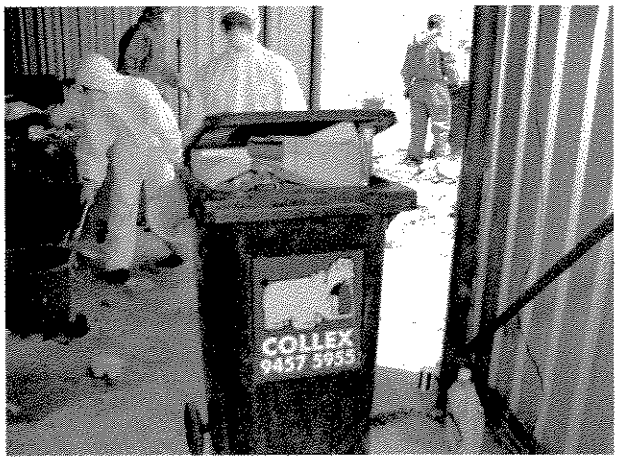
Nolan-ITU

Eastern Metropolitan Regional Council

Waste Composition Study



March, 2003

Ref: 4092-02

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1 INTRODUCTION

The Eastern Metropolitan Regional Council (EMRC) wished to establish a characterisation of waste streams disposed of at the Region's waste management facility, Redhill Waste Disposal Facility. Three main waste streams are disposed of at the landfill:

1. Domestic Solid Waste;
2. Materials Recovery Facility (MRF) Residual Waste; and
3. Commercial and Self-Haul Waste.

The EMRC engaged Nolan-ITU to conduct audits of the domestic solid waste and the commercial and self-haul waste streams.

This report details the methodology and results from each of the two audits undertaken. Information on the characterisation of the MRF residual waste stream is also presented in the report, based upon data provided by the EMRC outside the scope of the Nolan-ITU study.

2 METHODOLOGY

Given the physical difference between the two waste streams being analysed, two separate methodologies were developed and implemented. A physical waste audit was performed on the domestic solid waste, whilst a visual assessment was performed on the commercial and self-haul waste.

2.1 Domestic Solid Waste

The domestic solid waste audit consisted of a physical audit of 600 households' waste across the region. The audit was performed over a six day period, beginning Monday, 2nd December and concluding on Monday, 9th December. Almost nine tonnes of domestic solid waste was audited during this period. The following details the methodology of establishing sample size, collection scheme, and the physical audit of the material.

2.1.1 Sample Size and Collection Scheme

Using population data provided by the EMRC, a 600 household sample size was projected to yield a data confidence level of 95% within a margin of error of 3.9 percentage points (see Appendix A).

Based on the population spread across the six members Councils, a collection scheme was established for a daily collection of 100 household garbage bins. Presented in Table 2-1 is the household population spread, and resulting daily collection from each of the member Councils. A street from each member Council was randomly selected from which to collect the sample number of bins (see Appendix B for the daily collection schedule).

A single garbage truck was used and typically did two return trips to the EMRC Hazelmere site. The vehicle and driver was provided by local collector Gidge Waste, and a Nolan-ITU staff member accompanied to ensure correct collection of the sample.

Table 2-1. Sample Collection Scheme

Council	Number Households	Weighting (% of EMRC population)	Projected Daily Collection	Average Daily Collection
Bassendean	5,578	5.4	5	4
Bayswater	23,906	23.1	23	25
Belmont	13,524	13.1	13	9
Kalamunda	16,782	16.2	16	18
Mundaring	12,248	11.8	12	14
Swan	31,400	30.4	31	30
Total	***103,438***		***100***	***100***

As depicted in the final column of Table 2-1, there was some variation between the originally planned collection scheme and the scheme implemented. This variation is attributable to the slightly amended scheme introduced mid-week to generate data specific to Bayswater Council and some daily variations in pick up times.

Midway through the audit, the potential benefits of generating Bayswater Council-specific data were identified, as it is the only member Council with a separate greenwaste collection. From the Thursday of the audit week onwards, Bayswater was collected and audited separately from the remaining Councils, enabling analysis of the impact that greenwaste collection has on the domestic waste composition.

2.1.2 Auditing of Sample

Each day, the entire sample of 100 bins was audited by a team of Nolan-ITU trained auditors. In order to ensure occupational health and safety compliance, all staff undertook a safety induction to learn correct handling procedures. The details of this induction, including the Occupational Health and Safety Plan for the activity, is presented in Appendix C.

Upon arriving at the Hazelmere site, the material from the garbage truck would be unloaded onto a cleared surface. Using rakes and shovels, the bulky material was separated from the load, whilst bagged material was opened on trestle tables for sorting with tongs. As depicted below in Figure 2-1, separate categories of material were taken from the load and placed in separate bins.

Figure 2-1. Auditor sorting material on table.

The sample was separated into over 50 different categories, based upon the Australian Waste Database Solid Waste and Hazardous Waste Classification System. A copy of the audit data sheet can be viewed in Appendix B.

To ensure accuracy in terms of the sorting procedure, all auditors were trained on different material types and categories. During the course of each working day, spot checks and drills would be conducted to ensure the highest possible standard of accuracy was being maintained.

As bins filled with specific materials, they were weighed off and recorded. Only Nolan-ITU personnel had access to the scales and records. For taring purposes, only three types of bin were used, a standard 240lt MGB, 65lt crate, and a 55lt tub. The tare weight of the bins was taken each day to ensure a consistent weight.

2.2 Commercial and Self-Haul Waste

The commercial and self-haul waste assessment was performed on five weekdays and a Sunday, beginning Monday, 6th December, and finishing on Sunday, 8th December. As explained in the following, the methodology for the waste assessment was quite different to that of the domestic solid waste audit.

2.2.1 Sample Size

The speed at which a waste assessment can be performed meant the coverage of loads during the assessment period was extensive. Seventy percent (70%) of all commercial collections were assessed, whilst there was 100% coverage of self-haul material, owing to the single truck scheme emptying the self-haul hopper at the landfill face.

2.2.2 Visual Composition Assessment

Owing to the bulky nature and large throughput of waste material at the landfill site, a methodology approved by the Australian Greenhouse Office for the determination of the renewable energy component of incoming waste loads was adapted.

For incoming loads, a Nolan-ITU auditor would visually scan the vehicles content as it was being emptied, and then assessed as a pile at the landfill face. The following categories of material were applied:

- Concrete/bricks;
- Soil (earthen materials);
- Paper/cardboard;
- Food;
- Greenwaste;
- Wood;
- Textiles;
- Rubber;
- Plastic;
- Expanded polystyrene;
- Steel;
- Aluminium; and
- Asbestos.

An estimate would be established based on the volume percentage of each material compared to the overall load. The volume percentage was then converted to a weight percentage by applying density factors.

3 RESULTS

The following presents the results from the audit and assessment activities undertaken. In this section, EMRC-provided data on MRF residues for the region is also presented.

3.1 Domestic Solid Waste

As mentioned in Section 2.1.1, half way through the domestic solid waste audit, the Bayswater Council sample was collected separately for auditing. Accordingly, the following data is presented in two manners. Section 3.1.1 is the audit results for the EMRC sample, including the Bayswater component. Section 3.1.2 presents the results of the Bayswater only sample, and provides a comparison with the EMRC sample that excludes the Bayswater component.

3.1.1 Composition of the EMRC member council domestic solid waste stream

The results of the EMRC domestic solid waste audit suggest that at a regional level, there is considerable recovery of material through local kerbside recycling services. Tabulated in Table 3-1 is the summary of material types, match against the total weight audited over the six-day period.

Table 3-1. Total weight audited by material type

Material	Total weight audited (kg)
Paper/Cardboard/LPB	1,045.40
Glass Containers (all colours)	418.92
Plastics (PET, HDPE, PVC)	136.46
Other Plastics (incl LDPE, PP, PE)	481.18
Metals Packaging (Steel, Aluminium)	173.20
Other Metals	151.48
Greenwaste (Prunings, Lawn, Weeds)	3,242.30
Organics (Textiles, Wood)	395.84
Food waste	2,098.82
Contaminated Paper	223.18
Dust/Dirt/Rock/Ash	232.74
Disposable Nappies	229.10
Other	152.94
TOTAL	*8,981.56*

Presented in Figure 3-1 is the average percentage composition of material, based upon the average weight audited.

In terms of treatable material, almost two thirds of the waste is organic (contaminated paper, foodwaste, textiles/wood and greenwaste) biodegradable material. A further diversion of approximately 20% is also achievable through increased recovery of recyclable materials that are currently being placed into garbage bins.

General observations made during the course of the audit were also recorded and are presented below in Table 3-2.

Table 3-2. Observations during domestic solid waste audit

Material	Comment
Broken Glass	Although not prevalent, it was the greatest hazard encountered during the audit.
Greenwaste	While a reflection of seasonal climatic conditions, it was noted that greenwaste, and all waste in general, was particularly dry, eg, contained very little moisture content.
Engine Oils	It was evident that the mode of disposal for many home mechanics is the garbage bin.
Dry Cell Batteries	In terms of weight these items are minimal, but their frequent presence was noted and weighed off, and from a hazardous point of view, their prominence is of concern

3.1.2 Composition of Bayswater domestic solid waste stream

An individual audit of the Bayswater sample was conducted over the second half of the auditing period – a total of three days. The presentation rate was recorded for greenwaste bins placed out during the Bayswater-specific collections. On average 82% of residents, who had placed out their garbage bin for collection, had also placed out their greenwaste bin. In Table 3-3 an interesting comparison is drawn on a per bin basis between Bayswater and the remainder of the ERMC. The Bayswater bin is some 3.5kg lighter, primarily owing to the reduced amount of greenwaste present. All other categories are strikingly similar, although Bayswater is noticeably heavier in the dust/dirt/rock/ash category.

Table 3-3. Average weight composition on a per bin basis comparative

Material	Average weight composition per bin Bayswater only (kg)	Average weight composition per bin of EMRC excl Bayswater (kg)
Paper/Cardboard/LPB	1.95	1.72
Glass Containers (all colours)	0.44	0.76
Plastics (PET, HDPE, PVC)	0.21	0.22
Other Plastics (incl LDPE, PP, PE)	0.73	0.71
Metals Packaging (Steel, Aluminium)	0.23	0.23
Other Metals	0.57	0.24
Greenwaste (Prunings, Lawn, Weeds)	2.34	7.01
Organics (Textiles, Wood)	0.70	0.58
Food waste	3.47	3.42
Contaminated Paper	0.38	0.22
Dust/Dirt/Rock/Ash	0.67	0.21
Disposable Nappies	0.43	0.41
Other	0.29	0.20
TOTAL	*12.41*	*15.93*

The results are also presented as percentage average composition for Bayswater individual (Figure 3-2), and the remaining EMRC sample (Figure 3-3).

When presented as percentage composition, the results of the Bayswater audit provide a strong indication of the effectiveness of a separate greenwaste collection. Though greenwaste is still almost 20% of the garbage bin content, this figure is considerably less than the remaining EMRC sample, where greenwaste is 45%.

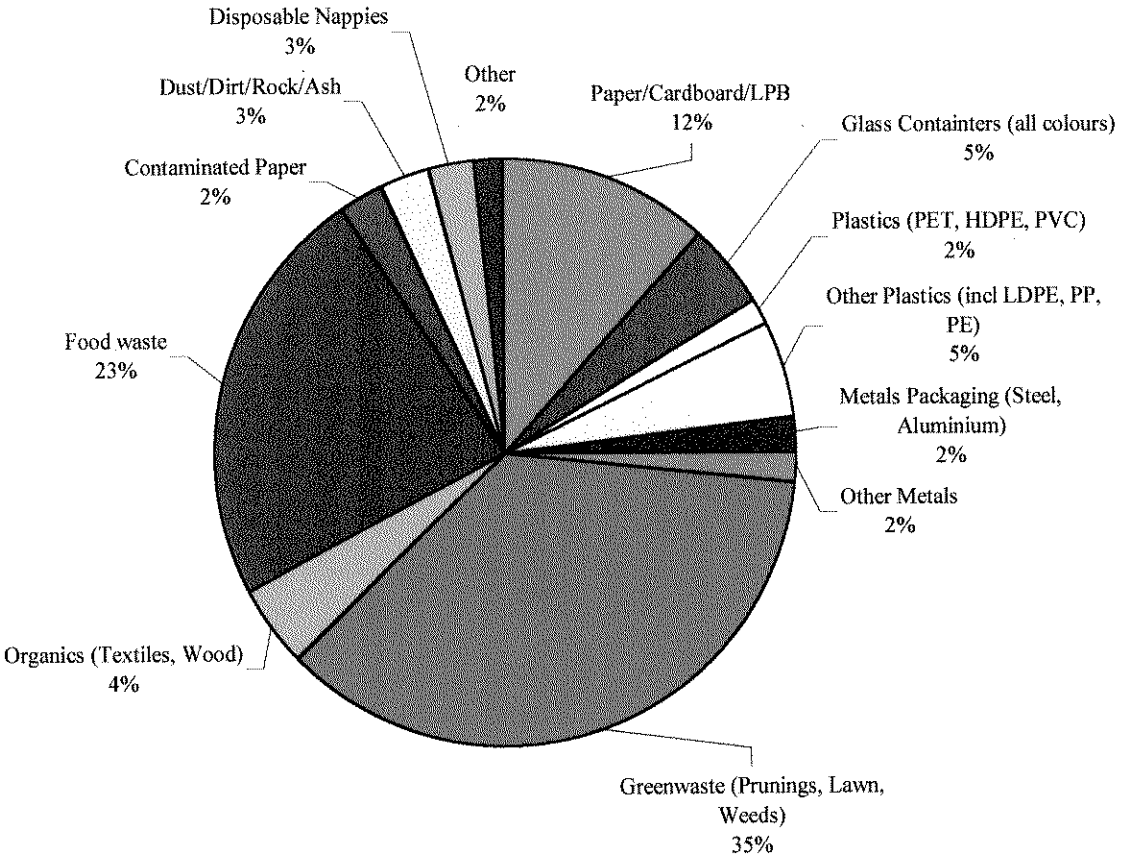

Figure 3-1. Average percentage composition by weight of domestic solid waste in the EMRC

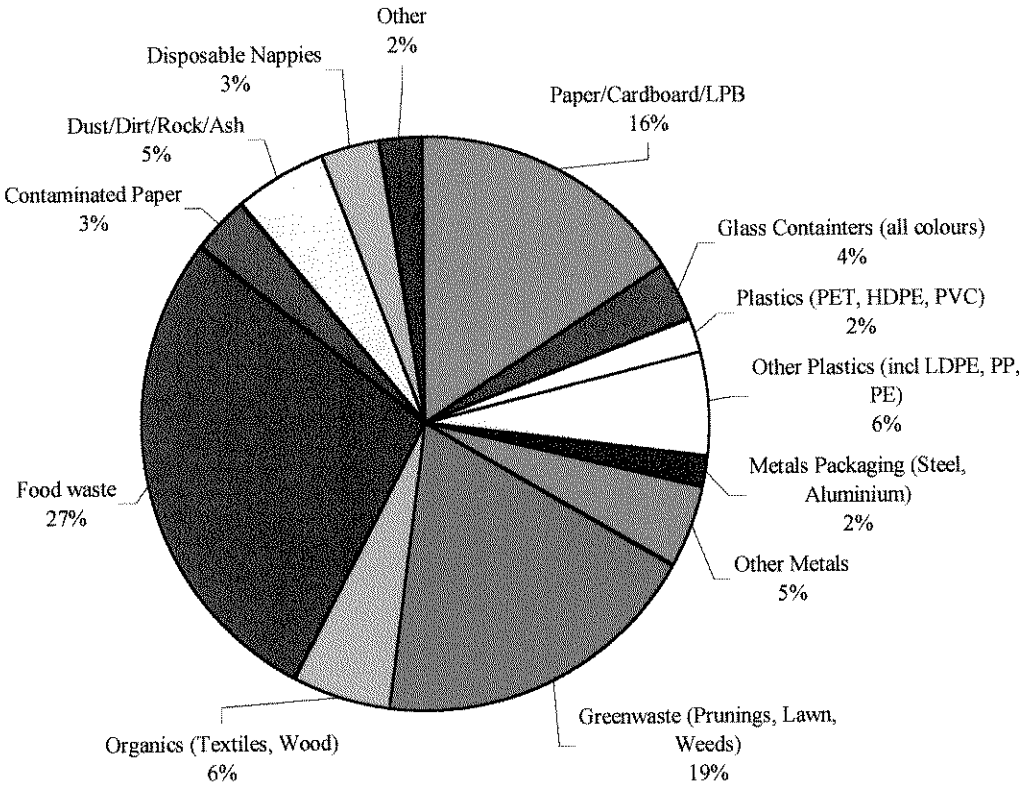

Figure 3-2. Average percentage composition by weight of domestic solid waste in Bayswater

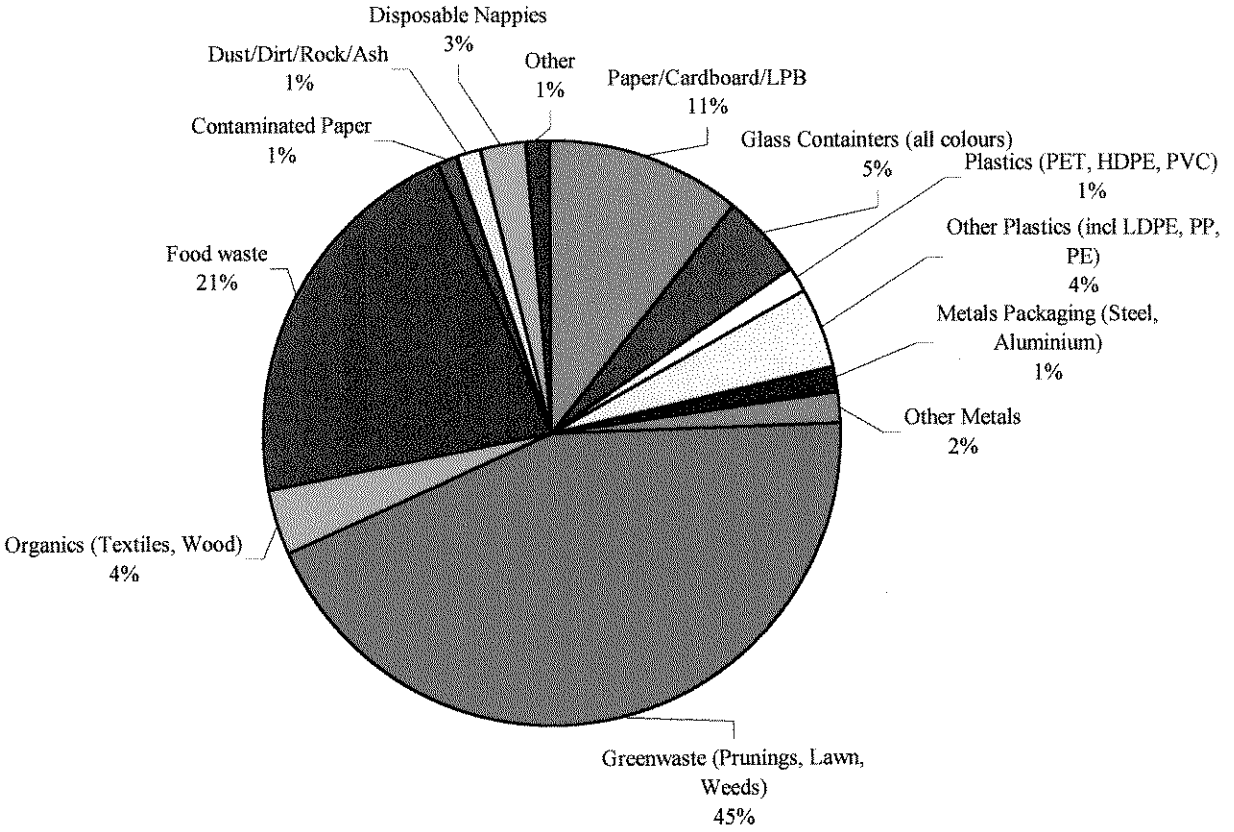

Figure 3-3. EMRC waste composition, excluding Bayswater from the sample

3.2 Commercial and Self-Haul Waste

Although undertaken simultaneously, the results of the commercial and self-haul waste assessment are presented separately. The source of each load was identified by matching vehicle number plates against the daily print-out from the weighbridge which lists number plates and indicates the commercial nature of vehicles.

3.2.1 Commercial Assessment

Figure 3-4 presents the results of the average composition of commercially collected waste being disposed of at the Redhill Waste Disposal Facility. The largest category of material is soil (37%), which is twice as large as greenwaste (17%), the second largest category of material. Depending on how mixed the material is when presented at the landfill, there is some opportunity for diversion, particularly in the greenwaste, food and paper/cardboard categories.

Beyond the data generated from the assessment, a number of observations were also made. These are presented below in Table 3-4.

Table 3-4. Observations of commercially-collected waste

Material	Comment
Green waste	It was noted that a number of trucks emptying at the landfill contained only green waste, and could have potentially been diverted from landfilling
Green waste	The oversize rejection of green waste is resulting in larger branches and limbs being landfilled

3.2.2 Self-Haul Assessment

The typical composition of self-haul waste to the Redhill Waste Disposal Facility presented in Figure 3-5 is qualitatively different from the commercial collection material. The soil and food waste components are significantly smaller; there is a larger composition of paper/cardboard.

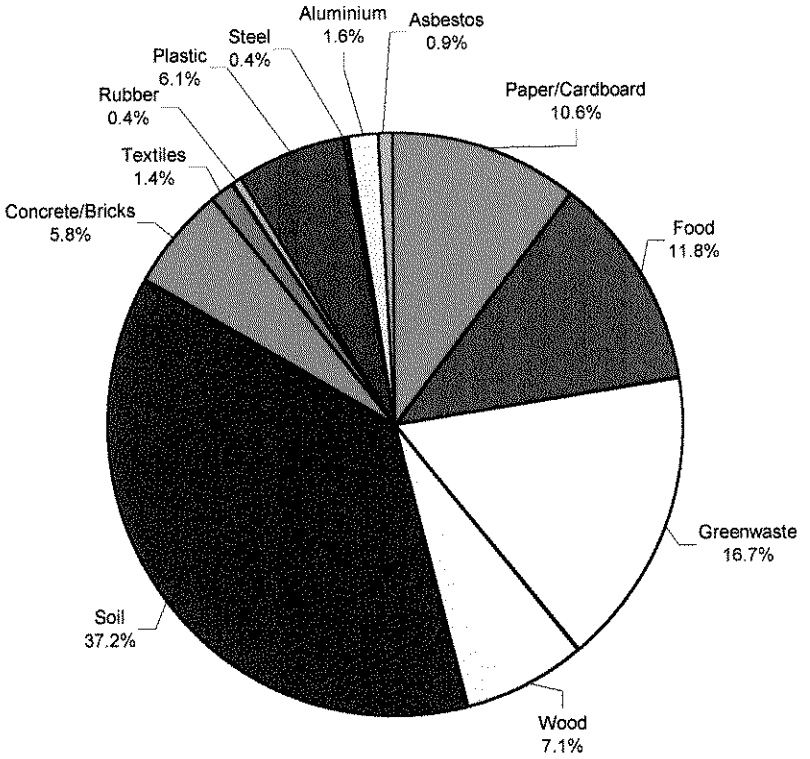

Figure 3-4. Average composition by weight of commercially collected waste disposed of at Redhill Waste Disposal Facility

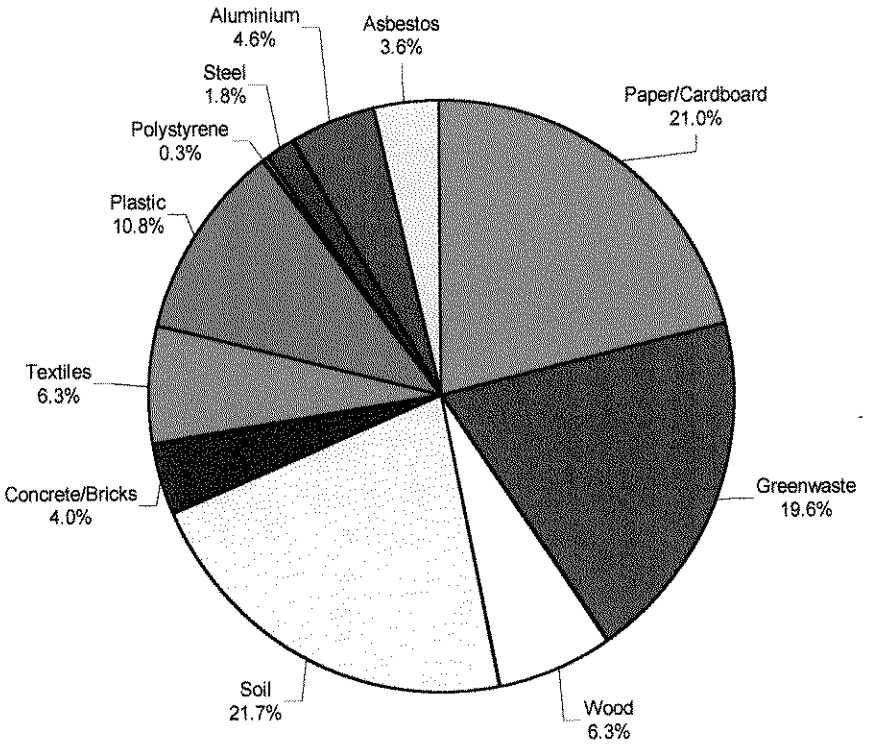

Figure 3-5. Average composition by weight of self-haul waste disposed of at Redhill Waste Disposal Facility

3.3 MRF Residue

With the assistance of the EMRC, Nolan-ITU has compiled the existing data of the Regions MRFs. This data has been supplied by member councils, and is not available in detailed composition, beyond two having a split between general contamination and glass fines.

Table 3-5. Annual MRF residue as reported by member councils (Year 01/02)

Council	Tonnage to MRF	General Contamination	Glass Fines	Total Residue (%)	Annual MRF residue (tonnage)
Bassendean	1,045	-	-	15.46%	162
Bayswater	4,172	-	-	30.00%	1,252
Belmont	2,859	-	-	30.00%	858
Kalamunda	4,116	-	-	33.08%	1,362
Mundaring	2,973	387	495	29.67%	882
Swan	3,059	523	352	28.60%	875
TOTAL	*18,224*				*5,391*

Assuming both the putrescible (general contamination) and inert (glass fines) waste is disposed of at Redhill Waste Management Facility, the MRF residue in the region amounts to just over 5,000 tonnes a year. Although not a significant amount compared to the total tonnages disposed of at Redhill annually, it would be a useful exercise to establish compositional data on the waste stream.

3.4 Review of existing waste data

Sourced through the EMRC and Nolan-ITUs network in Western Australia, a brief review of existing data was performed. The purpose of this review was to understand what current data on waste composition exists in the state, and what systems are in place for recording waste recovery and disposal.

The EMRC commercial waste supplier summary, relevant to the Redhill Waste Disposal Facility demonstrated a comprehensive recording system in place. Stemming from the account system, good data is held on traffic flow and the generic content of loads.

The Western Australian Local Government Association (WALGA) maintains good records on recovery and disposal of domestic solid waste at a generic level. Compositions of domestic solid waste are confined to individual councils. The Beverage Industry Environment Council (BIEC) conducted national waste audits during the 1990's. The last year of audits, 1997 show similar composition of the entire state to the results of the EMRC audit, with the exception of two materials. A quick summation suggests that the reduced component of paper/cardboard in the EMRC results compared to BIEC, have resulted in greenwaste becoming a more significant component in percentage terms.

Research and conversations indicate that the audit process undertaken by the EMRC on this occasion, is the most extensive of its nature in Western Australia to date.

4 CONCLUSIONS AND RECOMMENDATIONS

The key objective of this study was to provide waste composition data appropriate for use in the EMRC's upcoming Expression of Interest (EoI) for alternative waste treatment (aka, resource recovery). A review of existing EoI documents from other jurisdictions indicates that the data collected and reported here is of a similar and therefore suitable nature, with the exception of the MRF residue information.

In proceeding further with its EOI and then tender process for alternative waste treatment, there are several aspects related to waste composition data that the EMRC may wish to note. First, waste generation rates and composition profiles are subject to seasonal variation, both for domestic solid waste and commercially sourced waste. Consumer habits vary according to weather conditions, and industry activity is subject to seasonal cyclic fluctuations. It is recommended that a second series of audits be run in autumn or winter. This will enable a comparative study of composition on an annual basis, and provide more accurate data on materials being disposed of at the landfill.

A practice common in Europe, particularly in the early stages of considering alternative waste treatments (AWT), is to systematically record the moisture content of waste material. This is due to the fact that facility-input materials' moisture content can influence facility performance and efficacy. Typically a sample of major-component waste materials is separated from a large load, and placed in a drier for a 24hr period at low level temperature. The material is weighed before and after the drying process, yielding a result for the moisture content (primarily water) of the sampled material. Although not practiced in Australia, the measurement of waste moisture content will escalate in importance, as AWT becomes a more realistic consideration.

Appendix A

Domestic Solid Waste Sample Size Calculations

DOMESTIC SOLID WASTE SAMPLE SIZE CALCULATION

The validity which is a best estimate, was calculated using the following formula:

$$n = \left(\frac{1.96 * V}{\text{error margin}} \right)^2$$

Where: n = sample size

1.96 = 95% confidence interval

V = variation coefficent

Error margin = % error

Assuming N (the total population) is at least in the tens of thousands.

The following values were placed in the formula:

n = 600

V = 0.49 *(the average variation coefficient calculated from previous municipal solid waste audits in western societies is 0.31, however the range for specific material types can be higher or lower than 0.31. The figure of 0.49 is in the upper range and was selected to provide a more cautious/conservative result)*

Placing these two values into the formula, a value for the error margin was then calculated:

$$600 = \left(\frac{1.96 * 0.49}{\text{error margin}} \right)^2$$

$\therefore$ error margin = 0.039

Therefore, using a sample size of 600, and applying an industry calculated coefficient for this type of material auditing, a conservative estimate at 95% confidence of ± 3.9 percentage points is applicable.

Appendix B

Daily Collection Schedule and Audit Data Sheet

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DAILY COLLECTION SCHEDULES

DAY ONE: MONDAY 2ND DECEMBER 2002

Council	Street/Road	Ref	No of Bins
Swan	Illawara Cres	209 E9	31
Bassendean	Palmerston St	250 M7	5
Bayswater	Williamson St	249 Q16	23
Belmont	Fisher St	270 F12	13
Kalamunda	Worrell Ave	272 A5	17
Mundaring	Stoneville Rd	236 H8	11

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DAY TWO: TUESDAY 3RD DECEMBER 2002

Council	Street/Road	Ref	No of Bins
Swan	Brown St	232 M6	31
Bassendean	Colstoun Rd	250 J11	5
Bayswater	Copley St	249 N12	23
Belmont	Belmont Ave	270 B12	13
Kalamunda	Dawsen Ave	292 B9	17
Mundaring	Brooking Rd	235 G11	11

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DAY THREE: WEDNESDAY 4TH DECEMBER 2002

Council	Street/Road	Ref	No of Bins
Swan	Aveley Rd	172 D12	31
Bassendean	NO COLLECTION REQUIRED		
Bayswater	Shaftesbury Ave	249 J11	28
Belmont	Goodall St	270 M12	13
Kalamunda	Berry Drive	272 P12	17
Mundaring	Lionel Rd	254 D6	11

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DAY FOUR: THURSDAY 5TH DECEMBER 2002

Council	Street/Road	Ref	No of Bins
Swan	St Lawrence Drve	230 E5	31
Bassendean	Wicks St	250 G2	5
Bayswater	Byfleet St	229 N15	23
Belmont	Belgaria St	270 H12	13
Kalamunda	Snowball Rd	293 D3	17
Mundaring	Hartung St	256 D4	11

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DAY FIVE: FRIDAY 6TH DECEMBER 2002

Council	Street/Road	Ref	No of Bins
Swan	Cope St	232 J14	31
Bassendean	Littlemore Way	250 G1	5
Bayswater	Wonga Rd	229 J11	23
Belmont	Kanowna Ave	270 M4	13
Kalamunda	Kathleen Rd	313 H3	17
Mundaring	Seaborne St	235 K9	11

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DAY SIX: MONDAY 9TH DECEMBER 2002

Council	Street/Road	Ref	No of Bins
Swan	Southpoint Cres	209 E9	31
Bassendean	Palmerston St	250 M7	5
Bayswater	Milne St	249 Q16	23
Belmont	Fisher St	270 F12	13
Kalamunda	Cyril St	272 A5	17
Mundaring	Stoneville Rd	236 H8	11

AUDIT DATA SHEET

EMRC Waste Audits
Audit Data Sheet

Day..... Sheet No.....

	Category	Weight (kg)				Comments
	Cardboard					
	Newsprint					
	Magazines / Advertising					
	Paper - Other					
	LPB - septic / gabled					
	LPB - aseptic / brick					
	Aluminum Cans - CDL					
	Aluminium Cans - Non CDL					
	Aluminium Foil					
	Brown Glass - Bev CDL					
	Brown Glass - Bev Non CDL					
	Brown Glass - Non Bev					
	Clear Glass - Bev CDL					
	Clear Glass - Bev Non CDL					
	Clear Glass - Non Bev					
	Green Glass - Bev CDL					
	Green Glass - Bev Non CDL					
	Green Glass - Non Bev					
	Glass - Other					
	PET - Clear Bev CDL					
	PET - Clear Bev Non CDL					
	PET - Coloured Bev CDL					
	PET - Coloured Bev Non CDL					
	PET - Other					
	HDPE - 2 Litre Milk					
	HDPE - Other					
	Margarine Tubs					
	Plastic Film and Bags					
	LDPE					
	Polypropylene - rigid					
	Plastic - Other					
	Steel - Food Cans					
	Steel - Paint Cans					
	Steel - Aerosol Cans					
	Steel - Other Packaging					
	Steel - Other Non Packaging					
	TOTAL					

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EMRC Waste Audits

Day: ..... **Sheet No.** .....

	Category	Weight (kg)				Comments
	Lawn Clippings & Leaves					
	Prunings					
	Weeds					
	Food					
	Contaminated Paper					
	Polystyrene					
	Fluorescent Lights					
	Dry-Cell Batteries					
	Household Chemicals					
	Pharmaceuticals					
	Medical / Hygiene					
	Engine or Food Oil					
	Wood / Ceramics					
	Textile/Clothes/Leather/Rubber					
	Dust / Dirt / Rock / Ash					
	Disposable Nappies					
	Other / Miscellaneous					
	TOTAL					

Appendix C

Occupational Health and Safety Plan

Safety Induction Checklist

~~3.2~~1.1 Commercial and Self-Haul Waste

Although undertaken simultaneously, the results of the commercial and self-haul waste assessment are presented separately. The source of each load was identified by matching vehicle number plates against the daily print-out from the weighbridge which lists number plates and indicates the commercial nature of vehicles.

~~3.2.1~~1.1.1 *Commercial Assessment*

Figure **Error! No text of specified style in document.**-2 presents the results of the average composition of commercially collected waste being disposed of at the Redhill Waste Disposal Facility. The largest category of material is soil (37%), which is twice as large as greenwaste (17%), the second largest category of material. Depending on how mixed the material is when presented at the landfill, there is some opportunity for diversion, particularly in the greenwaste, food and paper/cardboard categories.
Beyond the data generated from the assessment, a number of observations were also made. These are presented below in Table **Error! No text of specified style in document.**-1.

Table Error! No text of specified style in document.**-1. Observations of commercially-collected waste**

Material	Comment
Green waste	It was noted that a number of trucks emptying at the landfill contained only green waste, and could have potentially been diverted from landfilling
Green waste	The oversize rejection of green waste is resulting in larger branches and limbs being landfilled

~~3.2.2~~1.1.2 *Self-Haul Assessment*

The typical composition of self-haul waste to the Redhill Waste Disposal Facility presented in Figure **Error! No text of specified style in document.**-3, is qualitatively different from the commercial collection material. The soil and food waste components are significantly smaller; there is a larger composition of paper/cardboard.

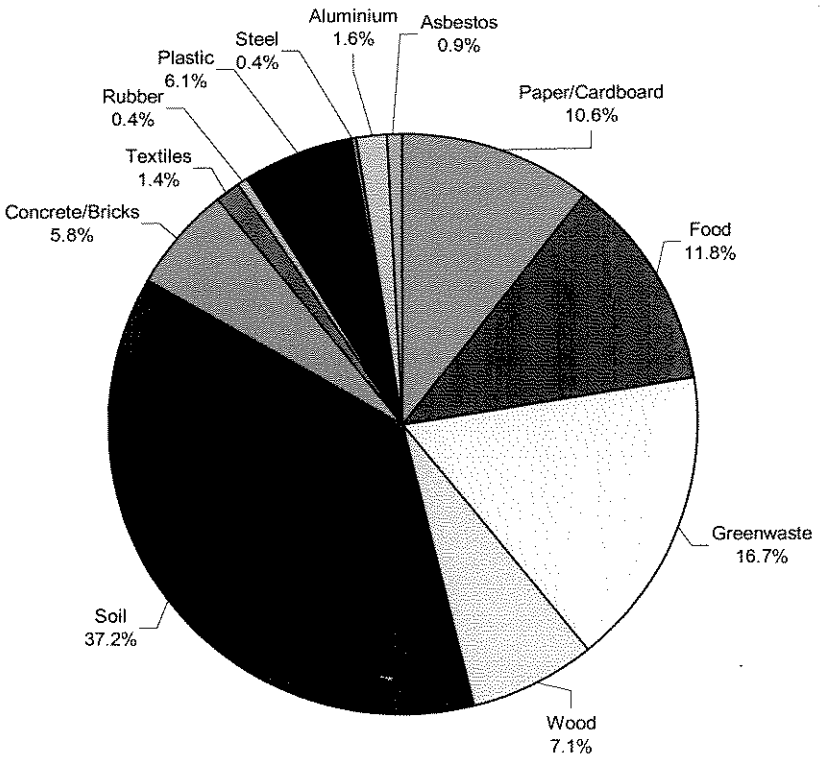

Figure Error! No text of specified style in document.**-2. Average composition by mass of commercially collected waste disposed of at Redhill Waste Disposal Facility**

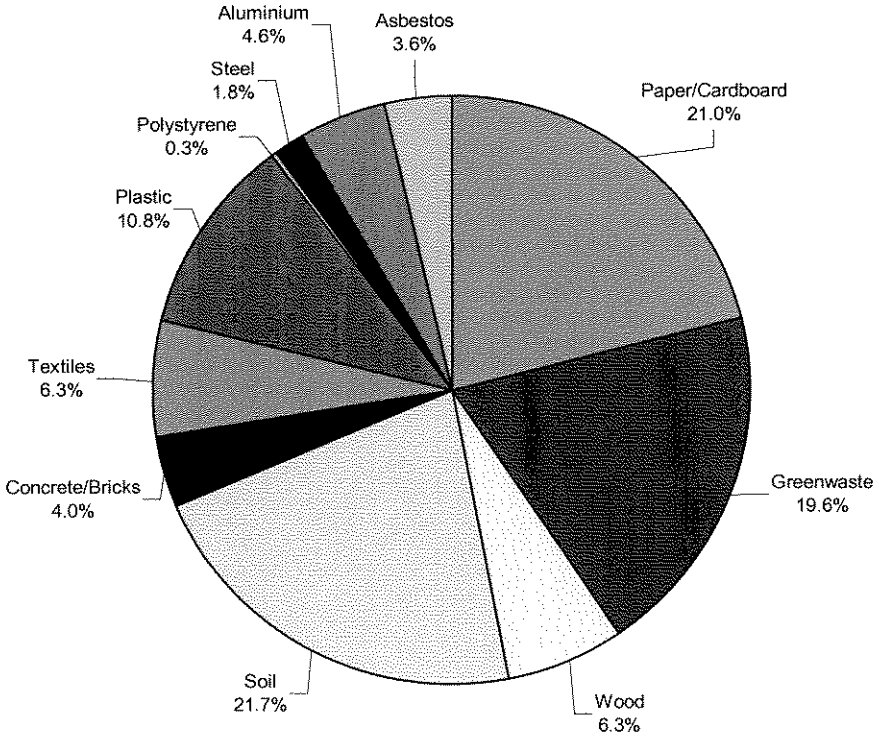

Figure Error! No text of specified style in document.**-3. Average composition by mass of self-haul waste disposed of at Redhill Waste Disposal Facility**

EMRC Auditing Program

Occupational Health and Safety Plan

November, 2002

Ref: 4092-02

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1 NOLAN-ITU OCCUPATIONAL HEALTH AND SAFETY POLICY

OCCUPATIONAL HEALTH & SAFETY POLICY

Nolan-ITU is committed to achieving the highest standards and performance in Occupational Health and Safety. In doing so, the company aims to create and maintain a healthy and safe working environment for all employees, clients and the community, whilst paying proper regard to environment protection.

Responsibility for the development and implementation of this policy rests jointly with management and employees, and as such, co-operation at all levels of the organisation is critical for the success of the plan.

Responsibility rests with management to:

- Apply a risk management approach to the systematic introduction of the OH&S Policy.
- Promote and maintain a healthy and safe working environment by commitment and financial support for the OH&S Policy.
- Promote an environment that will allow the development of OH&S objectives through mutual agreement.
- Actively support OH&S Legislation, Australian Standards and Codes of Practice.
- Ensure all employees are informed, instructed and trained in established safe working conditions and legal obligations, both on and off the job.
- Actively pursue advice and knowledge enabling the ongoing review of safe working conditions and implementation of changes as necessary.

Responsibility rests with employees to:

- Support Nolan-ITU management in its efforts to achieve OH&S and rehabilitation objectives by full participation in these programs.
- Notify management of all unsafe conditions, practices or hazards.
- Promptly report all injuries as soon as possible.
- Correctly use approved personal equipment appropriate to the hazard.

March 2002

Managing Director

2 PERSONNEL RESPONSIBILITIES

2.1 Safety Officer – Simon Kelley

The designated Safety Officer has the responsibility of leading all safety aspects of the auditing program. Specifically, the Safety Officer has the following duties:

- Identify the potential hazards that may be faced by auditors during the project, both during waste collection processes and during the waste/recyclables audit program.
- In consultation with employees, identify hazard avoidance and management strategies to be employed during this project.
- Identify all activities that may require the use of personal protective equipment, and ensure that this equipment is available for all appropriate personnel, and that each person is trained in the correct use and maintenance of this equipment.
- Ensure hazard avoidance/management strategies and correct use of personal protective equipment are adhered to by all employees.
- Monitor and oversee work practices and technical procedures to assure that exposure or potential exposure to hazards is minimised and that supervisors and employees exercise care and sound practices.
- Maintain documentation of Occupational Health and Safety training.

The Safety Officer has the authority to act in the name of Nolan-ITU Pty Ltd for matters concerning occupational health, environmental health and safety.

2.2 Audit Team Leaders – Naomi Douglas and Simon Kelley

The Audit Team Leaders have the direct responsibility of supervising the audit team. This includes maintaining safe work practices, and continuous monitoring of work conditions.

- Monitoring of ambient air temperature;
- Managing emergency medical incidents;
- Leading emergency evacuation;
- Provide guidance to employees in the development and maintenance of safe work practices;
- Monitor ambient conditions for the waste audit site and for the areas where samples will be collected;
- Institute corrective actions to eliminate unsafe conditions;

- Formally report all incidents involving injury and near misses; forwarding information obtained to the Safety Officer who in term will forward this information to the client and ;
- Issue PPE to employees who require it and ensure appropriate use; and
- Perform routine inspections of safety practices.

Audit Team Leaders will each carrying a mobile phone to ensure communication at all times.

2.3 Landfill Site Auditor – Emma Young

The Landfill Site Auditor will have responsibility to comply with all aspects of the Redhill Landfill OH&S requirements. The site requirements will be addressed prior to the site visit, and once on site, the Landfill Site Auditor will undertake the relevant site induction.

2.4 Responsibility of all personnel

- Report all unsafe conditions and/or observed procedures to the Audit Team Leader, or to the Safety Officer immediately these are recognised.
- Follow the approved work instructions and methodology for safe handling;
- Behave in a manner that promotes safety for themselves and others;
- Report all incidents injuries and/or near misses to the Audit Team Leader;
- Participate in all required Occupational Health and Safety Training;
- Wear approved safety equipment as instructed by the Audit Team Leader;
- Use Personal Protective Equipment (PPE) in a correct manner as instructed;

3 MEDICAL MONITORING AND VACCINATIONS

Nolan-ITU Pty Ltd to the best of their abilities, will ensure that all staff directly employed for this project will be medically fit to perform any duties requested and that these duties will not aggravate any existing conditions. The Safety Officer in consultation with Project Managers and individual staff members will discuss any issues that may impact on the physical well-being of the staff member should any issues be identified.

3.1 Medical monitoring

All personnel who will be employed during this project 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.

3.2 Confidentiality

The confidentiality of any records and reports provided and/or medical treatment will be maintained by the Safety Officer. At no times shall 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.

3.3 Vaccinations

All employees undertaking physical auditing will be recommended to have sufficient immunity levels for Hepatitis A and B and Tetanus. This recommendation is in line with the WA Consumer and Employment Protection Guidelines.

4 TRAINING AND GENERAL PRECAUTIONS

The key to maintaining appropriate Occupational Health and Safety for the duration of the project is in the training of all personnel.

All auditors will have access to adequate quantities of the appropriate Personnel Protective Equipment (PPE) throughout the project. Each auditor will be responsible for ensuring that their supplies are adequate for their requirements.

Auditors will have access to water and toilet facilities. Where shading is not available, auditors will ensure other measures are followed to protect against the elements, these will include:

- regular consumption of water to prevent dehydration;
- wearing of broad brim hats and long sleeved shirts to prevent sun burn; and
- wearing and regular application of sun screen.

4.1 Training

All direct employees and Audit Team Leaders participating will be required to undertake specific training in occupational health and safety aspects. This training will be conducted during the initial orientation program on day one.

Issues covered in the initial orientation include:

- Introduction and explanation to the hazards associated with the project;
- Equipment used on the waste audit site;
- Traffic and vehicle hazards;
- Materials deposited into waste containers (eg., chemicals);
- Routes of exposure to chemical and other hazards;
- Consequences of exposure;
- Correct use and care of Personnel Protective Equipment;
- Waste audit site specific requirements (eg., specific waste types, equipment used on-site, native fauna);
- Emergency response protocol; and
- Basic fist-aid procedures.

Contract staff will be required to attend a briefing by the Audit Team Leader each day. This briefing will cover the issues listed in the Safety Induction Checklists (attached in Appendix A). They will then sign the sheet to record that they have attended the briefing and are aware of each specific requirement. During this briefing the Audit Team Leaders will ensure that all safety protocols have been fully explained including the contractors responsibilities (as outlined above); the correct use of PPE; and reporting requirements in case of accidents or near misses. Specific site and job hazards will be fully explained.

4.2 Site Conditions

It will be the responsibility of each Audit Team Leader to monitor the ambient conditions (eg., air quality, temperature, humidity) prior to commencement of the working day and at regular times during the day. Appropriate changes to auditing and sample collection procedures will be made should the ambient conditions necessitate change to ensure the health and safety of all staff.

4.3 General Precautions

All staff will be issued with PPE (eg., safety vests, face masks; safety glasses and sunscreen). It is the responsibility of individuals for the supply of appropriate footwear and sunhat.

6. FIRST-AID PRECAUTIONS

The waste audit site will have a first-aid kit and all staff will be provided with appropriate training during the initial orientation to manage minor incidents.

All auditors and Audit Team Leaders will be provided with contact numbers of local medical practitioners, hospital and ambulance service in the advent of a serious incident. The Safety Officer will be contactable by all Audit Team Leaders in order to provide prompt responses to any incident.

5 RISK MATRIX

A risk matrix has been developed for the waste audit process and the sample collection procedures.

5.1 Hazard Identification

The ranking system used for this risk matrix is as follows:

Severity Ranking 1	Likelihood Ranking
1 – Death or disability	1 – Very likely to occur
2 – Long term medical treatment	2 – Likely to occur
3 – Medical attention	3 – Unlikely to occur
4 – First aid required	4 – Very unlikely to occur

Hazard	Severity Ranking	Likelihood Ranking	Overall Ranking
Skin puncture due to contact with sharp object	2	1	3
Odorous materials	4	1	4
Illness due to contact with bacterial/infectious substances	2	4	8
Muscle injury from lifting waste	3	2	6
Skin burn due to contact with chemicals	3	2	6
Eye injury due to dust/chemical contact	3	3	9
Breathing difficulties due to dust	3	4	12
Dehydration	4	4	16
Fatigue from auditing	4	4	16
Sun/wind burn due to exposure to elements	4	4	16
Hit by vehicle (on-site/during collection)	1	3	3

5.2 Risk Management Strategies

Risk	Management Strategy
Skin puncture due to contact with sharp object	• Auditors will be advised that no physical handling of waste is to occur auditors will use tongs. • Collection and site staff advised of correct handling of waste and bags to avoid contact with body. • Auditors will wear covered safety shoes; gloves; long sleeve shirts and long pants to minimize any accidental contact. • First aid kits will be provided in case of accident
Odorous materials	• Audit sites will be located in areas where there is adequate ventilation. • Auditors will be issued with facemask. • The Audit Team Leader (as well as individual auditors), will monitor staff reactions during the audit when odorous samples are present to determine if any auditor requires a

Risk	Management Strategy
	break.
Illness due to contact with bacterial/infectious substances	• Auditors will wear face mask and gloves. • Auditors will be advised of correct hygiene practices – water and soap will be provided for cleaning. • Auditors will be advised to wash up at each break and at end of day. • Auditors will wear coveralls. They will also be advised to wash their clothes separately.
Muscle injury from lifting waste	• All auditors will be trained in safe lifting techniques. • All auditors will be required to "test" each load prior to lifting to determine if assistance is required. • Auditors tasks will be rotated so that lifting tasks are shared.
Skin burn due to contact with chemicals	• Auditors are advised not to handle any waste or container brought onto the audit site. • Auditors will be advised to stand clear of any vehicle/person emptying a waste/recyclables container due to risk of splashes. Auditors will wear full clothing to ensure minimal skin is exposed. • Water and first aid kit will be available on each site.
Eye injury due to dust/chemical contact	• Auditors will wear safety glasses on site at all times.
Breathing difficulties due to dust	• Auditors will be provided with facemasks.
Dehydration	• All auditors will have a water flask that must be full and taken to the site each day. • Auditors will be made aware of this risk and the signs associated with early warning.
Fatigue from auditing	• Regular breaks will be scheduled during the audit processes. • Staff will be encouraged to report to the Audit Team Leader if they are feeling fatigued and be allowed to take breaks. • Adequate food and water will be provided for auditors to

Risk	Management Strategy
	have during breaks.
Sun/wind burn due to exposure to elements	• Auditors will be required to wear broad brimmed hats if working outdoors; • Sunscreen will be provided and required to be worn and regularly re-applied during the day if working outdoors • Auditors will be made aware of the risk and advised to monitor site conditions.
Hit by Vehicle	• The audit site will be clearly defined • Auditors will be given a site specific induction advising of presence of traffic and hazards. • No-go areas will be defined. • The Audit Team Leader will be aware of this risk.

6 SAFETY INDUCTION CHECKLIST – AUDITOR

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, facemasks 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 personal protective equipment 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.
- If the audit is conducted in the open, wear a sunhat and apply sunscreen on a regular basis.

ALL information observed or made known to you during the audit process is to be treated as confidential. No discussion or communication of any kind is to be held with parties outside the project team in relation to anything observed or made known to you during the audit process.

I have read the procedures described 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: _____