COMPOSITION OF WASTE

Swap Study Hokitika Landfill
9 – 15 February 2004

PREPARED FOR:
Westland District Council

PREPARED BY:
John Larcombe
JBL Environmental
BLENHEIM
July 2004

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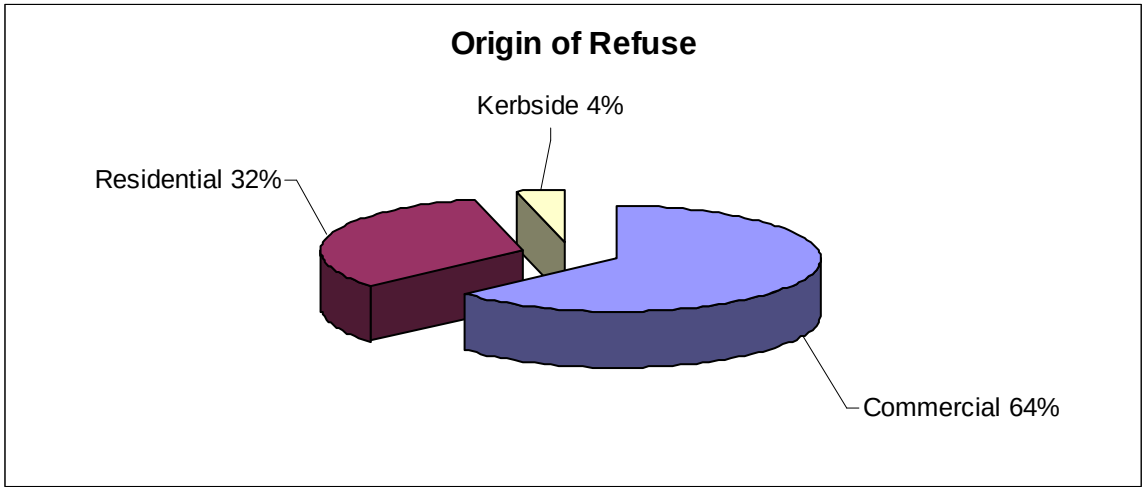
1.0 EXECUTIVE SUMMARY

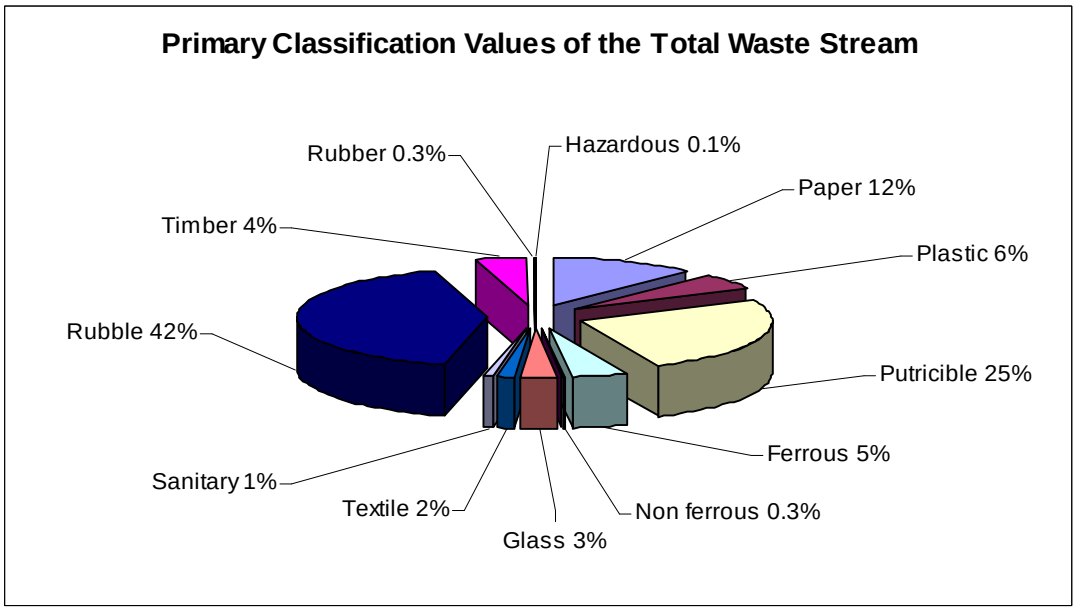
A waste analysis study, to determine the components of the refuse waste stream, was carried out at the Hokitika landfill between the 9th and 15th of January 2004.
This study uses the Ministry for the Environment's Solid Waste Analysis Protocol (SWAP) for determining the mix of refuse into twelve primary classifications. This protocol is designed to present information to assist with the management and monitoring of waste streams. The information also provides a base for any future studies and allows comparison with similar surveys from around New Zealand.
This study looks at the mix of refuse, the origin of refuse and the transport methods, as well as the opportunities for recycling, as these factors can be influential in how the waste is managed in the future.
The origin of refuse is shown in chart 1.

Chart 1 : Origin of Refuse



This study was conducted during the summer season, to gauge seasonal fluctuations, and at a time when tourist activity would have its greatest influence on the waste stream. Over time such influences can be tracked allowing for better design and understanding for future requirements.
The aim of the study was to determine, under these influences, the mix of refuse by primary classification and the values obtained for the total waste stream as shown in Chart 2.

Chart 2 : Primary Classification Values of the Total Waste Stream



The Hokitika landfill is a small facility which, during the survey period, received a total of 412 vehicles disposing of 124 tonne of refuse. At this rate the disposal equates to just over 6,400 tonne per year. Caution is expressed in the use of this value as the results of the survey are representative of the survey period only.

To gain the necessary information most loads were weighed on entry to the landfill and the proportion of each classification component calculated. Along with this the contents of a number of refuse bags were analysed to determine the mix ratio, and the proportion of material separated for recycling was recorded.

Recycling of cardboard, certain plastics, steel and glass occurs at the site. Although this is patronized by local residents and also by commercial operators, much recycling material is lost in unsorted loads. The success of recycling, especially for commercial operators, can be enhanced by the sorting of material at source prior to disposal.

The accuracy of the results is determined by the frequency of material requiring disposal.

Material received on a regular basis gives a good indication of the total mix whereas less frequently received materials can drastically sway results in a one off short term survey. For example, a car body either in or out of the survey would dramatically alter the value of ferrous material.

These inaccuracies can be lessened by more frequent surveys or inclusion of supporting data.

Moisture content can affect the results. The period of the survey received rain on one day. It appeared to have only a small effect on weight.

The processing of recyclables, paper and cardboard especially, was limited to the storage available and the capacity of the press. Some loads of cardboard were discarded due to these factors.

In line with the Governments aims for waste reduction to landfill, several waste streams clearly stand out as being suitable for reduction programmes.

Greenwaste is separated for shredding and timber stockpiled for burning.

With national strategies in place to stop burning at landfills, alternatives could be looked at for disposing of timber wastes. For example the Ashburton District Council shreds selected timber and plaster board wastes for inclusion in the compost mix.

Further recovery of cardboard and paper is an option, especially as stable markets are already established and recovery can be cost effective.

Light gauge steel including, car bodies, should continue to be stockpiled for recovery.

The cost of recovery / recycling is dominated by transport costs of raw materials to markets. This is a problem throughout New Zealand and, in line with government policy on user pays, some means of cost recovery should be considered.

Green waste, which accounts for 20% of the total waste stream, made up 80% of the putrescible classification and was recorded as a separate item owing to the large quantities received. Green waste is a target item for waste reduction to landfills as it can be commercially processed into compost or other soil enhancing product. Current efforts capture most of this material.

2.0 INTRODUCTION

This report presents the results of a waste analysis survey on the composition of the refuse stream recorded at the Hokitika landfill.
Such surveys, when undertaken over a period of time, can build up a reliable data record on the quantity and type of material being disposed to landfill. The results may become a tool for measuring the changes to waste disposal and for gauging the effects of various waste strategies.
The survey results can also be a tool to assist with the constructive planning and management of the district's waste.
The timing of this survey, 9th to 15th February 2004, was set to record the main summer seasonal waste stream. It also falls in the main tourist season when demand on waste facilities is at the greatest.

2.1 Background

Traditionally, rubbish has been dumped and forgotten.
However, growing awareness of environmental effects has increased the expectations of communities for enhanced standards of waste disposal. As a result parties responsible for waste management have come under pressure to respond to waste issues. But to enable effective decisions to be made, consistent and reliable data is required.
Therefore, in response to the need of operators and managers, and the need for information on a national basis, the Ministry for the Environment in 1992 released a strategy for measuring the components of the waste stream. This strategy was known as the "Waste Analysis Protocol" (WAP) which contained a methodology for categorising and collecting data on waste.
The strategy was revised in March 2002 and is now know as the "Solid Waste Analysis Protocol" (SWAP).
It is under the revised protocol that this survey has been conducted.

2.2 Waste Classification System

The SWAP protocol provides for two methods of classification, these being:-

Primary Classification
Secondary Classification

The purpose of the two classification systems is to allow quick coverage of the full waste stream and also detailed analysis of any particular component or source of waste.
Primary classification divides the waste into 12 categories with secondary classification further dividing these categories into a total of 47 sub categories.
Secondary classification requires considerable time for detailed analysis and is used more for the analysis of a particular component in the waste stream such as investigating a material for recycling.
This survey is based on primary classification analysis.

2.3 Objectives

The objective of this survey is to gauge the primary classification by weight of the waste stream during the summer seasonal influence which coincides with the peak tourist influence on the area.

2.4 The New Zealand Waste Strategy

Reducing New Zealand's waste has become a cornerstone of the Government's commitment to sustainable development.
The Ministry for the Environment released The New Zealand Waste Strategy in March 2002. This document outlines the Government's vision to minimize and manage waste resources as part of an overall goal to form a sustainable society. To achieve the waste reduction aim the New Zealand Waste Strategy has three core goals:

- lowering the social cost and risks of waste
- reducing the damage to the environment from waste generation and disposal
- increasing economic benefit by more efficient use of materials

Through the Ministry for the Environment waste programmes and guidelines, national targets will be set for regions to achieve. Target areas include organic wastes, special wastes, construction and demolition wastes, hazardous wastes, including contaminated sites, organochlorines and trade wastes, and lastly waste disposal.
The results from SWAP studies are one tool that can be used to measure both the performance of a region and the government's achievement towards a sustainable society. On a local level it provides Council with a planning tool and also a measure to chart progress towards its zero waste goal.

2.5 Previous Survey

Two earlier surveys have been carried out on the Hokitika landfill waste stream.
The first was in November 2000, by R. Cotton and R. Weaver, and the second in December 2001 by T. Allan and R. Scott.
Both used the WAP strategy.
The findings of these surveys are compared with the current results in section 5 of this report.

3.0 SURVEY DESIGN and METHODOLOGY

3.1 Design

The survey design is based on the Solid Waste Analysis Protocol (MfE 2002)
In line with the protocol recommendations the data was captured over a one week period during which the landfill was open for each of the seven days. Owing to the relatively low number of vehicle movements during the survey most loads were measured by weight, either by use of vehicle scales or by individual weighing of product disposed.
From the kerbside collection, which occurs every Wednesday, 58 bags were selected at random and the contents sorted into primary classifications and weighed.
The mean values were then applied in the final calculation of classification weights for all loads of kerbside bags.
As the type of transport to the disposal site is relevant, the survey included the capture of data on the mode of transport for all loads.
Vehicles were divided into four categories. These were:-

Trucks
Cars - including station wagons and SUVs
Utility vehicles - including vans
Trailers

The origin of refuse was recorded as one of three categories

Residential	Domestic household and property type wastes produced by residents.
Commercial	Includes wastes from commercial operations, building sites, shops factories, accommodation and commercial operators.
Kerbside	Domestic and commercial wastes collected through a kerbside bag system.

3.2 Survey Limitations

Several factors limit the accuracy and use of the final results.
Discussion with local operators indicated there was no unusual event or occurrence that influenced the survey period from what could be termed “normal” for that time of year. There are a few known factors and some minor occurrences observed by the survey team that require noting.
Firstly the results of the survey are indicative of the survey period only. With caution they can be interpreted for a wider period, however to gauge values for an annual basis further information is required such as seasonal and tourist influences. Only by constant monitoring or further seasonal surveys can an accurate picture be created.
Items such as car bodies were noted at the landfill however no such large or heavy items required disposal during the survey. The intermittent disposal of such items will influence the accuracy of the results.

3.3 Methodology

The survey was predetermined for and carried out over the week of 9th to 15th February 2004 on site at the Hokitika landfill.
Survey forms capturing the required data were developed and used to ensure sufficient information was recorded on site.
On site a weigh station was established close to the entry of the site and from this area information on all loads was recorded and, where necessary, vehicles weighed. Recycling facilities close to the recording station were monitored from this position and, as necessary, individual components of recycling material were weighed.
This set up offered a safe working environment.

To one side of the tip face a table and slab for weighing on were established from where the analysis of bags and other refuse was carried out.
Some loads, especially those in enclosed vehicles, were analysed once deposited at the tip face. The landfill operator worked with the survey staff to allow analysis before the material was pushed over the face.
Loads were evaluated as soon as possible after being discharged so to avoid contamination or covering by other loads.
Two staff were involved on site at all times.
A hazards assessment was carried out prior to the event and this, along with general health and safety issues, was discussed with staff on site.
Origin of refuse was recorded as given by the driver.
Samples were removed from loads and analysed on the same day.

4.0 RESULTS

4.1 Origin of Refuse

For this survey the origin of the waste stream has been recorded into three categories, Commercial, Residential and Kerb Collection. This information was obtained from the drivers as vehicles were weighed or entered the landfill.
These categories allow a better understanding on the production of waste and, through further studies, will show trends and influences affecting each waste source.
There are some marginal areas where the boundaries are grey between residential and commercial sources in particular with property maintenance. Where the material is generated by a commercial activity such as contract lawn maintenance then the material was classified as commercial. Refuse produced by residential property owners who then used a commercial vehicle for transporting the waste was deemed residential.
The origin was not influenced by the mode of transport to the landfill. Transport is discussed in section 4.3.

Chart 3 : Waste Stream - Origin of Refuse

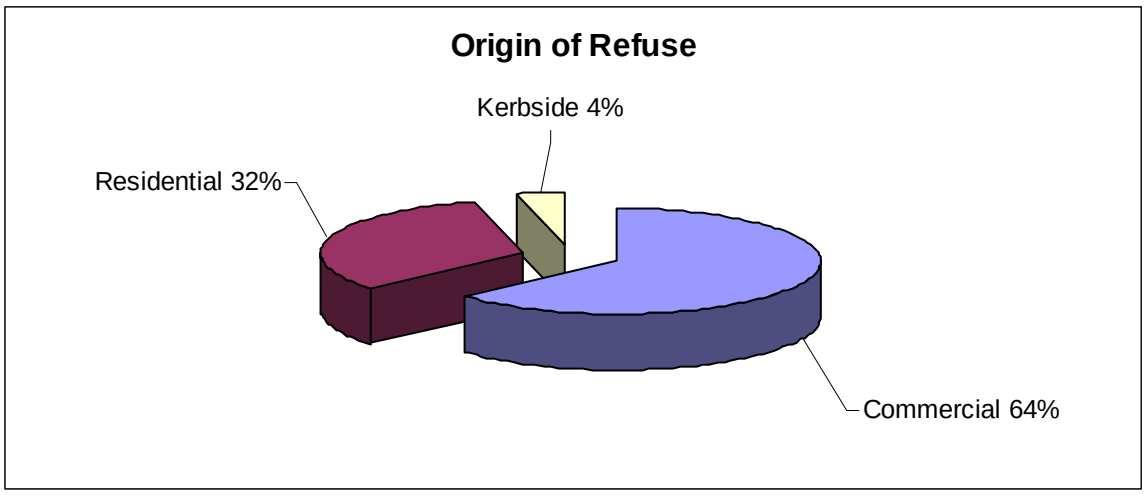


Table 1 :Origin of Refuse – Numerical Values

Origin	Weight kgs	Percentage
Commercial	78,769.00	63.67
Residential	40,263.76	32.55
Kerb Collection	4,680.00	3.78
Total	**123,712.76**	**100.00**

4.2 Primary Classification of the Waste Stream

Primary Classification involves defining waste into twelve categories. For this survey the Primary Classification results are shown both for the total waste stream and also for each of the three origins of refuse.
The classification values are likely to vary greatly between the three origins of waste and the understanding of these values will greatly assist with the targeting of waste recovery or waste minimization programmes.

4.2.1 Primary Classification of the Total Waste Stream

A Summary of the Primary Classifications of the total waste stream, for the period of the survey, is shown below in Chart 3 and Table 2
There are limitations to the accuracy of these values as discussed elsewhere in this report.

Chart 4: Primary Classification Values of the Total Waste Stream

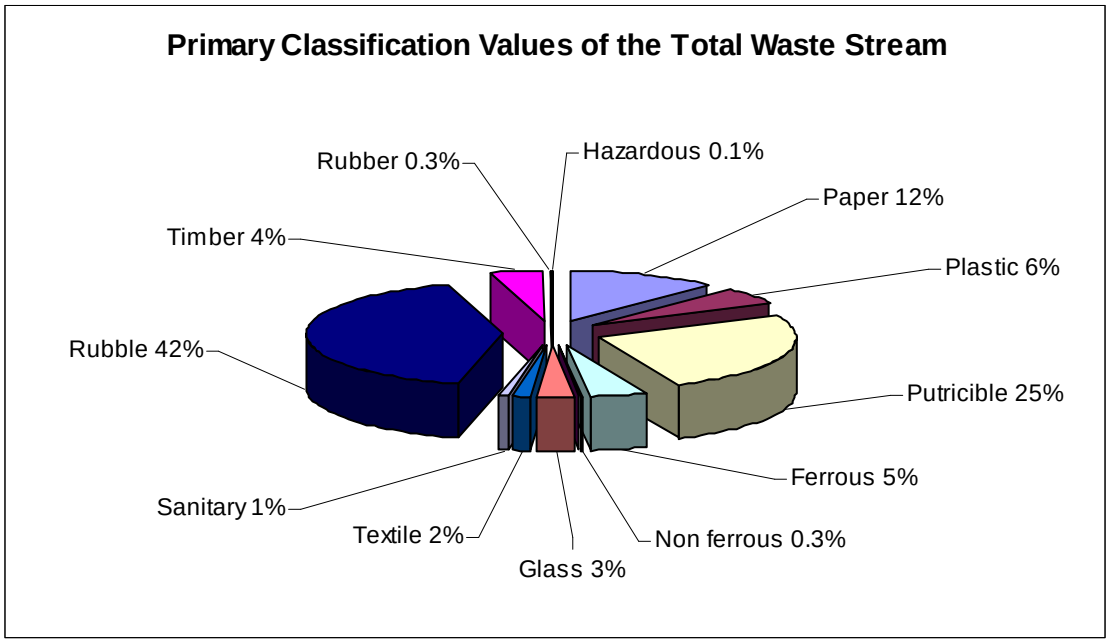


Table 2 : Total Waste Stream Analysis - Primary Classification Values

Classification	Total kgs	% Total
Paper	15,107.70	12.21
Plastic	6,989.00	5.65
Putrescible	31,523.30	25.48
Ferrous	5,724.50	4.63
Non Ferrous	408.46	0.33
Glass	3,673.10	2.97
Textile	1,936.90	1.57
Sanitary	1,069.60	0.86
Rubble	51,943.20	41.99
Timber	4,828.95	3.90
Rubber	422.05	0.34
Hazardous	86.00	0.07
Total	**123,712.76**	

4.2.2 Primary Classifications of the Commercial Waste Stream

The commercial waste stream is defined as waste generated by commercial operations no matter where these operations are situated.
The primary classification values of commercial waste are shown in Chart 5 and Table 3

Chart 5: Primary Classification Values of Refuse from Commercial Origin

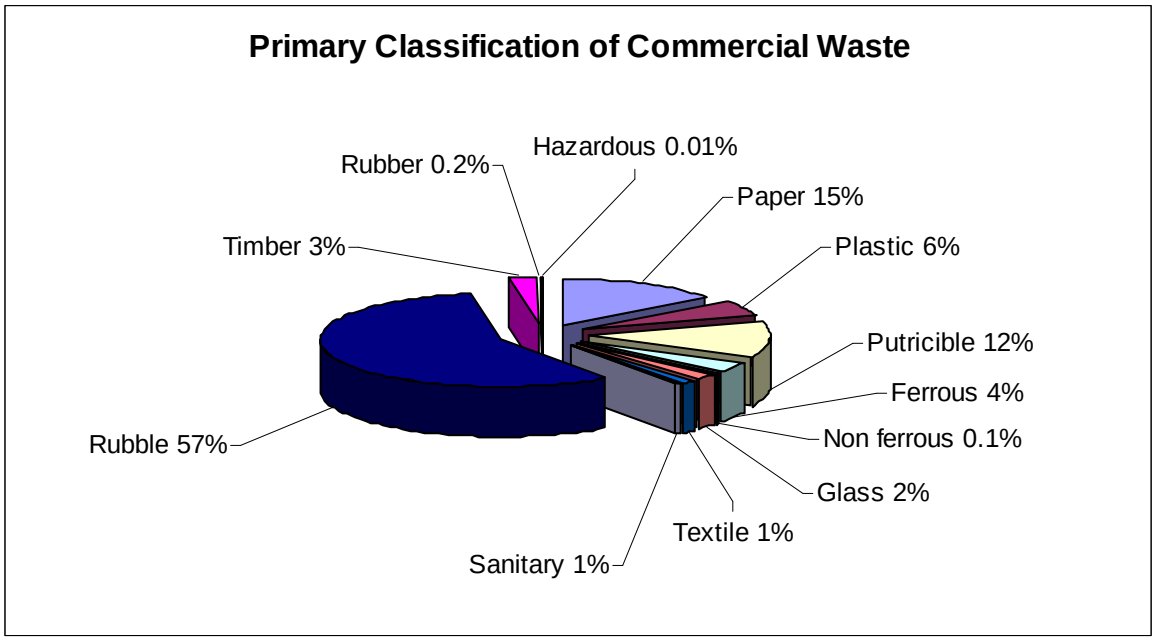


Table 3: Primary Classification Values of Refuse from Commercial Origin

Classification	Total kgs	% Commercial	% Total Waste
Paper	11,473.20	14.57	9.27
Plastic	4,712.80	5.98	3.81
Putrescible	9,362.40	11.89	7.57
Ferrous	2,578.70	3.27	2.08
Non Ferrous	108	0.14	0.09
Glass	1,683.70	2.14	1.36
Textile	1,030.30	1.31	0.83
Sanitary	539.90	0.69	0.44
Rubble	45,141.70	57.31	36.49
Timber	1,985.30	2.52	1.60
Rubber	149	0.19	0.12
Hazardous	4	0.01	0.00
Total	**78,769.00**	**100.00**	**63.67**

4.2.3 Primary Classifications of the Residential Waste Stream

The primary classifications for residential waste are presented in Chart 6 and Table 4 below. Whereas the chart depicts the classification as a percentage of the residential waste stream Table 5 presents the values for each classification as both a percentage of the residential waste stream and also of the total waste stream.

Chart 6: Primary Classification Values of Refuse from Residential Origin

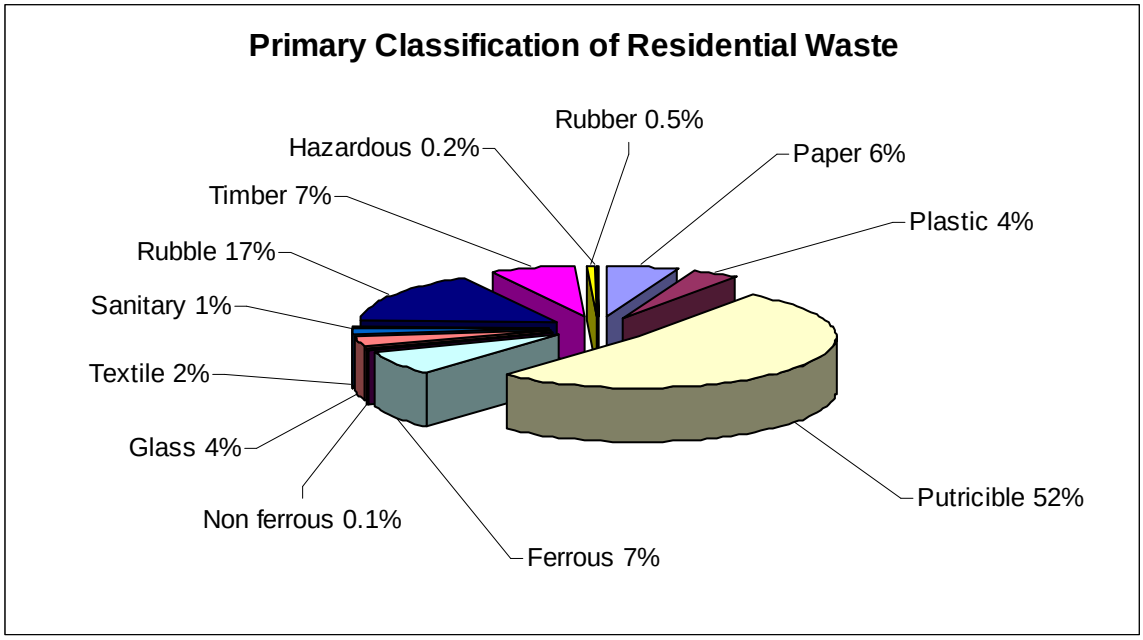


Table 4: Primary Classification Values of Refuse from Residential Origin

Classification	Total kgs	% Residential	% Total Waste
Paper	2556.50	5.85	1.90
Plastic	1524.20	3.79	1.23
Putrescible	20996.9	52.15	16.97
Ferrous	2995.8	7.44	2.42
Non Ferrous	254.46	0.63	0.21
Glass	1409.4	3.50	1.14
Textile	640.6	1.59	0.52
Sanitary	294.7	0.73	0.24
Rubble	6676.5	16.58	5.40
Timber	2827.65	7.02	2.29
Rubber	205.05	0.51	0.17
Hazardous	82.00	0.20	0.07
Total	**40263.76**	**100.00**	**32.55**

4.2.4 Primary Classification of the Kerb Collection Waste Stream.

The kerbside collection is carried out once a week and covers the Hokitika residential and commercial areas. The collection during the survey period weighed 4680kg. This equates to 3.8 % of the total waste stream.
Where visual classification is quickly carried out on open refuse, refuse bags pose a problem and, in particular, bags from residential origin as the contents can vary greatly, both in type and quantity.
The design of the survey took this issue into account and allowed the analysis of contents from sufficient refuse bags to give an acceptable confidence level on the major classification values.
The analysis of refuse bag contents was carried out using the SWAP Primary Classification procedure. A summary of the classification values is given in Chart 7 and Table 5 below.
A summary of individual samples is attached in Appendix 2.

Chart 7: Primary Classification Values of Refuse from Kerb Collection Origin

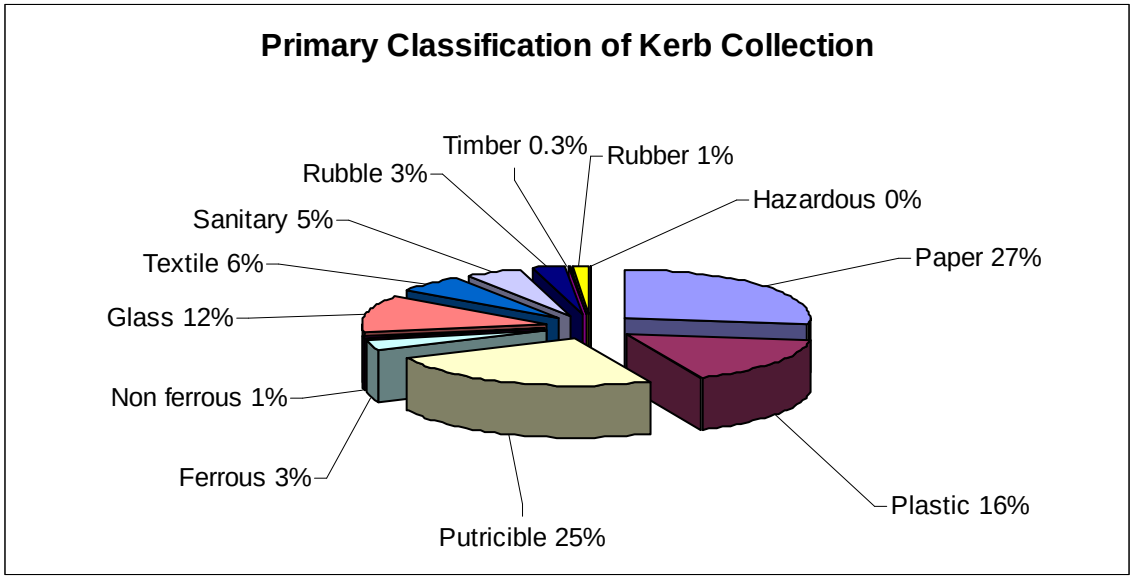


Table 5: Primary Classification Values of Refuse from Kerb Collection Origin

Classification	Total kgs	% Street	% Total Waste
Paper	1278	37.31	1.03
Plastic	752	16.07	0.61
Putrescible	1164	24.87	0.94
Ferrous	150	3.21	0.12
Non Ferrous	46	0.98	0.04
Glass	580	12.39	0.47
Textile	266	5.68	0.22
Sanitary	235	5.02	0.19
Rubble	125	2.67	0.10
Timber	16	0.34	0.01
Rubber	68	1.45	0.05
Hazardous	0	0	0
Total	**4680**	**100.00**	**3.78**

A summary of the classification values is given in Ttable 6 below.

Table 6 : Summary of Primary Classification Values of the Waste Stream (by weight in Kgs)

Classification	Commercial	Residential	Kerb Collection	Total	% Total
Paper	11,473.20	2,356.50	1,278	15,107.70	12.21
Plastic	4,712.80	1,524.20	752	6,989.00	5.65
Putrescible	9,362.40	20,996.90	1,164	31,523.30	25.48
Ferrous	2,578.70	2,995.80	150	5,724.50	4.63
Non Ferrous	108.00	254.46	46	408.46	0.33
Glass	1,683.70	1,409.40	580	3,673.10	2.97
Textile	1,030.30	640.60	266	1,936.90	1.57
Sanitary	539.90	294.70	235	1,069.60	0.86
Rubble	45,141.70	6,676.50	125	51,943.20	41.99
Timber	1,985.30	2,827.65	16	4,828.95	3.90
Rubber	149.00	205.05	68	422.05	0.34
Hazardous	4.00	82.00	0	86.00	0.07
Total	**78,769.00**	**40,263.76**	**4,680**	**123,712.76**	**100.00**

4.3 Transport of Refuse

A total of 412 vehicles transported refuse into the landfill during the survey. These were both commercial and private vehicles. Whereas the survey recorded the origin of loads and category of vehicle, from which the commercial and residential values can be determined, the thrust of the transport information has been the determination on the type and configuration of vehicles. This information is more likely to be required for future development and access issues. By monitoring the changes in the four categories of vehicle type the success and efficiencies in changes to the refuse services can be determined.
The following determination was used.
Cars – includes station wagons, and SUVs.
Trailers – all recorded were of light construction, towed by a variety of vehicles.
Trucks – varied from small four wheel to large eight wheel configuration.
Utility – included light vans.

Charts 8 and 9 show the values for weight and numbers by vehicle category. Table 7 presents a summary of the numerical values.
Chart 10 and Table 8 show vehicle numbers by category for each day of the survey.

Chart 8: Refuse Weight by Transport Category

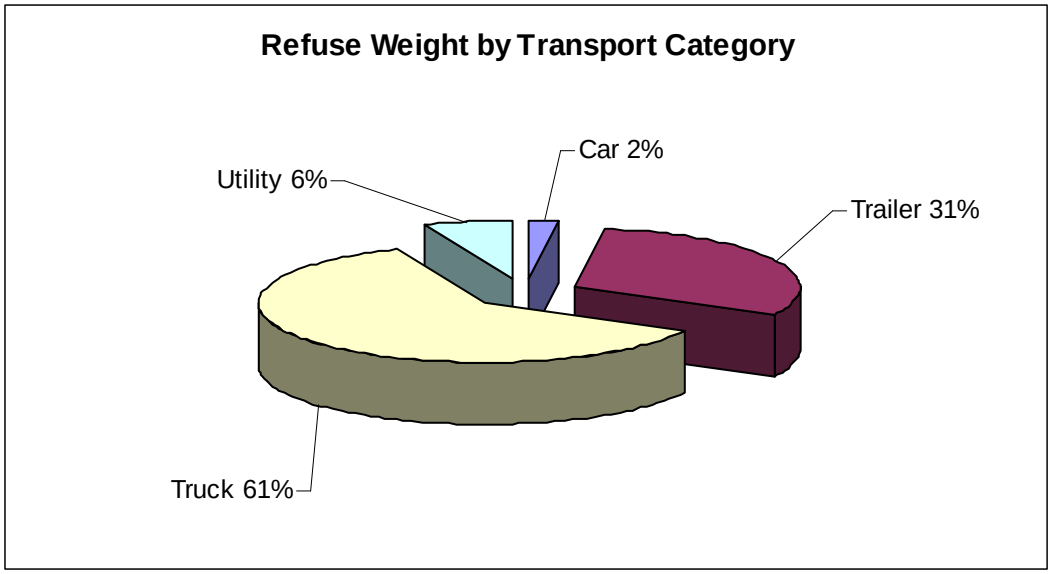


Chart 9: Vehicle Numbers by Transport Category

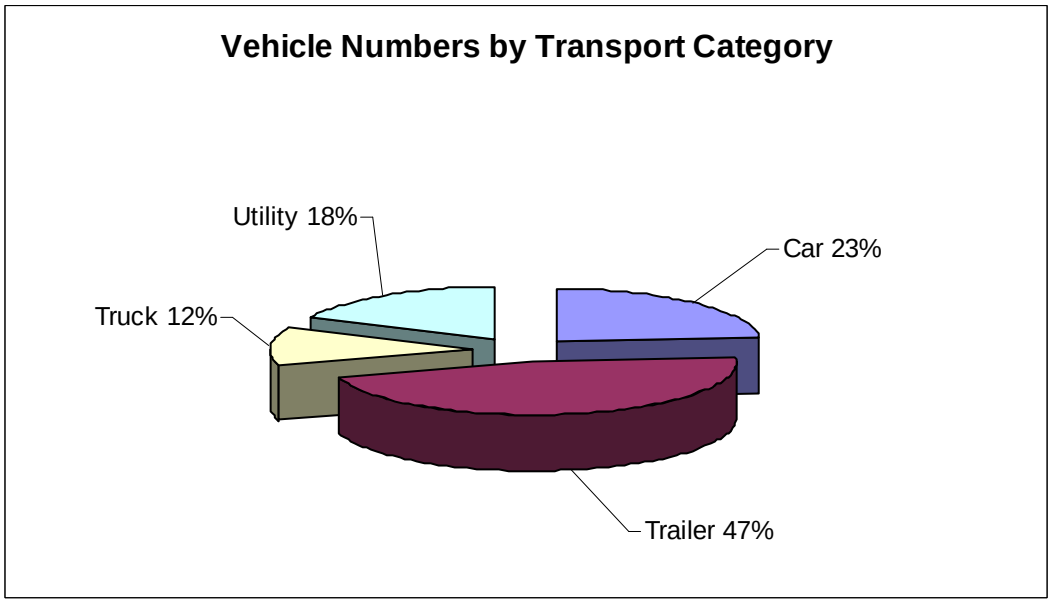


Table 7 : Vehicle Numbers and Refuse Weight by Transport Category

Vehicle Category	Numbers	% Number	Weight kgs	% Weight
Car	97	23.5	2,790	2.26
Trailer	193	46.8	37,798	30.55
Truck	48	11.7	75,154	60.75
Utility	74	18.0	7,971	6.44
Total	**412**		**123,713**	

Chart 10 : Vehicle Numbers by Category and Date

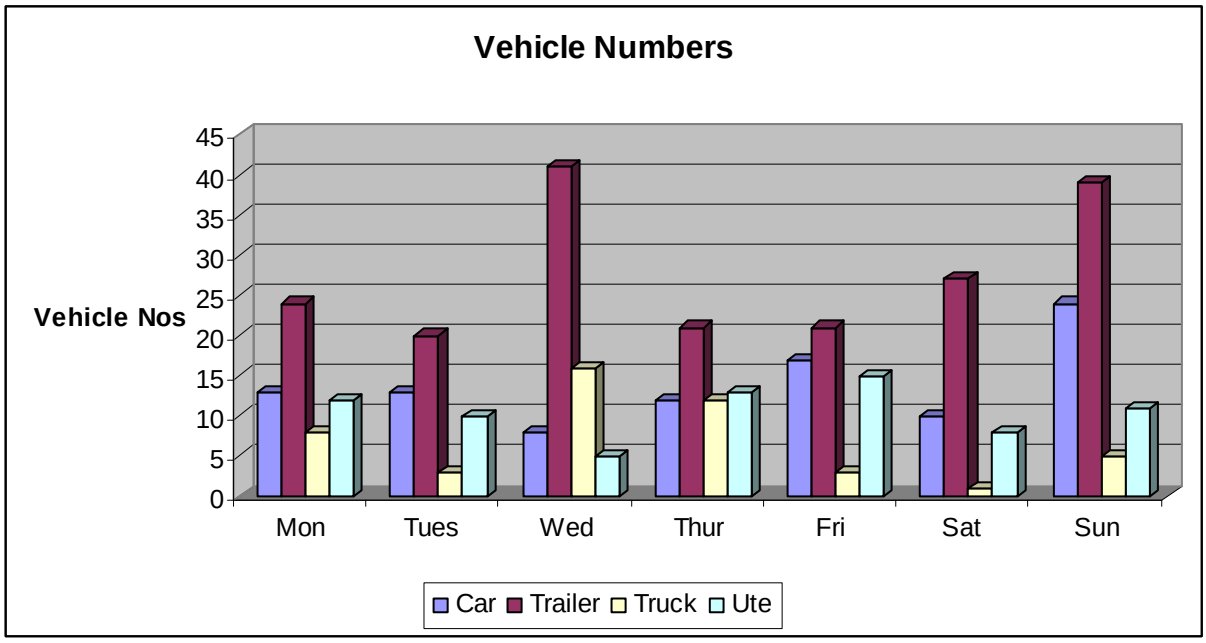


Table 8 : Vehicle Numbers

	Car	Trailer	Truck	Ute	Total
Mon. 9 Feb	13	24	8	12	**57**
Tues. 10 Feb	13	20	3	10	**46**
Wed. 11 Feb	8	41	16	5	**70**
Thur. 12 Feb	12	21	12	13	**58**
Fri. 13 Feb	17	21	3	15	**56**
Sat. 14 Feb	10	27	1	8	**46**
Sun. 15 Feb	24	39	5	11	**79**
Total	**97**	**193**	**48**	**74**	**412**

4.4 Refuse Volume and Weight

4.4.1 Annual Volume and Weight of Refuse

Refuse data for this survey was primarily recorded by weight. No attempt was made to define the total volume and like wise no attempt was made to establish values for the density of the landfilled refuse.
This survey determined values that occurred for the summer seasonal variation which is a period that generally experiences an influx in tourist numbers.
The values obtained are applicable only for the survey period and extrapolation of results from these values may not be reliable. However as refuse is often expressed as terms of an annual value the

results from the survey have been extrapolated to this format. No adjustments or correction factors have been applied so these values should be used for indicative purposes only.
The values are shown in Table 9 below.

Table 9 : Estimated Annual Weight

Survey Period	Estimated Annual Value
123.7 tonne	6,400 tonne

4.5 Refuse Bag Analysis

4.5.1 Sample Size and Accuracy of Bag Analysis

The sample size required to obtain an acceptable degree of accuracy generally escalates rapidly as the relative proportion of the component decreases.
Based on information from similar surveys it was determined to sample 60 kerbside bags to obtain an acceptable order of accuracy on components greater than 15% of the refuse. A total of 64 bags were analysed, 58 from the kerb collection and 6 kerbside bags delivered by residents.
The following values for the coefficient of variation (CV) were calculated from the survey sampling regime. These values will help determine the levels required for future sampling analysis.

Table 10: Primary Classification Co-efficient of Variation

Classification	Weight kgs	Mean Value	CV
Paper	96.48	27.47	1.07
Plastic	56.52	16.09	1.01
Putrescible	87.12	24.80	1.28
Ferrous	10.70	3.05	2.87
Non Ferrous	3.44	0.98	4.02
Glass	43.04	12.25	2.47
Textile	19.70	5.61	2.64
Sanitary	17.70	5.04	2.60
Rubble	9.40	2.68	4.40
Timber	1.20	0.34	2.94
Rubber	5.92	1.69	2.92
Hazardous	0	0	0

From the CV value precision levels can then be calculated. For this survey precision levels were derived from a chart presented in figure 5.5, page 43, of the Solid Waste Analysis Protocol manual.
At 95% confidence level the following precision levels were obtained.
Paper $\pm$28 %
Plastic $\pm$27 %
Putrescibles $\pm$35 %

As the CV is greater than expected, brought about by the variation in proportion of quantities in bags, then future surveys should target analysis of 100 bags to gain the desired 20% precision level.

4.5.2 Kerbside Bag Weight and Refuse Density

A total of 102 bags were weighed. Their combined weight was 559.48kg giving an average weight of 5.49kg per bag.
Within these bags the maximum individual bag weight recorded was 14.42kg and the minimum weight 1.62kg.
Refuse density was calculated by dividing the total weight of measured bags by the measured volume, 2.914m3.The average density calculated at 192kg / m3 loose.

Table 11: Summary of Refuse Bag Data

Average Bag Weight	5.49 kg
Maximum Bag Weight	14.42 kg
Minimum Bag Weight	1.62 kg
Average Bag Density	192 kg / m3

4.6 Refuse from Fox Transfer Station

The Hokitika landfill acts as a repository for refuse from the Fox Transfer Station. Once a week a top loading truck clears the Fox facility and transports the refuse to Hokitika as an uncompacted load. Any excess material generated at Fox is removed by the maintenance contractor to the Franz Josef landfill.
The truck has a capacity of 30m3 and at the time of the survey was recorded at 4.5 tonne. The operator indicated the load weight varies seasonally between 3 and 4.5 tonne with the current season being the period of greatest refuse production.
This refuse in summer tends to originate mainly from tourist activities.

4.7 Recycling Operations

Facilities are established that allow the separation and disposal of certain wastes for recycling. A press is housed on site and the landfill operator compacts material into bales as time and quantities permit.
The separation of material is carried out by the landfill user and as a consequence much material is disposed to the landfill.
To encourage recycling, clean material, mainly paper, cardboard, plastic and glass are accepted at no fee. Fees do apply for disposal of steel items such as whiteware and car bodies.
Table 12 shows a summary of the values of material separated for baling during the survey period. This table shows, for each classification of material recycled, the total weight collected during the survey, the total weight recorded as recycled and the recycled value expressed as a percentage of the total weight of that classification.
No record was made of the steel and non ferrous materials separated for recycling.

Table 12: Values of Recycled Material

Material	Recycled Weight kgs	Total Weight kgs	% of Total Weight
Paper & Cardboard	1,470.7	15,107.70	9.74
Plastic, 1 & 2	110.6	6,989.0	1.58
Glass	348.4	3,673.1	9.48

5.0 DISCUSSION

5.1 Green Waste

Green waste accounted for 20.44%, by weight, of the total waste stream during the survey.
As a secondary classification of putrescible waste it was the only item identified and recorded as a separate identity during the survey. As such green waste made up 80% of the putrescible waste stream.
Green waste is of interest in that it can be managed in ways that keep it out of the landfill and has the possibilities of being used as a raw material for compost and soil enhancing projects.
This is being carried out to some extent on site in that the green waste is stockpiled in areas away from the active tip face and spread over covered landfill and allowed to compost. From time to time a shredder is used to mulch the green waste and hence assist with the breakdown of this material.
There are possibilities of commercial ventures for compost, and further waste analysis studies could enhance the results gained to-date.
The current free access for green waste disposal may account for the large quantities received.

5.2 Timber wastes

Timber wastes where possible were stockpiled separately and away from the tip face.
The intention is to reduce the volume by controlled burning.
Most of the customers attempted to separate their timber out and stockpile in the designated area.
Whereas the practice is acceptable at present there will come a time when burning is no longer permitted at landfills and alternative disposal will be sought.
Other landfill operations have attempted to shred this type of material and either spread as a mulch or to mix with green matter being composted.
In either method of disposal there is a need to separate out treated timber and continue to landfill or seek reuse of this material.
Timber wastes account for 3.9% of the waste stream.

5.3 Reduction / Recycling

The recycling efforts have targeted the marketable materials. Observation during the survey was 75 vehicles or 18% of the total vehicle count brought in recycling material. Of these 47 or 63% of the vehicles involved carried recycling material only. From residential origin the individual quantities were small however the few commercial uses, in particular with disposal of cardboard, brought in substantial quantities per load.
As can be seen in Table 12 on page 18 the values for paper / cardboard and glass were less than 10% of those classification waste streams. The value for plastics is more difficult to gauge as only targeted plastics are recycled and to obtain the values for these grades of plastic would require a secondary classification analysis on the plastics waste stream.
The low proportion of recycled material indicates there is scope to recover more of these materials. This material is generally mixed or in contaminated loads and would require some effort by the customer to prepare for recycling.
The exception was cardboard and paper where several clean loads were sent to the tip as there was insufficient storage at the baling plant.
To capture this material a larger storage / processing area is required. Along with expansion, an education programme would be required to inform customers of the preparation of material, in particular source separation.
With the government's targets for reduction to landfill, there needs to be an incentive to make recycling and reduction attractive.
This has been achieved in other regions by increased landfill fees, some of which have been used to promote alternative disposal. The increased fees also prompt the producer to look at cost effective alternatives.

5.4 Hazardous Waste

Only small quantities of hazardous waste were detected during the survey, much of which was handed in for alternative disposal.
A total of 86kg or 0.07% of the waste stream was identified as hazardous.
The hazardous material consisted of:-

Four large (Ute) lead acid batteries
Two small (motorcycle) lead acid batteries
21 cans of paint or paint residues
26 litres of waste oil
1kg of alkaline / metal batteries.

All hazardous waste was located in refuse brought in individual loads. None was located in the analysis of refuse bags.
These values are extremely low compared to other landfills. Over time a more comprehensive picture of hazardous values could be gauged.

5.5 Baseline data

The Ministry for the Environment maintains a data base of SWAP study results from various landfills throughout New Zealand and from this information produce a base line data base. Table 13 presents combined results from the Dunedin, Hutt, Kaikoura and Matamata landfills along with values from a Marlborough 2003 survey.

Table 13: Baseline Data (Percentage of Waste Stream by Weight)

	Hokitika	Spring	Summer	Autumn	Winter	Marlborough
	2004	2002	2002-3	2003	2003	2003
Paper	12.2%	20.2%	12.1%	11.0%	13.1%	15.9%
Plastic	5.7%	8.4%	5.3%	7.3%	13.4%	17.4%
Organic	25.5%	22.6%	27.2%	24.2%	33.0%	17.2%
Glass	3.0%	3.7%	1.9%	2.3%	7.5%	3.9%
Ferrous Metal	4.6%	4.8%	4.7%	5.8%	7.1%	7.1%
Non ferrous Metal	0.3%	1.3%	0.3%	0.5%	0.5%	0.1%
Timber	3.9%	9.1%	10.1%	11.3%	7.6%	24.3%
Rubble/concrete	42.0%	16.7%	21.4%	15.2%	6.7%	11.7%
Rubber	0.3%	1.6%	1.9%	0.6%	0.1%	0.6%
Nappies/Sanitary	0.9%	1.5%	1.7%	1.3%	5.7%	0.2%
Textiles	1.6%	4.8%	3.0%	3.6%	4.1%	1.6%
Potentially Hazardous	0.1%	5.2%	10.3%	16.7%	1.2%	0.01%

As can be seen from the above table Marlborough is considerably lower in organics (putrescibles) and considerably higher in timber. Possible reasons are effects of the compost operation and the large timber processing industry in Marlborough.

5.6 Comparison with Previous Surveys

Two previous waste analysis surveys have been conducted at this landfill. The first in November 2000 and the second in December 2001
These studies used an earlier version of the WAP classification system and presented their findings in a different format to the current study. Consequently information gained from comparison of results does not give as clear an indication to trends as expected.
These comparisons are shown in Tables 14 and 15 below.
Both of the early surveys indicated large quantities of ash requiring disposal at the landfill. The current survey did not encounter any of this material, but recorded substantial quantities of rubble.

The rubble was stockpiled for covering of the landfill. This may be an infrequent happening and coincidence that it occurred during the survey. Further clarification is required on both matters.

Table 14 : Total Waste Stream Trends

Classification		November 2000	December 2001	February 2004
Paper		9	16	12
Plastic		13	12	6
Putrescible	Kitchen	25	27	5
	Garden	15	11	20
Ferrous		4	4	5
Non Ferrous		-		0.3
Glass		8	8	3
Textile		2	2	2
Sanitary		17	12	1
Rubble		2	1	42
Timber		2	2	4
Rubber		2	1	0.3
Hazardous		1	1	0.1

The only other values that could be matched were for the kerbside collection.

Table 15: Kerb Collection Trends

Classification		November 2000	December 2001	February 2004
Paper		7.3	19	37
Plastic		11	13	16
Putrescible	Kitchen	24.7	31	25
	Garden	15.6	9	
Ferrous		2.7	4	3
Non Ferrous		-	-	1
Glass		7.7	6	12
Textile		2	1	6
Sanitary		20.4	13	5
Rubble		3.1	1	3
Timber		2.6	1	0.3
Rubber		1	1	1
Hazardous		1	1	0

Annual Values

Each of the three surveys has indicated an annual volume based on results of the survey. The comparison is shown in Table 16

Table 16: Annual Disposal Trends (tonnes)

	November 2000	December 2001	February 2004
Survey Week	120	68.82	124
Estimated Annual	6000	3500	6400

6.0 ACKNOWLEDGEMENTS

I would like to thank the following:

Richard Cotton for providing background and historic information.

The survey team of Mathew Boon and Don Hegglun for supervising traffic over the weighing system and keeping track of the loads.

Doug King, site contractor, for co-operating with the intrusion on his routine and for information on landfill, waste diversion and recycling activities.

7.0 REFERENCES

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8.0 APPENDIX

Appendix 1 Load Analysis by Origin and Weight …… A1 – A12
Appendix 2 Bag Sample Analysis …….. A13