Low	Moderate	Moderate	High
Rare	Low	Low	Low	Low	Moderate

2. ASSESS THE RISK

Risk assessment calculator indicates:

Identify the risk:

DETERMINE WHAT CONTROL MEASURES TO TAKE

(a) Short term/Immediate control measures:

(b) Long term control measures:

3. REVIEW, APPLY AND MONITOR CONTROL MEASURES

a) Review the possible control measure:

(i) Will the control measure introduce a new hazard?	YES/NO If no, continue If yes, undertake The risk management procedure again.
(ii) Is the revised control measure effective?	YES/NO If yes, continue. If no, re-do step 3.



(b) Control measure finally applied: _____

(c) Monitor the control measure:

(i) Does the control measure continue to be effective? **YES/NO**
If yes, continue to monitor If no, re-do the risk management procedure again.

ORGANISATION DETAILS

- (a) Audit project: _____
- (b) Prepared by: _____
- (b) Signature: _____
- (b) Date: _____

Appendix B - Risk management strategies (sample collection)

Risk	Management Strategy
Vehicle accident while in transit	<ul style="list-style-type: none"> All employees will be advised of this risk and reminded of the requirement to observe all traffic rules especially speed restraints when travelling to and from sites. Only fully licensed personnel will be permitted to drive vehicles.
Skin puncture due to contact with sharp object	<ul style="list-style-type: none"> Employees will be advised that no physical handling of waste is to occur. Employees will wear covered safety shoes; long sleeve shirts and long pants to minimise any accidental contact. First aid kits will be provided in case of accident.
Odorous materials	<ul style="list-style-type: none"> Employees will be issued with facemask. The site supervisor will monitor reactions during the audit when odorous samples are present to determine if any employee requires a break.
Injury from slipping/fall	<ul style="list-style-type: none"> Employees will discuss sample collection procedures. All employees will wear sturdy boots and be advised to exercise due care when moving in / through any location.
Knocked down/run over by vehicle	<ul style="list-style-type: none"> All employees will be briefed of this risk. The use of mobile phones will be restricted to breaks when the employee is not in a traffic area. Get other trucks out of the path of auditors Employees will be trained to ensure visual contact is made with any vehicle in the vicinity prior to moving off the kerbside or traversing driveways. Prior to moving around any corners, the employee will make a visual and auditory inspection to determine if any vehicles are approaching – if yes, then the employee will position themselves to ensure that they will not be knocked down. Employees will wear a highly visible safety vests.
Muscle injury from lifting waste	<ul style="list-style-type: none"> All employees will be trained in safe lifting techniques. All employees will be required to ‘test’ each load prior to lifting to determine if assistance is required.
Skin burn due to contact with chemicals	<ul style="list-style-type: none"> Employees are advised not to handle any waste or container without wearing gloves and other PPE. First aid kit and water will be available on each site.
Eye injury due to dust/chemical	<ul style="list-style-type: none"> Employees will wear safety glasses at all times. The first aid kit should contain sterile eye wash liquid.
Breathing difficulties due to dust	<ul style="list-style-type: none"> Employees will be provided with face masks.
Dehydration	<ul style="list-style-type: none"> All employees are expected to have their own water bottle that must be filled and taken on site each day.



Risk	Management Strategy
	<ul style="list-style-type: none"> • Drinking water must be available throughout the day. • Employees will be made aware of the risk and early warning signs of dehydration.
Fatigue from collection procedures	<ul style="list-style-type: none"> • Regular breaks will be scheduled during the collection processes. • Staff will be encouraged to report to the site supervisor if they are feeling fatigues and be allowed to take breaks • Adequate food and water will be provided for employees to consume during breaks.
Waste spill – water or land contamination	<ul style="list-style-type: none"> • Where waste is being bagged – the employee will work on a paved area or roadway wherever possible. • Each truck will carry a clean-up kit. Any spills will immediately be cleaned up. • Waste will not be bagged near to or over a storm water drain or other sensitive areas.
Sun/wind burn due to exposure to elements	<ul style="list-style-type: none"> • Employees will be required to wear broad brimmed hats if working outdoors. • Sun cream will be provided and is required to be worn and regularly re-applied during the day if working outdoors. • Employees will be made aware of the risk and advised to monitor safe conditions.

Appendix C - Risk management strategies (waste audit)

Please note the risk assessment matrix provided below is for guidance only. The Waste Audit supervisor is responsible for taking stock of the audit and site requirements and update the risk assessment matrix based on the country and site.

Risk	Management Strategy
Skin puncture due to contact with sharp object	<ul style="list-style-type: none"> • Employees shall wear covered safety shoes; gloves; long sleeve shirts and long pants to minimise any accidental contact. • Collection and site supervisor staff advised of correct handling procedure of waste and bags to avoid contact with body. • Employees will be advised that no physical handling of wastes is to occur. Tongs are to be used where appropriate. • First aid kits will be provided in case of accident.
Odorous materials	<ul style="list-style-type: none"> • Audit sites will be located in areas where there is adequate ventilation. • Employees will be issued with face mask. • The site supervisor will monitor staff reactions during the audit when odorous samples are present to determine if any employee requires a break.
Illness due to contact with bacterial/infectious substances	<ul style="list-style-type: none"> • Employees will wear a facemask and gloves. • Employees will be advised of correct hygiene – water and soap will be provided for cleaning. • Employees will be advised to wash up at each break and at the end of day. • Employees will wear coveralls. They will also be advised to wash their clothes separately.
Muscle injury from lifting waste	<ul style="list-style-type: none"> • All employees will be trained in safe lifting techniques. • All employees will be required to ‘test’ each load prior to lifting to determine if assistance is required. • Tasks will be rotated so that lifting tasks are shared throughout the day.
Skin burn due to contact with chemicals	<ul style="list-style-type: none"> • Employees are not to handle any waste or container brought onto the waste audit site. • First aid kit and water will be available on each site. • Employees will be advised to stand clear of any vehicle or person emptying a waste/recyclables container due to risks of splashes.
Eye injury due to dust/chemical contact	<ul style="list-style-type: none"> • Employees will wear safety glasses on site at all times. • The first aid kit should contain sterile eye wash liquid.
Breathing difficulties due to dust	<ul style="list-style-type: none"> • Employees will be provided with face masks
Dehydration	<ul style="list-style-type: none"> • All employees are expected to have their own water bottle that must be filled and taken on site each day.



Risk	Management Strategy
	<ul style="list-style-type: none">• Drinking water must be available throughout the day.• Employees will be made aware of the risk and early warning signs of dehydration.
Fatigue from auditing	<ul style="list-style-type: none">• Regular breaks will be scheduled during the auditing processes.• Staff will be encouraged to report to the site supervisor if they are feeling fatigued and be allowed to take breaks• Adequate food and water will be provided for employees to consume during breaks.
Sun/wind burn due to exposure to elements	<ul style="list-style-type: none">• Employees will be required to wear broad brimmed hat if working outdoors.• Sun cream will be provided and is required to be worn and regularly re-applied during the day if working outdoors.• Employees will be made aware of the risk and advised to monitor safe conditions.
Hit by vehicle	<ul style="list-style-type: none">• The audit site will be clearly defined.• Employees will be given a site-specific induction advising of presence of traffic and hazards.• No-go areas will be defined.• The supervisor will be aware of the risk.

Appendix D - General safety procedures

- This section lists some of the general safety procedures recommended for a physical sort of solid waste.
- All waste sorting personnel should be in good physical condition, have had a recent medical examination, maintain a current tetanus booster, and Hepatitis A and B shots, not be sensitive to odours and dust, and be able to read warning signs/labels on waste containers.
- There should be absolutely no eating, smoking, or drinking during sorting activities. Food and liquids are to be kept away from the sorting area. Plenty of fluids (e.g. water, sports drinks, etc.) and single-use, disposable cups must be available at all times. Hands and faces should be washed before eating, drinking or smoking. Consume drinks and rest frequently during hot days. Any smoking is to be done at a safe, approved location away from the main auditing area.
- The sorters should be grouped into pairs and each member should periodically assess the physical condition of his/her partner.
- Always wear the following before beginning the sorting procedure: both pairs of gloves (outer rubber and inner latex), chemical goggles or safety glasses with splash shields, a dust mask, and disposable overalls.
- Do not attempt to identify unknown chemical substances present in the waste stream: vials of chemicals, unlabelled pesticide/herbicide containers, and substances (e.g. chemicals, or needles) in unlabelled plastic/glass bottles/jugs.
- Household hazardous wastes are those wastes resulting from products purchased by the public for household use which because of their quantity, concentration, physical, or infectious, characteristics, may pose a substantial known or potential hazard to human or environmental health when improperly disposed.
- Empty containers of household hazardous wastes are generally not considered to be a hazardous waste. If hazardous wastes are detected, the Site Safety Officer should be notified.
- Hazardous materials and hazardous wastes should not be present in residential sources of municipal solid waste. If hazardous wastes are present in the municipal waste stream, from a commercial or industrial source, the material is not a household hazardous waste, it is a hazardous waste and the Site Safety Officer must be notified. Sorting activities are to cease immediately until the hazard has been removed.
- A potential hazard that can arise in waste sampling is the presence of medical wastes. Sorters must be on alert for the indicators of medical wastes: hypodermic needles, needle covers, medical tubing, articles contaminated with red (blood) coloured substances, and medical device packaging. If medical wastes are detected, the sort will be halted and the Site Safety Officer notified.
- When sorting glass, remove the large pieces first, and then remove the clear glass. Never use your hands to dig down through the waste. Use a rake or small shovel to pull/push the material to the side and continue sorting.
- At the end of each shift, remove all disposable clothing into a plastic garbage bag, and place the bag into a solid waste receptacle. All sorters must shower at the end of each shift.

Appendix E – Recommended personal safety/protective equipment

Recommended personal safety/protective equipment (PPE) is used by individuals to prevent injuries, exposure or contact with hazardous substances or objects. The following section lists some of the personal safety/protective equipment recommended for a visual and physical sort of solid waste.

Body protection

- Sun screen
- Broad-brimmed hats
- Disposable coveralls
- Chemical resistant coveralls, if appropriate
- Hard-bottomed, non-slip, steel-capped boots
- A supply of outer rubber (cut and puncture resistant) gloves
- Chemical goggles or safety glasses with splash shields
- Dust masks
- A supply of inner (latex) gloves
- Insect repellent
- Hearing protection (e.g. ear plugs or earmuffs) if site has equipment or activities that generate loud noises.

Other safety equipment

- Supply of water and soap for washing/flushing etc.
- Industrial first-aid kit
- Field blanket
- Eyewash kit
- Moist, disposable towels/wipes (e.g. baby wipes)
- Mobile telephone
- Liquids to replenish fluids (water and cups for dehydration)
- Trolley

Personnel required to collect the audit sample should be issued with (and required to wear):

- High-visibility safety vests
- Overalls
- Safety foot wear
- Gloves
- Masks
- Safety glasses
- Broad-brimmed hats if collecting during daylight areas



Appendix F – Medical monitoring

Medical monitoring

All employees will be required to provide information to the Safety Officer of any conditions and/or medication programs that may be compromised during any phase of the project. For example, if an employee is prone to asthma attacks as a result of exposure to dust, then this should be brought to the attention of the Safety Officer.

Confidentiality

The confidentiality of all records and reports provided as a requirement of the medical monitoring program and/or medical treatment will be maintained by the Safety Officer. At no time should these records/reports be provided to any other person except with the express permission, in writing, of the person to whom the records/reports are referring.

Vaccinations

All employees undertaking physical auditing will be required to show evidence that their immunity is at sufficient levels for Hepatitis A and B and that tetanus immunisation is current. Contract staff will be requested to show similar evidence.

First-aid precautions

First-aid kits will be present at all waste audit sites and within all waste/recyclables sample collection vehicles. All staff will be provided with appropriate training during the initial orientation to manage minor incidents.

The following basic first aid items should be available in the first-aid kit:

- | | |
|---|---|
| <input type="checkbox"/> Adhesive bandages | <input type="checkbox"/> Eye wash |
| <input type="checkbox"/> Antibacterial ointment packets | <input type="checkbox"/> Antiseptic towelettes |
| <input type="checkbox"/> Alcohol prep pads | <input type="checkbox"/> Scissors |
| <input type="checkbox"/> Butterfly closures | <input type="checkbox"/> First-aid guide |
| <input type="checkbox"/> Wound closure strips | <input type="checkbox"/> CPR face shield |
| <input type="checkbox"/> Povidone iodine prep pads | <input type="checkbox"/> Eye pad |
| <input type="checkbox"/> Elastic wrap | <input type="checkbox"/> Metal tweezer |
| <input type="checkbox"/> Reusable hot and cold gel pack | <input type="checkbox"/> Examination gloves |
| <input type="checkbox"/> Adhesive tape rolls | <input type="checkbox"/> Sterile sponge dressings |
| <input type="checkbox"/> Ice bags | <input type="checkbox"/> Sterile trauma pad |
| <input type="checkbox"/> Knuckle bandages | <input type="checkbox"/> Cold pack |
| <input type="checkbox"/> Sting relief pads (for insect bites) | <input type="checkbox"/> Gauze rolls |
| <input type="checkbox"/> Triangular bandage | <input type="checkbox"/> Sterile examination gloves |
| <input type="checkbox"/> Arm splint | <input type="checkbox"/> Conforming bandages |
| <input type="checkbox"/> Finger splints | <input type="checkbox"/> Note pad and pencils |
| <input type="checkbox"/> Insect repellent packets | <input type="checkbox"/> Safety pins |



- Splinter probe
- Cotton swabs
- Cotton tip applicators
- Acid burn – neutralising solution/aerosol can



Appendix G - Safety induction checklist (sample collection)

The collection of waste containers from the kerbside is inherently hazardous. You are responsible to ensure that you conduct all activities in a safe manner and immediately alert your supervisor of any practice or situation you consider to be unsafe – for you or any other person. You must not undertake any activity that you consider to be unsafe.

The following safety procedures **MUST** be followed at all times:

- Personal protective equipment must be worn correctly at all times whenever working. This includes safety vests, safety glasses, covered shoes, gloves, face masks and coveralls.
- Back braces should be provided and trolleys supplied if moving of heavy waste loads is required.
- All containers and/or individual bags of waste must never be carried near the body.
- Bags should never be supported by placing hands under the bag – bags must be held from the top.
- Always test the weight of the bag prior to lifting. Always ask for assistance if the bag is beyond your ability to lift it. Whenever lifting, bend the knees and lift from the legs – not the back.
- Always be aware of other traffic, and pay attention to other waste collectors and if they are placing themselves in any danger from the traffic. Be aware of traffic coming from driveways.
- NEVER enter or exit a vehicle that is moving – always wait until it has stopped and look for any traffic.
- Be aware of other hazards such as slippery surfaces, overhanging branches and other materials near the kerbside.
- Always ensure that all containers are physically secured prior to moving the vehicle.
- If a waste spill occurs, take immediate action to prevent the spill from spreading, use safe clean up practices and **INFORM** your supervisor **IMMEDIATELY**.
- Always confirm with your supervisor as to where waste should be deposited upon arriving at the waste audit site.
- When having a break **IMMEDIATELY** wash hands with disinfectant. Do not eat, drink or smoke or touch your face until hands have been thoroughly washed.
- Leave all personal items in the designated secure area and do not touch until you have thoroughly cleaned hands.
- Smoking, eating or drinking is not permitted in the immediate vicinity of any area where waste is located.
- Upon completion of the day, all PPE including overalls are to be deposited into the specific bags/containers provided. After depositing this equipment, **IMMEDIATELY** wash hands with disinfectant.



- Stop for breaks as you feel necessary. Ensure you have an adequate intake of fluids and nourishment.
- If you feel unwell, report to the supervisor immediately.
- Report any injuries sustained immediately to your supervisor.
- If the waste collection is conducted in sunny weather, wear a sunhat and apply sunscreen on a regular basis.
- I have read the procedures described above and been given a verbal occupational health and safety briefing on the hazards associated with the collection of the waste and my responsibilities.

Signed: _____ Date: _____



Appendix H – Safety induction checklist (audit personnel)

The waste audit process is inherently hazardous. You are responsible to ensure that you conduct all activities in a safe manner and immediately alert your supervisor of any practice or situation you consider to be unsafe – for you or any other person. You must not undertake any activity that you consider to be unsafe.

The following safety procedures must be followed at all times:

- Personal protective equipment must be worn correctly at all times whenever working. This includes safety glasses, covered shoes, gloves, face masks and overalls.
- Never place hands blindly into piles of waste. All waste must be spread on the table and be fully visible prior to sorting. Where this is not possible, instruments such as tongs should be used to spread waste.
- All bags of waste (sorted and unsorted), must never be carried near the body.
- Bags should never be supported by placing hands under the bag – bags must be held from the top.
- Always test the weight of the bag prior to lifting. Always ask for assistance if the bag is beyond your ability to lift it. Whenever lifting, bend the knees and lift from the legs – not the back.
- If a needle or any sharp item is identified in the waste, IMMEDIATELY cease sorting and alert all auditors and the supervisor. DO NOT attempt to pick up the sharp item under any circumstances.
- Do not place hands near face while sorting.
- When having a break IMMEDIATELY wash hands with disinfectant. Do not eat, drink or smoke or touch your face until hands have been thoroughly washed.
- Leave all personal items in the designated secure area and do not touch until you have thoroughly cleaned hands.
- Smoking, eating or drinking is not permitted in the immediate vicinity of any area where waste is located.
- Upon completion of the day, all PPE including overalls are to be deposited into the specific bags/containers provided. After depositing this equipment, IMMEDIATELY wash hands with disinfectant.
- Stop for breaks as you feel necessary. Ensure you have an adequate intake of fluids and nourishment.
- If you feel unwell report to the supervisor immediately.
- Report any injuries sustained immediately to your supervisor.
- If the audit is conducted in the open, wear a sunhat and apply sunscreen on a regular basis.

I have read the procedures described above and been given a verbal occupational health and safety briefing on the hazards associated with the conduct of the audit and my responsibilities.

Signed: _____ Date: _____



Appendix I – Declaration

All site personnel (including auditors, visitors, and observers) should be handed a copy of the occupational health and safety plan. The following declaration should be signed and a copy maintained by the Safety officer.

I _____ (print name) have read and understand the occupational health and safety plan and will follow the procedures and protocols detailed in the plan for waste auditing at all designated sites.

Signed: _____ Date: _____



Appendix J - Recommended auditing equipment

- Small rake
- Stanley knife (with retractable blade)
- Small bins or buckets of known volume for weighing / containing sorted materials
- Sorting table
- A scale that is accurate to 100 grams. Depending upon the waste stream, if required to measure below 100 grams (i.e. for materials in small quantities such as syringes), a small but accurate set of kitchen scales would be a good alternative
- Tongs
- Permanent markers
- Clipboard and data sheets
- Calculator
- Garbage bags
- Rake with a long handle
- Rake with a short handle
- Shovel with a long handle
- Broom
- Camera
- Duct tape
- Plastic sheeting (minimum of 10 mm thick)



Appendix K - Collection sheet

Please note that the consultant team used an online tool but collected the below information.

	Date	Auditor		Weather			
	Sample number	GPS recorded?	location Photo?	Interview sheet provided?	Interview sheet returned?	Bags provided?	Comments
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							



Appendix L - Sorting categories

Material Categories, definition and source of data

C	Category	Description	EOL Source	Incoming
Metal	Aluminium cans	Alcoholic sodas and spirit-based mixers, beer and soft drink, Food cans, pet food cans, aerosols, industrial cans	H, C, L	Cu, D
	Aluminium recyclable	Steel Packaging	H, C, L	Cu, D
	Steel containers	Alcoholic sodas and spirit-based mixers, beer, soft drink, Food cans, pet food cans, aerosols, industrial cans, clean/empty paint cans	H, C, L	Cu, D
	Metal other	100% ferrous items that are not cans/tins/packaging materials, any other steel, Beer bottle tops, jar lids, composite ferrous items for which the weight of the ferrous metal is estimated to be greater than the other material items, Foils 100% aluminium items that are not cans/tins/or packaging materials, any other aluminium	H, C, L	Cu, D
Fishing	Fishing/seafood metal		H, C, L	
	Fishing/seafood plastic		H, C, L	
	Fishing/seafood wood		H, C, L	
Paper and Cardboard	Cardboard	Cardboard without corrugation (glossy and non-glossy), cereal boxes, business cards,	H, C, L	
	LPB	Soy milk cartons, some fruit juice cartons, UHT/long-life milk	H, C, L	
	Composite	Composite paper items for which the weight of the paper is estimated to be greater than the weight of the other materials	H, C, L	
	Paper	Office paper, writing pads, letters, envelopes, books, Newspapers, newspaper like pamphlets, paper, magazines, brochures, wrapping paper, labels, paper packaging (no plastic or wax coating)	H, C, L	
Plastic	PET containers	(Polyethylene) – soft drink, flavoured water, fruit juice, sports drinks, plain water (carbonated/non-carb), Food containers, mouthwash containers, detergent bottles	H, C, L	Cu, D
	HDPE containers	(High-density polyethylene) milk and flavoured milk bottles Bleach bottles, oil containers, food containers	H, C, L	Cu, D
	LDPE containers	(Low-density polyethylene) squeeze bottles	H, C, L	Cu, D
	PVC containers	(Polyvinyl chloride) clear cordial and juice bottles, Detergent bottles	H, C, L	Cu, D
	PP	Bottles and containers	H, C, L	Cu, D
	EPS	Yoghurt and dairy containers, vending cups, clam shells	H, C, L	Cu, D
	PS	Meat and poultry trays, vending cups, fragile-item packaging	H, C, L	Cu, D
	PP	Bottles and containers	H, C, L	Cu, D
	Flexibles/Film	No shopping bags, Just chip packets and other MLM packaging	H, C, L	Cu, D
	Other plastic		H, C, L	Cu, D
Single use plastic items	Beverage containers	the total count from the beverage container sort	H, C, L	Cu, D
	Cigarette Butts		H, C, L	Cu, D
	Cigarette Packets		H, C, L	Cu, D
	Straws		H, C, L	Cu, D
	Coffee Cups		H, C, L	Cu, D



C	Category	Description	EOL Source	Incoming
	Bags - heavy glossy typically branded carry bags		H, C, L	Cu, D
	Bags - supermarket type light weight carry bags		H, C, L	Cu, D
	Takeaway containers plastic other than EPS		H, C, L	Cu, D
	Takeaway containers styrofoam		H, C, L	Cu, D
	Takeaway containers paper		H, C, L	Cu, D
	Takeaway container lids		H, C, L	Cu, D
	Bottle lids		H, C, L	
Batteries	Non-rechargeable batteries	Common batteries, AAA, AA etc. single-use	H, C, L	
	Rechargeable Batteries	Common batteries (rechargeable), AAA, AA etc. rechargeable	H, C, L	
	Lead acid batteries	Large batteries used in vehicles or other machinery	H, C, L	Cu, D
	Mobile phone batteries	Batteries used in mobile phones	H, C, L	Cu, D
	Power tool batteries	Batteries used in power tools	H,C,L	
	Lithium Batteries	Small lithium batteries	H, C, L	
	Lithium ion batteries	Batteiries used in electric cars	H, C, L	Cu, D
	Other batteries	All other battery types	H, C, L	Cu, D
E-Waste	Computer Equipment	Keyboard, monitor, hard drives, printers, etc.	H, C, L	Cu, D
	TVs	TVs	H, C, L	Cu, D
	Mobile Phones	Mobile phones, phones, pads, charges, car kits, bluetooth	H, C, L	Cu, D
	Electrical Items & Peripherals	Radio, iPod, Gameboys, stereos, speakers, VCR, DVD players, powertools, wiring and cables, small electrical items (toaster, blender, etc.), computer discs, cassettes, DVDs, CDs	H, C, L	Cu, D
	Toner Cartridges	Printer and toner cartridges	H, C, L	Cu, D
Glass	Glass bottles	Recyclable (all colours) – beer bottles, wine bottles, spirit cider/fruit-based, flavoured water, fruit juice, sports drinks, plain water	H, C, L	Cu, D
	Glass Jars	Non-beverage containers (all colours) – sauce bottles, jam jars, vegetable oils, other food containers	H, C, L	Cu, D
	Glass fines	Mixed glass or glass fines < 4.75 mm	H, C, L	Cu, D
	Glass other	Plate glass (window and windscreen), Pyrex, mirror glass, Corning ware, light globes, laboratory and medical glass, white opaque glass (e.g. Malibu alcohol bottles)	H, C, L	Cu, D
Hygiene	Feminine hygiene	Used disposable feminine hygiene products	H, C, L	
	Pharmaceutical		H, C, L	
	Nappies	Used disposable nappies/diapers	H, C, L	
	Medical waste	Sharps, human tissue, bulk bodily fluids and blood, any blood-stained disposable material or equipment	H, C, L	
	Other sanitary waste		H, C, L	
Organic _s	Food	Vegetable/fruit/ meat scraps	H, C, L	
	Wood/timber		H, C, L	



C	Category	Description	EOL Source	Incoming
	Garden organics	Grass clippings, tree trimmings/prunings, flowers, tree wood (< 20 mm diameter)	H, C, L	
	Other organics	Animal excrement, mixed compostable items, cellophane, kitty litter	H, C, L	
Hazardous	Paint	Containers containing paint (dry or wet)	H, C, L	
	Fluorescent Tubes	Fluorescent tubes; compact fluorescent lamps (CFLs)	H, C, L	
	Household Chemicals	Containers containing bleach, cleaning products, unused medical pills	H, C, L	
	Asbestos	Asbestos and asbestos containing products or building materials	H, C, L	
	Clinical (medical)	Sharps, human tissue, bulk bodily fluids and blood, any blood-stained disposable material or equipment	H, C, L	
	Gas Bottles	Gas bottles	H, C, L	
	Mercury	Mercury used in medical applications	H, C, L	Ministry of health, hospitals
	Hazardous Other	Any other hazardous material	H, C, L	
	Textiles	Wool, cotton and natural fibre materials	H, C, L	
	White goods		H, C, L	Cu, D
	Ceramics		H, C, L	
	Containerised used oil		H, C, L	Cu, Retail
	EOL renewable energy equip	Includes EOL solar panels	H, C, L	Cu, Power company, installers
	End of life Vehicles		H, C, L	Cu
	Tyres		H, C, L	Cu
	Please describe			

Codes used:

H = Household audit

C = Commercial audit

L = Landfill audit

Cu= Customs

D = Distributors



Appendix M - Detailed list of container categories



BEVERAGE CONTAINER ONLY FURTHER SORT			
	<500	500-1500	>1500
Aluminium			
Alcoholic sodas & spirit-based mixers			
Beer/cider			
Water			
flav water/soft drink (carbonated)			
flav water/soft drink (non-carb)			
Food (human)			
Food (dog and cat)			
Other			
Steel			
Alcoholic sodas & spirit-based mixers			
Beer			
cider/fruit based etc			
flav water/soft drink (carbonated)			
flav water/soft drink (non-carb)			
Other			
LPB			
milk			
flavoured milk			
fruit juice (>90% fruit &/or Veg juice)			
fruit drink			
flav water/sports drink, non-carb			
Beauty and personal care			
Home care (including cleaning)			
Other			
PET			
milk			
drink pouches			
flav. Milk			
flav water/ sports drink etc (non-carb)			
flav water/soft drink (carbonated)			
plain water (carbonated or non-carb)			
fruit juice (>90% fruit &/or Veg juice)			
fruit drink			
Beauty and personal care			
Home care (including cleaning)			
Other			
HDPE			
milk			
drink pouches			
flav. Milk			
flav water/ sports drink etc (non-carb)			
flav water/soft drink (carbonated)			
plain water (carbonated or non-carb)			
fruit juice (>90% fruit &/or Veg juice)			
fruit drink			
Beauty and personal care			
Home care (including cleaning)			
Other			
Other Plastic			
milk			
drink pouches			
flav. Milk			
flav water/ sports drink etc (non-carb)			
flav water/soft drink (carbonated)			
plain water (carbonated or non-carb)			
fruit juice (>90% fruit &/or Veg juice)			
fruit drink			
wine bladders			
Beauty and personal care			
Home care (including cleaning)			
Other			
Glass			
Alcoholic sodas/spirit-based mixers			
Beer			
Cider/fruit based etc			
Flav water/soft drink (carbonated)			
Plain water (carbonated or non-carb)			
fruit juice (>90% fruit &/or Veg juice)			
fruit drink			
Wine (glass only)			
Wine cooler			
Spirit			
Beauty and personal care			
Home care (including cleaning)			
Other			



Appendix N - Landfill audit sheet

Location		Date: _____			Auditor		
Sample Number							
Entry time							
Vehicle registration number							
Type of vehicle							
Maximum capacity (m3)							
Compaction (Circle)		H	M	L	H	M	L
Tipping point							
Source (C&I / C&D / Council / SH / MSW)							
Sector (M S H O X C T L E U G)							
Bagged waste	Bagged waste						
Metals	Aluminium cans						
	Aluminium recyclable						
	Steel containers						
	Metal other						
Fishing	Fishing/seafood metal						
	Fishing/seafood plastic						
	Fishing/seafood wood						
Paper Cardboard	Cardboard						
	LPB						
	Composite						
	Paper						
Plastic	PET containers						
	HDPE containers						
	LDPE containers						
	PVC containers						
	PP						
	EPS						
	PS						
	PP						
	Flexibles/Film						
	Other plastic						
	Beverage containers						



Single use plastic items	Cigarette Butts			
	Cigarette Packets			
	Straws			
	Coffee Cups			
	Bags - heavy glossy branded carry bags			
	Bags - supermarket light wt carry bags			
	Takeaway containers plastic not EPS			
	Takeaway containers styrofoam			
	Takeaway containers paper			
	Takeaway container lids			
	Bottle lids			
Batteries	Non-rechargeable batteries			
	Rechargeable Batteries			
	Lead acid batteries			
	Mobile phone batteries			
	Power tool batteries			
	Lithium Batteries			
	Lithium ion batteries			
	Other batteries			
E-Waste	Computer Equipment			
	TVs			
	Mobile Phones			
	Electrical Items & Peripherals			
	Toner Cartridges			
Glass	Glass bottles			
	Glass Jars			
	Glass fines			
	Glass other			
Hygiene	Feminine hygiene			
	Pharmaceutical			
	Nappies			
	Medical waste			
	Other sanitary waste			
Organics	Food			
	Wood/timber			
	Garden organics			
	Other organics			
Hazardous	Paint			
	Fluorescent Tubes			
	Household Chemicals			
	Asbestos			
	Clinical (medical)			
	Gas bottles			
	Mercury			
	Hazardous Other			
Other	Textiles			



Appendix O - Stockpile assessment sheet

Stockpile assessment sheet

Date

Location of stockpile

Photo taken

Material type	<input type="checkbox"/> Cars <input type="checkbox"/> Heavy machinery <input type="checkbox"/> Solar Panels <input type="checkbox"/> Boats <input type="checkbox"/> Gas bottles - acetlyene <input type="checkbox"/> Gas bottles - oxygen <input type="checkbox"/> Gas bottles - cooking <input type="checkbox"/> 44 gallon rums <input type="checkbox"/> Containers (20 ft) <input type="checkbox"/> Containers (40ft) <input type="checkbox"/> Used oil <input type="checkbox"/> Iron roofing material <input type="checkbox"/> Aluminium cans <input type="checkbox"/> Plastic water tanks
Volume of stockpile	
Number of items in stockpile	
Weight of one item (if possible)	
Comments	

