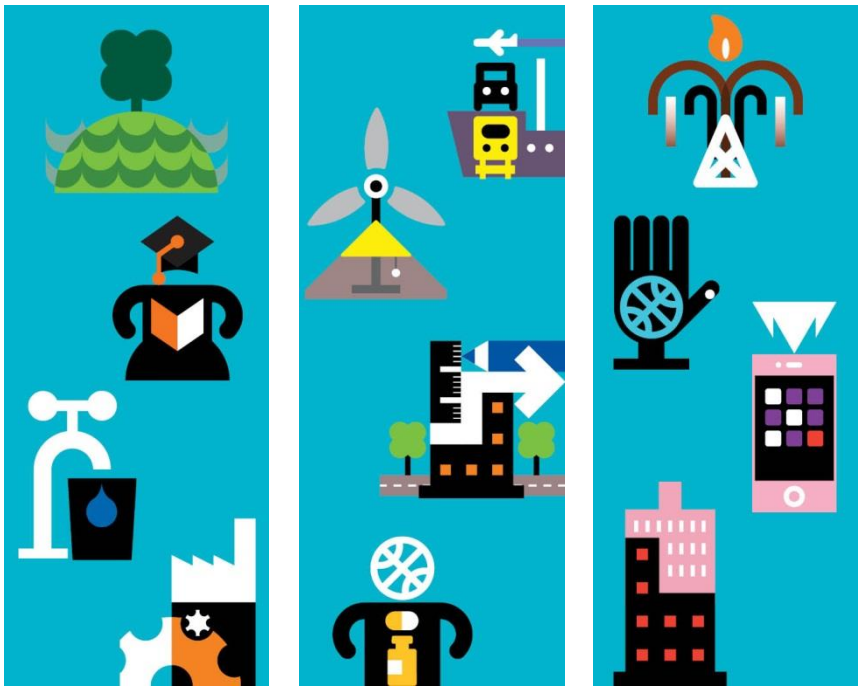

3rd Generation Integrated Waste Management Plan

Situational Analysis

January 2016

Langeberg Local Municipality

LANGEBERG
MUNISIPALITEIT MUNICIPALITY MASIPALA

Mott MacDonald

3rd Generation Integrated Waste Management Plan

Situational Analysis

January 2016

Langeberg Local Municipality

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01	03 October 2016	V Naicker	M Abrahams	F Moos	3rd Generation Integrated Waste Management Plan Situational Analysis Draft Report
02	15 December 2016	V Naicker	M Abrahams	F Moos	3rd Generation Integrated Waste Management Plan Situational Analysis Final Report

Contents

Executive Summary

1. Terms of Reference

In response to Contract: 42/2015, Mott MacDonald Africa (Pty) Ltd was appointed by the Langeberg Local Municipality (LLM) for the provision of professional services in developing the 3rd generation Integrated Waste Management Plan for the Langeberg Municipality.

It is proposed that the Scope of Works is as set out for IWMPs in Section 12 of the Waste Act as discussed above and the Western Cape Government Integrated Waste Management Plan Guidelines (2012).

2. Introduction and Background

The National Environmental Management: Waste Act (Act No 59 of 2008) (hereafter referred to as the Waste Act) states in Section 11 that each municipality must develop an IWMP. An IWMP provides a framework within which local municipalities can deliver a waste management service to all residents and businesses. According to Section 12 of the Waste Act, the following should be included in the contents of an IWMP:

- Demographic information.
- Assessment of waste generation, quantities, and types.
- Status quo of services for collection, minimisation, re-use, recovery, treatment, and disposal of waste.
- Determination of people not receiving waste collection services.
- Identification of poor waste management and its negative health and environmental impacts.
- Establishment and implementation of targets and initiatives for waste minimisation, re-use, recycling and recovery.
- Incorporation of best environmental practices.
- Identification of implementation measures.
- Planning of new facilities for disposal and decommissioning of existing waste disposal facilities.
- Indication of financial resources required to implement projects.

3. Scope of Works

The Scope of Works is as set out for IWMPs in Section 12 of the Waste Act, as discussed above, and the Western Cape Government Integrated Waste Management Plan Guidelines (2012). The Scope of Works covered all aspects listed in the Guideline Table of Contents but did not necessarily follow the same outline. The main towns and settlements covered in the study were Ashton, Bonnievale, Montagu, McGregor, and Robertson.

The development of an IMWP consists of four phases i.e. (Phase 1 – Inception, Phase 2 – Situational Analysis, Phase 3 – Draft IWMP and Phase 4 – Final IWMP).

4. Situational Analysis

4.1 Legislation

LLM is providing solid waste collection services to its residents and performing waste planning, waste minimisation, re-use, and recycling. However, it must solid waste management improve with respect to the following:

- Increasing the diversion from landfill through increased recycling efforts,
- Full cost accounting through true cost reflective tariffs,
- Acquisition of skilled staff in Solid Waste Management, and
- Completing the licensing of its WMFs.

4.2 Demographics

Overall LLM experienced a population growth between 2001 and 2011 of approximately 1.79% per annum (Stats SA, 2011). Assuming the same level of growth (1.79% p.a.) as the period 2001 to 2011, the 2016 figure should be approximately 106 792 people living in approximately 27 477 households. Approximately half of the population of LLM live within the non-urban areas (30%) and Robertson (22.4%). The remaining half live in the formal town areas (Ashton, Bonnievale, McGregor) have populations which are of similar population size in comparison to township areas of Zolani and Nqkubela. This indicates that there

should be an equal focus on the provision of waste services for urban and non-urban settings.

The population of LLM will grow to approximately 119 399 by 2040 which is a 17% increase in the total population compared to the current 2016 population. This is important as it gives an indication that any waste services that are implemented and that any planned WMFs should account for this increase in population and the associated increase in waste generation.

The majority of households, almost 55%, in LLM can be categorised as low income households earning below R47 885 per annum. Middle income households make up 40% of the total households in LLM with high income households contributing to 5% of households.

As per the 2016 Provincial Treasury data the areas with the greatest number of low income households are the townships of Zolani and Nkqubela. The most affluent areas are Robertson and McGregor followed by the remaining urban towns.

Only 22% have completed high school and 7% have some form of higher education, which translates to limited opportunity for high income employment (Stats SA, 2011) McGregor and Montagu have the best education levels whilst Langeberg NU (farms) have the most basic levels of education (Stats SA, 2011). The majority of the population have some secondary education indicating that there is a high rate of high school students leaving school (Stats SA, 2011).

The population has increased and the age distribution has matured between 2001 and 2011, as the elderly population of 65 and older increased from 5.7% to 6.1% (Stats SA, 2011). However, the population is still quite young and approximately 37% of the population are 19 years or younger (Stats SA, 2011). Considering the youth and the elderly, the working population forms approximately 57% of the total population (Stats SA, 2011).

The age distribution is important as it indicates the need for educational, healthcare and work requirements and that LLM is poor, has high household size

numbers and high unemployment levels. These considerations will need to be considered during the needs analysis.

The employment status of LLM is that 37% (23 772) of the population is not economically active whilst 54% (34 713) are employed, 7% (4 431) are unemployed and 2% (1 110) are discouraged work seekers (Stats SA, 2011).

Most the workforce originates from Langeberg NU (farms), Robertson and Bonnievale. This information agrees with the household incomes and the agricultural associated industries and activities in these areas. The townships, previously noted as low income or poor areas can now be contributed to the low number of employment amongst the working class. This informs the waste generation as lower income households generate less waste compared to high income households.

LLM generated approximately R5.8 billion gross value added in 2013 (Municipal Economic Review and Outlook, 2015. The economy of LLM is strongly driven by commercial services (34.6%), manufacturing (31.6%) and agriculture, forestry and fishing (18.3%). These sectors also account for most of the employed population. As per the Municipal Economic Review and Outlook 2015, LLM has been experiencing a slow recovery after the recession of 2009. The slump in growth has been most notable in the agriculture, forestry and fishing industry.

Based on visits to the towns of LLM, it can be stated that LLM has good road and rail infrastructure. Waste collection services are provided via road networks. Province in conjunction with LLM is currently in the process of upgrading and expanding the main roads between Ashton and Montagu which will accommodate future increases in traffic volumes.

In addition to the site visits, the main documents used in this report to assess the development and infrastructure of LLM are the Western Cape Potential Growth Potential Study 2014 (DEA&DP, 2014) and the Langeberg SDF (CNdV, 2015). Both studies indicate that there is medium or moderate growth potential.

The Western Cape Growth Potential Study 2014 (DEA&DP, 2014) indicated that LLM is a medium growth potential municipality. The human capital (work-force)

and infrastructure levels are low whilst the institutional index (ability to govern) physical index (access to natural resources) and the economic index (income generation and value generation) are medium.

This indicates that there is a need in LLM to improve infrastructure and increase efforts in education and training whilst improving service delivery. The economic index is to an extent dependent on the socio-economic conditions of LLM residents which are impacted by the provision of the other resources or indices e.g. (human capital, physical, infrastructure and institutional).

4.3 Waste Quantities and Waste Characterisation

Currently 143 tpd of waste are taken to WMFs of which only 10% of the waste is being diverted from WDFs. This figure is half of the 1st Generation WCIWMP target of 20% diversion by 2019. The transfer station being built in Ashton and Bonnievale will contribute to increasing diversion efforts. This in addition to the contribution of private recyclers will enable LLM to achieve the diversion target.

The waste characterisation of Langeberg was conducted and overseen by the DEA&DP. A total of 600 waste samples was collected from the towns between 20 and 26 October. The waste characterisation was then conducted in five groups of EPWP workers from the Ashton MRF.

The results indicate that recyclables occupy 61% of the total waste volume in LLM with organic waste accounting for a further 16% of the volume. This leaves non-recyclables with a 23% volume of the total waste in LLM. Of the recyclables portion soft and dense plastics as well as cardboard and paper were the major contributors to overall volume. McGregor had the lowest volume share of recyclables and the greatest amount for organic waste. In terms of mass, recyclables accounted for 43% of the mass followed by organic waste which accounted for a further 32% of the waste by mass. The remaining 25% was for non-recyclables. The heaviest recyclable was glass which accounted for 11% of the total mass. McGregor had the greatest percentage share for organics at 45% and Bonnievale had a notable 16% of mass contributed by other wastes. The

amount of hazardous household waste accounts for 2% in volume and mass of all waste in LLM. The results of the waste characterisation indicate that there is a significant portion of organic waste and recyclables within the LLM waste stream and if these waste streams are diverted that there would be airspace and savings in the rendering solid waste management services.

4.4 Existing Waste Management

4.4.1 Organisational Structure and Responsibilities

Solid Waste Management is a division of Engineering Services. Solid Waste Management is headed up by a Solid Waste Manager who is assisted by two Solid Waste Superintendents. Each Superintendent oversees either the eastern or western catchment areas. The eastern catchment consists of Ashton, Bonnievale and Montagu and the west comprises Robertson and McGregor. One Superintendent is responsible for McGregor and Robertson and the other is responsible for Ashton, Bonnievale and Montagu. Supervisors in each of the towns oversee the cleaning teams and the collections team which consists of vehicle and equipment operators and general workers. In addition to the supervisors, there are team leaders for the Ashton, Robertson and Montagu refuse transfer stations and Bonnievale and McGregor drop off facilities. Currently, the role of Waste Management Officer is fulfilled by the LLM Solid Waste Manager. There are currently vacancies in the following positions:

- Two Superintendents.
- Team Leader for Ashton Transfer Station.
- Ashton waste collections tractor driver with skip trailer.
- Ashton compactor operator.
- Weighbridge operator at Ashton WDF.
- Dump scraper operator at Ashton WDF.
- Bonnievale Supervisor.
- Bonnievale waste collections tractor driver with skip trailer.
- Team Leader for Montagu Transfer Station.
- Montagu waste collections tractor driver with skip trailer.
- Team Leader for McGregor drop off.
- Team Leader for Robertson Transfer Station.

- Supervisor in Robertson.
- Weighbridge operator at Robertson Transfer Station.
- Skip truck driver waste collections in Robertson.

The solid waste teams for each town report the illegal dumping incident which is then remedied using a front-end loader (FEL) and two tipper trucks. The waste is then transported to the Ashton WDF. Skips for garden and park waste are provided in all towns and are placed in selected open areas within the residential suburbs. The costs incurred by LLM from illegal dumping are estimated to be approximately R1million per annum.

In LLM waste is collected in four ways:

- Black Bags for non-recyclables
- 240 litre wheelie bin for non-recyclables
- Clear bags for recyclables.
- Skip containers for garden and park waste.
- Cages for business waste

Black bags are provided to all the urban residents of LLM. These are often placed inside wooden receptacles, wheelie bins or green steel drums. The black bags are collected and transported by rear-end loader (REL) vehicles to Ashton WDF. Clear bags are provided to all households for the collection of recyclables. These are then taken to the Ashton MRF. Skip containers are provided to the low income areas in all the towns.

The collection of general waste from businesses, households, schools and other organisations is carried out by five rear end loading (REL) vehicles. Currently there are 2 vehicles servicing Robertson and McGregor and the other 3 split between the three remaining towns and nearby farms. The main transportation routes are along the main roads between the towns, namely the R60, R62, R317 and R318. The R60 links Robertson and Ashton, the R317 links Robertson to Bonnievale and the R62 links Montagu to Ashton. The R318 traverses the north west of the municipality from the N1 through to Montagu. All non-recyclable

household waste from towns is taken to Ashton WDF whilst all household and business recyclables are collected by LLM at source and transported to Ashton MRF. Bonnievale garden and park waste is taken to Bonnievale WMF. All other garden and park waste is taken to Robertson composting facility. Building and demolition waste is taken to Montagu (Bessieskop) WDF and Bonnievale (WMF). Hazardous waste is transported approximately 160km via the R60 and N1 to Vissershok WDF in Cape Town.

LLM has plant and equipment depots in every town and as well as at the Ashton WDF. No operational issues were mentioned but 23 of the 34 vehicles in the fleet are older than the prescribed seven years. The collection fleet compactor vehicles total six in number of which two are over seven years old. Tractor trailers are used to transport garden and park waste as well as assist FELs with moving waste at the composting sites. Waste compactor are used in Ashton WDF with a forklift used for the Ashton MRF to move baled recyclables around on site.

LLM has a hotline for logging complaints about service delivery. Complaints can also be logged on LLM's website at: http://www.langeberg.gov.za/index.php/complaintsqueries. Complaints pertaining to solid waste are forwarded to the Solid Waste Manager and then to the respective Solid Waste Supervisor for that town. The problems together with the actions and solutions are documented.

LLM has partially met its objectives from its previous IMWP and the outstanding actions will need to be included as part of the needs assessment and gap analysis processes of the 3rd generation IWMP.

4.4.2 Waste Management Facilities

LLM has 11 WDF and WMFs, of which eight are operational:

- Ashton WDF (Operational)
- Ashton MRF (Operational)
- Ashton Transfer Station (operational in May 2017)

- Bonnievale WMF (Operational)
- McGregor Historical WDF (Closure and Rehabilitation needed)
- McGregor Drop Off Facility (Operational)
- Bessieskop (Montagu) WDF (Operational but will need closure and rehabilitation)
- Montagu Transfer Station (Operational)
- Robertson WDF (Closed)
- Robertson Transfer Station (Operational), and
- Robertson Composting Facility (Operational).

The list above excludes the Bonnievale drop off facility which will be completed in June 2017. All operational facilities are open and manned six days per week, Monday to Friday: 08:30 – 16:30 and on Saturdays: 08:00 – 13:00. The facilities are also open on selected public holidays.

4.4.3 Minimisation, Reuse and Recycling Initiatives

LLM is engaged in multiple waste minimisation, reuse and recycling initiatives. Besides offering separation at source for all towns, the municipality provides educational programmes that drive and increase the levels of participation of the community. These initiatives include:

- LLM presentations to school and organisations about waste reduction, re-use, recycling and composting.
- Tedcor (Youth in Waste) door to door campaign - The main aim of the intervention was to increase community involvement and participation in recycling. The campaign also was used to inform communities of solid waste services offered by the municipality and collect information on the performance of solid waste management using surveys.
- LLM hosts educational tours of the Ashton MRF for schools and organisations

4.5 Economics and Financing

The majority of projects are capital replacement reserve (CRR) funded projects with the new transfer station in Montagu and the drop off facility being MIG funded. The total medium term revenue expenditure (MTREF) for the next 3 years is estimated to be R26 million, with the bulk being in 2018/19 for the closure and rehabilitation of the McGregor landfill site. These are some of the identified action items for compliancy that will ensure that LLM meets its objectives. The Assessment of Municipal Integrated Waste Management Infrastructure Summary Report (JPCE, 2016) states that no further projects are required to meet the 20% waste diversion target. As per the report, the Ashton and Bonnievale WDFs are scheduled to commence closure in 2017 for compliance purposes, but this may be financially prohibitive for the municipality to do so within the next 5-year period. The cost of compliance with existing licenses is approximately R4.1 million for operational compliance and a further R23.7 million for rehabilitation compliance. The cost requirement for infrastructure to meet the 20% diversion is estimated at R18 million for Ashton WDF and R12.5 million for Bonnievale WDF. The table below shows scheduled projects from the municipality prior to the development of the Assessment of Municipal Integrated Waste Management Infrastructure Summary Report. All the projects will be examined in the gap analysis and needs assessment of this IWMP.

In 2016/17, the LLM Solid Waste Management spent approximately R36.5 million. The largest allocations are general expenditure (47.6%) and salaries, wages & allowances (33.5%). The major expenses in general expenditure include the depreciation, contractors and impairments. This information is important as it may inform future actions such as reducing costs such as revising contracts and or staffing. The issues will be looked at in the gap analysis.

This information is important as it may inform future actions such as reducing costs such as revising contracts and or staffing. The issues will be looked at in the gap analysis.

LLM has created a comprehensive set of tariffs and uses a combination of measurements for their tariffs including mass (kg and tons), frequency (monthly), or volume (m3).

The LLM solid waste tariff projections for the next years increased by 8.4% between the previous year and the current 2016/17 financial year. The waste is in categories for general household waste, mega industries which pay for collections and disposal, sports grounds, rejected wastes which are not accepted at the Ashton WDF and municipal waste.

The total income for LLM is approximately R28.3 million. This total represents the amount less the cost of covering the free waste services afforded to the 5500 indigent households within LLM (as per the LLM IDP 2016/17). The income generated by the billing of residents and businesses for waste services (levy), is the largest component of the income accounting for 59% of the total income followed by the equitable share allocation (24%) and MIG capital which accounts for a further 9% of the total share.

The expenditure of the LLM Solid Waste Management as mentioned in the previous section on expenditure, was approximately R36.5 million. Hence, there is a deficit amounting to nearly R8.2 million for Solid Waste Management.

Currently LLM has an outdated by-law that does not make provision for the enforcement or prosecution of any persons or parties that are guilty of littering, burning waste or illegal dumping. The Waste By-law is viewed by the LLM Solid Waste Management as a key need that will need to be addressed in the needs assessment.

1 Acronyms

CBD	Central Business District
CFLs	Compact fluorescent lights
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs (previously known as DEAT)
DEA&DP	Department of Environmental Affairs & Development Planning
DEAT	Department of Environmental Affairs and Tourism
DETEA	Department of Economic Development, Tourism and Environmental Affairs
DWA	Department of Water Affairs (Previously known as DWAF)
DWAS	Department of Water Affairs and Sanitation
ECD	Early Childhood Development
eWASA	e-Waste Association of South Africa
HCGW	Health Care General Waste
HCRW	Health Care Risk Waste
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HRM	Human Resource Management
ICT	Information and Communications Technology
IDP	Integrated Development Plan
IHWMP	Integrated Health Waste Management Plan
IIWTMP	Integrated Industry Waste Tyre Management Plan
IndWMPs	Industry Waste Management Plans
IWMP	Integrated Waste Management Plan
JPCE	Jan Palm Consulting Engineers
LED	Local Economic Development
LLM	Langeberg Local Municipality
MIIU	Municipal Infrastructure Investment Unit
MRF	Materials Recovery Facility
MSA	Municipal Systems Act (Act no. 32 of 2000)
NDP	National Development Plan
NEMWA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NPC	National Planning Commission
NU	Non-Urban
NWMS	National Waste Management Strategy (2011)
PETCO	PET Plastic Recycling South Africa

POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
REL	Rear-End Loader
SCM	Supply Chain Management
SDF	Spatial Development Framework
SLA	Service Level Agreement
SMME	Small, Medium, Micro Enterprise
SOILL	Southern Oil (Pty) Ltd
SP	Sub-Place
UNEP	United Nations Environment Programme
WCIMWP	Western Cape Integrated Waste Management Plan
WDF	Waste Disposal Facility
WIS	Waste Information System
WMF	Waste Management Facility
WMO	Waste Management Officer
WWTW	Waste Water Treatment Works

2 Glossary

Buy-back Centre	A collection facility where individuals or groups hand in recyclables (like cans, plastic or paper) in return for payment.
Drop-off Centre	A collection site usually for all types of recyclables where individuals can deliver and deposit general waste and recyclables into designated containers.
Hierarchy of Waste Management	The systematic order, or hierarchy, in which to approach the management of wastes. Even before creating waste one needs try to avoid generating it. Then one must recover materials for recycling, reuse and repair as far as is practical and economically feasible. After this, what is left should be responsibly treated and/or disposed of in such a way as to minimise the potentially adverse impact of waste on people and the natural environment.
Integrated Waste Management Plan	An Integrated Waste Management Plan provides a framework within which local municipalities can deliver a waste management service to all residents and businesses.
Material Recovery Facility	A specialised plant that receives, separates and prepares recyclable material for marketing to end user manufacturers.[1]
Transfer Station	A facility for the temporary deposition of certain wastes, where the waste is transferred to long-haul vehicles for transportation to a remote facility, often a landfill. Waste is often compacted prior to being loaded onto the long-haul vehicles.
Waste Management System	Waste management requires the implementation of many interconnected processes. This web of interconnected waste management processes forms the Waste Management System.
Waste Policy	According to Section 11 of the Municipal Systems Act No. 32 of 2000, a municipality exercises is legislative or executive authority by, amongst others, developing and adopting policies. A policy is a high-level statement of intent. A Waste Policy is therefore a policy specifically focussed on waste

[1] A Naudé 2010, Conceptualising Waste Management, Cape Town

3 Acknowledgements

We would like to express our appreciation for inputs received and the generous co-operation from the Langeberg Local Municipality Solid Waste Management Department.

4 Terms of Reference

It is a requirement of National Government under the NEMA Waste Act (59 of 2008) (hereafter referred to as the Waste Act) that a municipality compiles an Integrated Waste Management Plan (IWMP) to form part of the municipal Integrated Development Plan (IDP). An IWMP provides a framework within which local municipalities can deliver a waste management service to all residents and businesses.

In response to Contract: 42/2015, Mott MacDonald Africa (Pty) Ltd was appointed by the Langeberg Local Municipality (LLM) for the provision of professional services in developing the 3rd generation Integrated Waste Management Plan for the Langeberg Municipality.

It is proposed that the Scope of Works is as set out for IWMPs in Section 12 of the Waste Act as discussed above and the Western Cape Government Integrated Waste Management Plan Guidelines (2012). The Scope of Works will cover all aspects listed in the Guideline contents. Please refer to Appendix A for the Guideline contents.

5 Introduction and Background

The Introduction and Background Section of this report introduces waste management plans and the approach adopted for this report and includes an assessment of the applicable legislation, the strategic objectives of the municipality and an overview of the geographical area of study.

5.1 Integrated Waste Management Plans

The National Environmental Management: Waste Act (Act No 59 of 2008) (hereafter referred to as the Waste Act) states in Section 11 that each municipality must develop an IWMP. An IWMP provides a framework within which local municipalities can deliver a waste management service to all residents and businesses. According to Section 12 of the Waste Act, the following should be included in the contents of an IWMP:

- Demographic information.
- Assessment of waste generation, quantities and types.
- Status quo of services for collection, minimisation, re-use, recovery, treatment and disposal of waste.
- Determination of people not receiving waste collection services.
- Identification of poor waste management and its negative health and environmental impacts.
- Establishment and implementation of targets and initiatives for waste minimisation, re-use, recycling and recovery.
- Incorporation of best environmental practices.
- Identification of implementation measures.
- Planning of new facilities for disposal and decommissioning of existing waste disposal facilities.
- Indication of financial resources required to implement projects.

Implementation requires that municipalities move away from traditional “end of pipe” solutions that focus on waste after it has been generated (i.e. collection, transport, processing, recycling or disposal of waste material), to a service which focuses on the prevention of waste, as well as the minimisation of waste as a by-product of production (DEAT, 2009, p.1).This approach is in recognition of the widely adopted waste hierarchy, which includes the three Rs of waste management, i.e. recovery, reuse and recycle (see Figure 5.1) as well as energy recovery. Only after these efforts should the residual waste be disposed of at a landfill. Section 16.1c & d of the Waste Act states that the holder of waste must take all reasonable measures within the holder’s power to ensure that, where waste must be disposed of, the waste is treated and disposed of in an environmentally sound manner, such that it does not endanger health or the environment or cause nuisance through noise, odour or visual impacts.

The delivered service must maximise efficiency and minimise environmental impacts and financial costs, with the ultimate aim of improving quality of life. Any IWMP must suggest measures that are practical, achievable, implementable and sustainable.

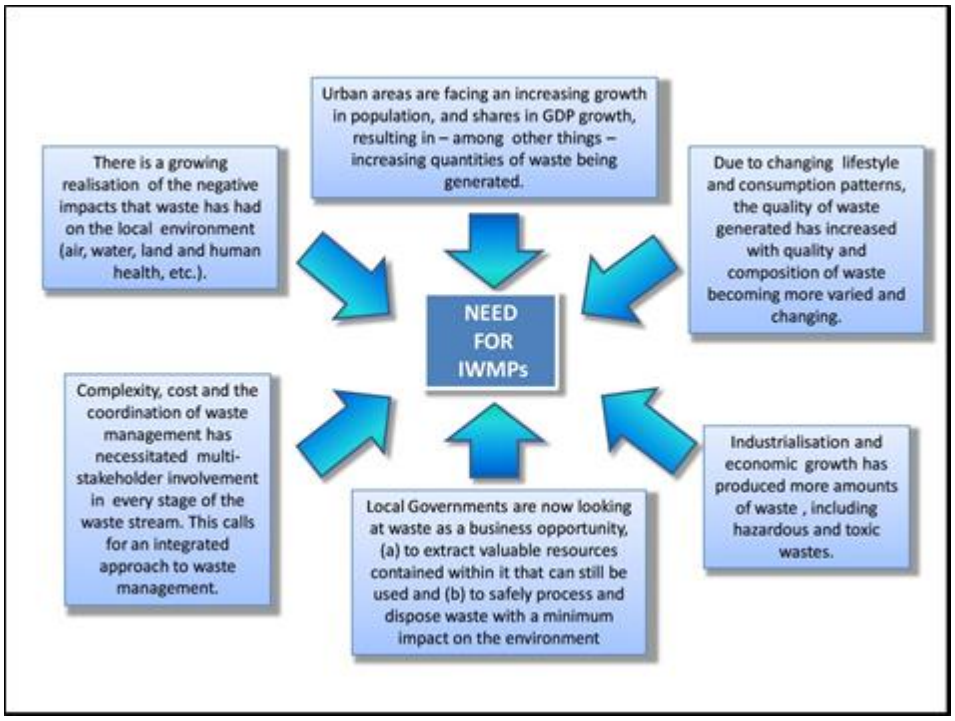
Figure 5.1: Waste Management Hierarchy

Source: DEA 2011, National Waste Management Strategy

Integrated waste management is a multi-pronged approach that requires the co-operative effort of government and waste generators. Local Government, as a service provider, must ensure that there is a waste management service delivery system providing a network of collection and disposal options, so that generators can effectively exercise their responsibilities. This would include separating their waste at source (the point of generation), and then properly recycling, storing and disposing of the different parts of the waste. Local Government, as a regulator, must ensure compliance with relevant waste related legislation. Local Government therefore has a dual role as both service provider and regulator.

Figure 5 2 gives an indication of the reasons behind the need for integrated solid waste management planning.

Figure 5.2: The need for IWMPs



Source: UNEP, 2009

The IWMP addresses several key objectives by:

- Discussing the current situation in respect to the description of the population development profile of the area.
- Reviewing the quantities and types of waste generated in the area.
- Describing the services provided (or that are available) for the collection, minimisation, re-use, recycling and recovery, treatment and disposal of waste.
- Commenting on the number of persons in the area who are not receiving waste collection.
- Identifying and planning for future waste management needs and requirements of LLM.
- Ensuring that the plan identifies strategies for provision of adequate and equitable waste services to all residents within LLM.
- Incorporating the principles of the internationally accepted waste management hierarchy into daily as well as short to long-term, waste activities and planning.
- Building on the waste management foundations currently established and improving all aspects of waste management within LLM.

- Promoting the reduction of the quantity of waste disposed of at landfill by the continual support of private and community waste minimisation and the development of recycling projects, initiatives and municipal projects.
- Recommending that LLM establish systems to have critical waste information at hand for optimisation of waste management services.
- Ensuring that all recommendations minimise adverse social and environmental impacts related to waste management and thereby improving the quality of life for the communities of LLM.
- Assessing the institutional arrangements of LLM and recommending measures for optimising the efficiency of the waste management system in terms of infrastructure, equipment, human resources, the development of skills and capacity.

5.2 Industry Waste Management Plans

Part 7 of the Waste Act makes provision for industry waste management plans. “Industry” as defined in the Waste Act means commercial activities, commercial agricultural activities, mining activities and the operation of power stations. The Department of Environmental Affairs & Development Planning (DEA&DP) has released a report titled: Generic Guideline Document for Preparing Industry Waste Management Plans (Draft, March 2010). The document differentiates between “Mandatory plans” to be prepared in terms of sections 28 (1) and (2) and 29 (1) and (2) of the Waste Act and “Voluntary plans” in terms of section 28 (7).

The mandatory plans will be those specifically required by the Minister of Environmental Affairs while voluntary plans may be prepared by a person, category of persons or industry should they decide to do so.

Mandatory plans are currently being developed for the following areas:

- Tyres industry for waste tyres.
- Paper and Packaging industry for packaging and paper waste.
- Lighting industry for mercury containing lamps e.g. CFLs.
- Electrical and Electronic Equipment Industry.
- Pesticide Industry for residual pesticides and pesticide containers. (DEA, 2011)

5.3 Integrated Waste Management Planning as described in the IDP, 2016-17

The Langeberg IDP 2016-17 (LLM, 2016) describes the main objective of integrated waste management planning as follows:

“To provide a compliant solid waste service and upgrade and maintain existing infrastructure.”

This is the sole predetermined objective for the municipality strategic objective “Provision of a clean environment”.

The main activities highlighted for action by the municipality are:

- The application of closure permit for the McGregor, Montagu and Bonnievale Waste Disposal Facilities (WDF)s to complete rehabilitation.
- To report annually on compliance with the National Waste Management Strategy.
- To increase the tonnage of domestic waste recycled.

The main issues of the municipality are described as being caused by a:

- Tariff structure which is not cost reflective.
- Lack of skilled staff in Solid Waste Management.

5.4 Approach and Methodology

The drafting of the situational analysis report includes the work completed from two phases, namely:

- Phase 1: Inception Phase
- Phase 2: Situational Analysis

5.4.1 Phase 1: Inception Phase

Phase 1 consisted of activities as detailed in Table 5.1.

Table 5.1: Inception Phase Activities

Activity	Description	Date
Inception Meeting	Discussion of scope of works and deliverables	10 May 2016
Draft Inception Report Submission	Draft inception report sent to DEA&DP for comment	6 June 2016
Draft Inception Report Comments Received	The comments from DEA&DP for the draft inception report were received	5 July 2016
Final Inception Report	Final Inception report submitted to Client	28 July 2016

5.4.2 Phase 2: Situational Analysis

Phase 2 consisted of site visits and information gathering and a literature review. The activities performed in the situational analysis have been included in Table 5.2.

Table 5.2: Situational Analysis Activities

Activity	Description	Date
Site visits	Visiting all waste management and disposal facilities in LLM	18 July 2016
Information gathering	Informal meeting and discussion with LLM Solid Waste Department to gather and collect all information	19 July 2016
Site visits	Site visits to businesses, schools and churches in Bonnievale, Robertson, Ashton and Montagu.	20 July 2016

The following literature review was reviewed:

- Constitution of the Republic of South Africa, 1996.
- National Environmental Management: Waste Act, 2008.
- National Waste Management Strategy, November 2011.
- Environment Conservation Act No. 73 of 1989.
- White Paper on Integrated Pollution and Waste Management of South Africa, Government Gazette, No. 20978, March 2000.
- National Health Act, Act 61 of 2003.
- Western Cape HealthCare Waste Management Act, Act 7 of 2007.
- Western Cape Health Care Waste Management Amendment Act, Act 6 of 2010.
- National Health Act, Act 61 of 2003, Department of Health, 2004
- Department of Environmental Affairs and Development Planning (DEA&DP) Directorate: Waste Management [2012]. Integrated Waste Management Planning: A Guide for Waste Management Planning, Volume 1- Conducting a Status Quo Analysis (ISBN: 978-0-621-40822-5), and Volume 2 – Section A – Identification of Waste Management Needs and Objectives; Section B – Development, Implementation and Evaluation of IWMPs, (ISBN: 978-0-621-40822-5), Cape Town, South Africa.
- National Environmental Management Act, Act 107 of 1998.
- The Municipal Structures Act, 1998 (Act No. 117 of 1998).
- Municipal Systems Act, No. 32 of 2000.
- National Environmental Management: Waste Amendment Act, No. 26 of 2014.
- The National Environment Management: Air Quality Act, No. 39 of 2004.
- Hazardous Substances Act, No. 5 of 1973.
- Health Care Waste Management Amendment Act, No. 6 of 2010.
- Western Cape Health Care Waste Management Act, 2007 (Act 7 of 2007): Western Cape Health Care Risk Waste Management Regulations, 2013.
- National Water Act, No. 36 of 1998.
- National Domestic Waste Collection Standards (GG No. 33935 GN. No. 21).
- Waste Classification and Management Regulations (GG No. 36784 GN. No. 634).
- National Norms and Standards for the Assessment of Waste for Landfill Disposal (GG No. 36784 GN. No. 635).
- National Norms and Standards for Disposal of Waste to Landfill (GG No. 36784 GN. No. 636).
- List of Waste Management Activities (GG No. 37083 GN. No. 921).
- National Waste Information Regulations (GG No. 35583 GN. No. 625).
- Integrated Pollutant and Waste Information System.
- Notice of Approval of an Integrated Industry Waste Tyre Management Plan of the Recycling and Economic Development Initiative of South Africa (GG No. 35927).
- Plastic Carrier Bag and Plastic Flat Bag Regulations (GG No. 24831 GN. No. 625).
- National Environment Management: Waste Act, No. 59 of 2008: Waste Management Plans for Approval (GG No. 39018 GN. No. 736).
- National Environment Management: Waste Act, No. 59 of 2008: Industry Waste Management Plans (P.N. 365/2013).
- Basel Convention.
- Stockholm Convention.
- Relevant by-laws and policies.

- LLM Spatial Development Framework.
- LLM IDP 2016-17.
- The Western Cape Integrated Waste Management Plan.
- The National Development Plan.
- The Western Cape Spatial Development Framework.

After reviewing the legislation and plans, the information gathered was compared to the existing waste management system in LLM to understand the current waste management activities. The Situational Analysis is the starting point for the phases that follow (Phase 3 – Draft IWMP and Phase 4 – Final IWMP). The methodology followed in the development of the IWMP is shown in Table 5.3.

Table 5.3: IWMP Process

Methodology	
Phase 1: Inception	**Phase 3: Draft IWMP**
Project inception meeting	Conduct the public participation process
Inception report	Conduct a gap analysis assessment
	Conduct a needs assessment
	Implementation programme and budget
	Stakeholder engagement and comment period
Phase 2: Situational Analysis	**Phase 4: Final IWMP**
Information gathering and review	Finalise IWMP
Status quo assessment	Submit final report
Assessment of progress made towards 2nd generation IWMP	Client review and acceptance
	Project closeout
Stakeholder engagement	
Submit situational analysis	

5.5 Langeberg Local Municipality Vision, Mission Statement and Strategic Objectives

5.5.1 Policies of Langeberg Local Municipality

LLM has an outdated waste management policy in place. LLM is awaiting the finalisation of the Western Cape draft model by-law. The provincial by-law will be used a basis for drafting the Langeberg Municipal Waste By-law.

5.5.2 The Vision of Langeberg Local Municipality

The vision of the municipality is:

“To create a stable living environment and sustainable living conditions for all citizens” (LLM, 2016)

5.5.3 Mission Statement

The mission statement of the municipality is:

“By providing cost effective quality services to the Citizens, exercise good leadership, ensuring sound governance and financial management.” (LLM, 2016)

5.5.4 Strategic Objectives

Strategic objectives exist at national, provincial, district and local levels of government. It is important that these objectives are aligned and inform each other with development needs. The strategic objectives will be outlined and used at a later stage for the gap analysis and needs assessment.

5.5.4.1 National Strategic Objectives

National strategic objectives were based on the National Development Plan 2030 (NPC, 2011). The plan has set the following objectives and actions:

- Economy and employment
- Economic infrastructure
- Environmental sustainability and resilience
- Inclusive rural economy
- South Africa in the region and the world
- Transforming Human Settlements
- Improving education, training and innovation
- Health care for all
- Social protection
- Building safer communities

- Building a capable and developmental state
- Fighting corruption
- Nation building and social cohesion (NPC, 2011)

5.5.4.2 Provincial Government of the Western Cape Strategic Objectives 2014

The Provincial Government of the Western Cape Strategic Objectives 2014 document outlines strategic objectives for the Western Cape along with priorities, proposed plans and targets as follows:

- Creating opportunities for growth and jobs
- Improving education outcomes
- Increasing access to safe and efficient transport
- Increasing wellness
- Increasing safety
- Developing integrated and sustainable human settlements
- Mainstreaming sustainability and optimising resource-use efficiency
- Increasing social cohesion
- Reducing poverty
- Integrating service delivery for maximum impact
- Creating opportunities for growth and development in rural areas
- Building the best-run regional government in the world

5.5.4.3 Cape Winelands District Strategic Objectives

The Cape Winelands 2016-17 Review identified the following strategic objectives for the Cape Winelands District Municipality:

“To create an environment and forge partnerships that ensures the health, safety, social and economic development of all communities including the empowerment of the poor in the Cape Winelands District through economic, environmental and social infrastructure investment.

Promoting sustainable infrastructure services and transport system which fosters social and economic opportunities.

To provide an effective and efficient financial and strategic support services to the Cape Winelands District Municipality.” (Cape Winelands IDP, 2016)

5.5.4.4 Langeberg Local Municipality Objectives

The strategic objectives of Langeberg Municipality are as follows:

- Sustainable integrated human settlements.
- Sustainable civil engineering infrastructure services.
- Energy efficiency for a sustainable future.

- Provision of a safe and efficient road network.
- Promotion of public safety.
- Provision of a clean environment.
- Social community development.
- Growth and economic development.
- Sound financial management.
- Institutional development and corporate governance.
- Good governance. (LLM, 2016)

5.5.4.5 Summary of Strategic Objectives

The local and district municipality have aligned their goals with both the National Outcomes as well as the National Development Plan and the Western Cape strategy across the social, environmental and economic spheres of sustainability (Table 5.4). Waste management is not mentioned in isolation in the strategic documents. It is assumed that waste is encompassed as part of the environmental issues. However, waste management affects social and economic outcomes as well. Therefore, it is important to take note of the strategies as these will help form criteria for the selection of options and projects later in this project.

Table 5.4: Summary of Objectives (LLM IDP, 2016)

Medium Term Strategic Framework National Outcomes (OC)	National Development Plan	WC Provincial Strategic Plan Goals (PSG)	CWDM - Growth Strategy, District Strategic Objectives (DSO)	Langeberg Strategic Objective (SO)
OC 1: Improved quality of basic education.	Improve education, training and innovation.	PSG 2: Improve education outcomes and opportunities for youth development.	DSO 5: To facilitate and ensure the development and empowerment of the poor and most vulnerable people, particular women, children, youth, the disabled, elderly persons and rural dwellers throughout the Cape Winelands.	SO 8 : Growth and economic Development. Establishment of ECD centres in rural areas.
OC 2: A long and healthy life for all South Africans.	Promoting health.	PSG 3: Increase wellness, safety and tackle social ills.	DSO 5: To facilitate and ensure the development and empowerment of the poor and most vulnerable people, particular women, children, youth, the disabled, elderly persons and rural	SO 7: Social and economic development. HIV /AIDS Programs.

Medium Term Strategic Framework National Outcomes (OC)	National Development Plan	WC Provincial Strategic Plan Goals (PSG)	CWDM - Growth Strategy, District Strategic Objectives (DSO)	Langeberg Strategic Objective (SO)
			dwellers throughout the Cape Winelands	
OC 3: All people in South Africa are and feel safe.	Social protection. Building safer communities. Transforming society and uniting the country.	PSG 3: Increase wellness, safety and tackle social ills.	DSO 2: To ensure the health and safety of communities in the Cape Winelands through the proactive prevention, mitigation, identification and management of environmental health, fire and disaster risks.	SO 5 : Promotion of public safety Implementation of Law enforcement programs. SO 9 Sound Financial Management. Effective ICT. management. Adherence to SCM – policy. Open and transparent Tender processes.
OC 4: Decent employment through inclusive economic growth.	Economy and employment. An integrated and inclusive rural economy.	PSG 1: Create opportunities for growth and jobs.	DSO 1: To facilitate sustainable economic empowerment of all communities within the Cape Winelands through economic, environmental and social infrastructure investment, poverty alleviation, job creation and skills development.	SO 8 : Growth and Economic Development. Branding of area as a tourism destination. Development of LED. Strategy SO9: Sound Financial Management.
OC 5: A skilled and capable workforce to support an inclusive growth path.	Improving education, training and innovation Positioning South Africa in the World Fighting corruption Building a capable and developmental state	PSG 2: Improve education outcomes and opportunities for youth development PSG 1: Create opportunities for growth and jobs	DSO 4: To provide an effective and efficient support service to the CWDM's executive directorates so that the organisational objectives can be achieved through the provision of HRM, admin support, Communication, ICT and sound International and Intergovernmental Relations.	SO 10 : Institutional development and corporate governance. Performance management system. Implementation of mentoring policy. Knowledge management and change management programs.
OC 6: An efficient, competitive and responsive economic	Economy infrastructure Environmental sustainability	PSG 4: Enable a resilient, sustainable, quality	DSO 3: To support and ensure the development and	SO 2 Sustainable civil engineer infrastructure services

Medium Term Strategic Framework National Outcomes (OC)	National Development Plan	WC Provincial Strategic Plan Goals (PSG)	CWDM - Growth Strategy, District Strategic Objectives (DSO)	Langeberg Strategic Objective (SO)
infrastructure network.	Transforming human settlement and the national space economy	and inclusive living environment	implementation of Infrastructural services such as bulk- and internal services, functional road network and public transport services that contribute to Integrated Human Settlements in the Cape Winelands.	Tarring of Roads Provision of quality water to all citizens Demand management of water SO3: Energy efficiency for a sustainable future. SO4 : Promotion of a safe and efficient road network. SO 8: Growth and economic development.
OC 7: Vibrant, equitable and sustainable rural communities with food security for all.	Integrated and inclusive rural economy. Transforming human settlement and the national space economy.	PSG 4: Enable a resilient, sustainable, quality and inclusive living environment.	DSO 5: To facilitate and ensure the development and empowerment of the poor and most vulnerable people, particular women, children, youth, the disabled, elderly persons and rural dwellers throughout the Cape Winelands.	SO 8: Growth and Economic Development. Skills development Incentive program for businesses. Implementation of EPWP projects, Rural development programs.
OC 8: Sustainable human settlements and improved quality of household life.	Integrated and inclusive rural economy. Transforming human settlement and the national space economy.	PSG 4: Enable a resilient, sustainable, quality and inclusive living environment	DSO 3: To support and ensure the development and implementation of infrastructure services such as bulk- and internal services, functional road network and public transport services that contribute to Integrated Human Settlements in the Cape Winelands.	SO 1: Sustainable integrated human settlement. Building of houses Transferring of existing housing stock.
OC 9: A responsive, accountable, effective and efficient local government system.	Building a capable and developmental state. Fighting corruption. Transforming society	PSG 5: Embed good governance and integrated service delivery through	DSO 4: To provide an effective and efficient support service to the Cape Winelands District executive	SO 10: Institutional development and corporate governance SO 9:

Medium Term Strategic Framework National Outcomes (OC)	National Development Plan	WC Provincial Strategic Plan Goals (PSG)	CWDM - Growth Strategy, District Strategic Objectives (DSO)	Langeberg Strategic Objective (SO)
	and uniting the country.	partnerships and spatial alignment.	directorates so that the organisational objectives can be achieved through the provision of HRM, admin support, communication, ICT and sound international and intergovernmental relations. DSO 6: To ensure financial sustainability of the Cape Winelands District and fulfilment of statutory requirements.	Sound Financial Management SO 11: Good Governance Effective Stakeholder engagement Implementation of ward participatory system Implementation of communication strategy Printing of external newsletter SO 7: Social and Community Development Youth advisory council programs for youth. Implementation of Thusong centre programmes.
OC 10: Environmental assets and natural resources that is well protected and continually enhanced.	Use resources sustainably (transition to a low-carbon economy)	PSG 5: Embed good governance and integrated service delivery through partnerships and spatial alignment	DSO 1: To facilitate sustainable economic empowerment of all communities within the CWD through economic, environmental and social infrastructure investment, poverty alleviation, job creation and skills development	SO 2: Sustainable civil engineering infrastructure services Demand management of water resources SO 6: Provision of clean environment Implementation of Waste Management Plan SO3: Energy efficiency for a sustainable future Demand Management of electricity
OC 11: Create a better South Africa and contribute to a better and safer Africa and World.	Transform society and unite the nation.	PSG 4: Enable a resilient, sustainable, quality and inclusive living environment.	DSO 5: To facilitate and ensure the development and empowerment of the poor and most vulnerable people, particular women, children, youth the disabled, elderly	SO11: Good Governance. Training programs for citizens in both rural and urban areas. SO8: Growth and Economic Development. Implement EPWP

Medium Term Strategic Framework National Outcomes (OC)	National Development Plan	WC Provincial Strategic Plan Goals (PSG)	CWDM - Growth Strategy, District Strategic Objectives (DSO)	Langeberg Strategic Objective (SO)
			persons and rural dwellers throughout Cape Winelands.	projects. Skills Development programs. Arts and culture programs within area. Rural development programs. Establishments of ECD centres within rural areas. SO7: Social and community development. Youth programs. SO 5: Promotion of public safety. Law enforcement.

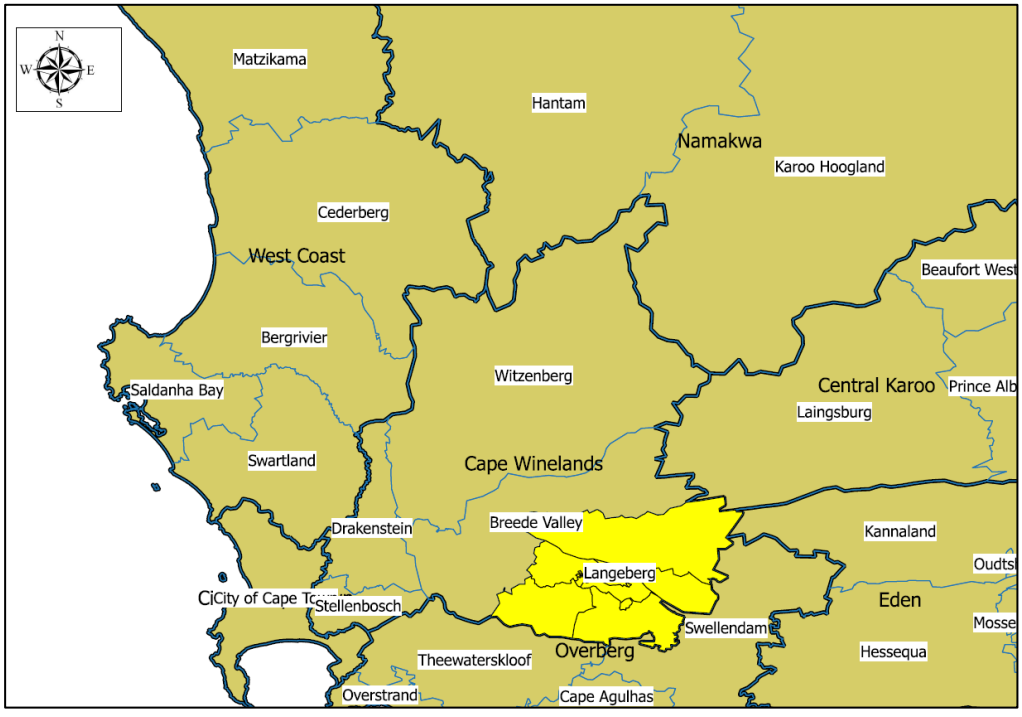
Source: LLM IDP 2016-17

5.6 Geographical Area of Study and Ward Zones

5.6.1 Geographic Area of Study

The LLM is a part of the Cape Winelands District Municipality in Western Cape, South Africa. LLM is neighboured by Breede Valley Municipality to the north and west, Kannaland Municipality to the east, Swellendam Municipality to the south east and Theewaterskloof Municipality to the south west and Laingsburg Municipality to the north east (Map 5.1). The municipality covers an area of approximately 4 517.4 km^2.

Map 5.1: Langeberg Local Municipality in relation to other municipalities



The major towns are Ashton, Bonnievale, McGregor, Montagu and Robertson (Map 5.2). Other smaller settlements are Zolani an Nqkubela. The municipality is flanked by the N1 from Cape Town in the North and the N2 in the South. The main roads in the municipality are the R60, R62, R317 and R318. The R60 links Robertson and Ashton, the R317 links Robertson to Bonnievale and the R62 links Montagu to Ashton. The R318 traverses the north west of the municipality from the N1 through to Montagu. The area is predominantly rural with a high unemployment rate and is dominated by low income households.

Map 5.2: Langeberg Municipality Map

5.6.2 Ward Zones

LLM is divided into 12 wards. The spatial orientation of the wards are shown in Map 5.3 and the ward details are listed in Table 5.5.

Map 5.3: LLM Wards

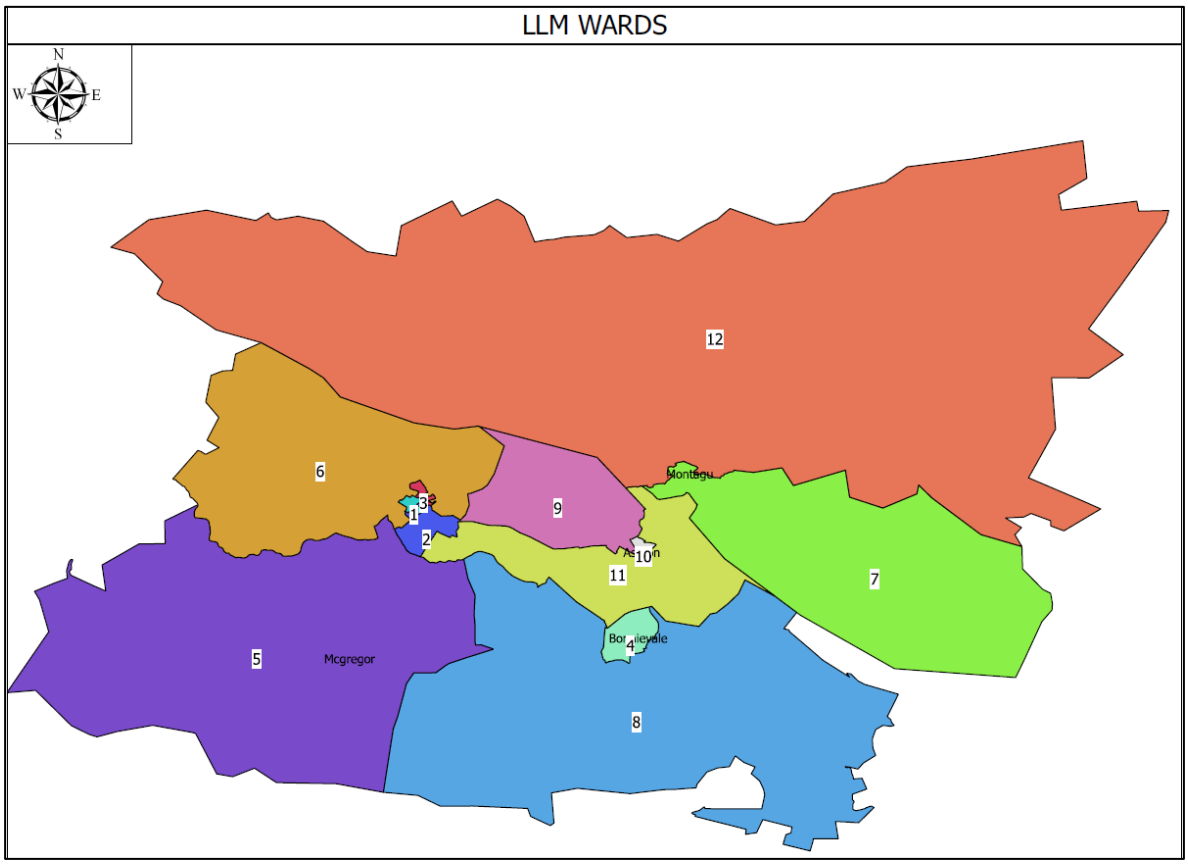


Table 5.5: LLM Ward Details

Ward Area Number	Ward Area
1	Robertson
2	Robertson (Nkqubela)
3	Robertson
4	Bonnievale (Happy Valley)
5	McGregor
6	Robertson
7	Montagu
8	Bonnievale
9	Ashton
10	Ashton (Zolani)
11	Ashton (Rural)
12	Montagu

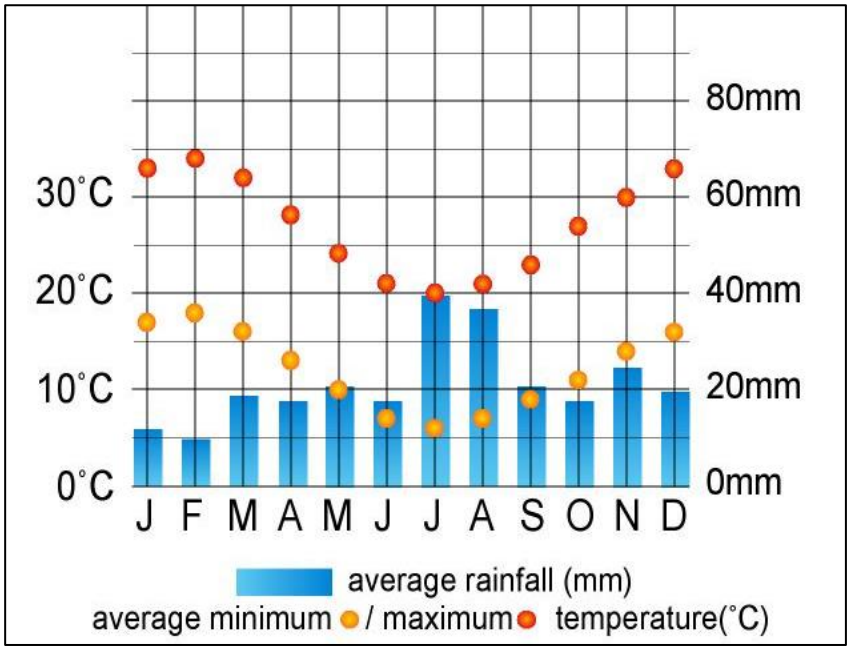
Source: LLM IDP 2016-17

5.6.3 Geo-physical and Geo-hydrological conditions

5.6.3.1 Climate

LLM is a predominantly winter rainfall region experiencing most of its annual precipitation in summer months (Figure 5.3). Langeberg receives approximately 250mm of rain per annum and experiences a high average temperature of 33°C during summer months and average temperatures as low as 6°C in July.

Figure 5.3: LLM Average Temperatures and Rainfall

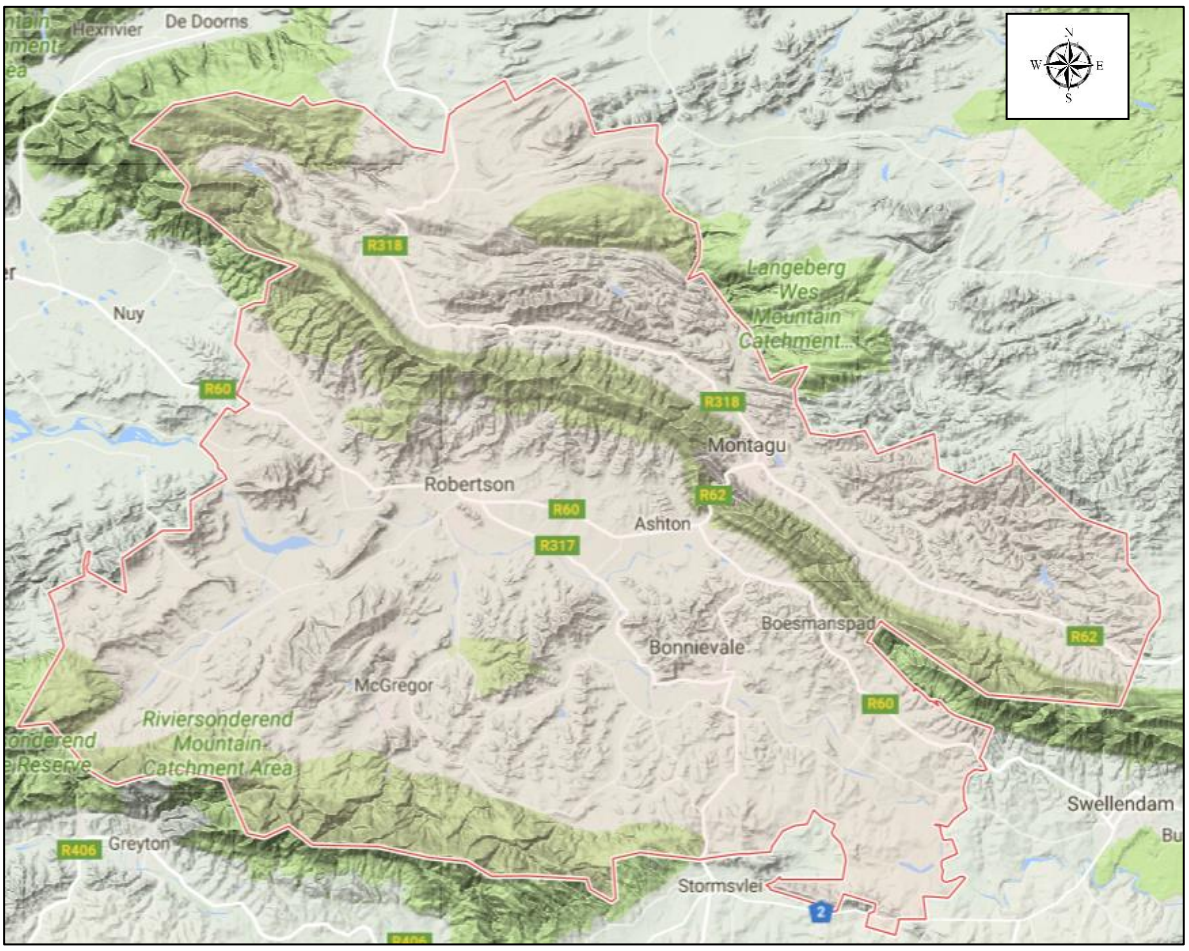


Source: http://www.jabedimapping.com/jabmaps/ImagesWinelandsLangebergLangebergAreaMap4Jpg

5.6.3.2 Topography

The topography of LLM is dominated by two major mountain ranges – the Langeberg Mountain Range which stretches across the north-west of the municipality passing Robertson, Montagu and Ashton east towards Swellendam; and the Riviersonderend Mountain Range which is to the south of the town of McGregor (Map 5.4). The LLM lies between these two mountain ranges and has rich, fertile soil suitable for agriculture. As a result of this, agriculture is of the greatest economic sectors in LLM in terms of both employment and GDP.

Map 5.4: LLM Topography Map



Source: Google Maps, 2016

5.6.3.3 Geology, geohydrology and hydrology

LLM is underlain by five main geological formations: the Table Mountain, Bokkeveld, Witteberg Groups, Dwyka and Ecca Groups. The Table Mountain, Bokkeveld, Witteberg Groups belong to the Cape Supergroup whilst the Dwyka and Ecca Groups belong to the Karoo Supergroup.

Most of LLM lies over the Cape Supergroup which consists of the sand derived sedimentary rock of the Table Mountain Group, the clay derived sedimentary rock of the Bokkeveld Group and the shales and sandstones of the Witteberg Group.

LLM lies within the Breede Water Management Area which has strong yield of water from the underlying aquifer system. The current annual abstraction rate from surface water is approximately 6100 megalitres per annum (GLS Consulting, 2012).

The main river flowing through the area is the Breede River which flows for 337km from Ceres towards the Indian Ocean at Infanta. This river is an important water resource in the LLM.

The Breede River supplies Ashton, Bonnievale and Robertson via an irrigation canal. Robertson also sources water from the Langeberg catchment area north of Robertson. McGregor is supplied with water from the Houtsbaai River and Montagu is supplied from the Kruiskloof, Keurkloof, Rietvlei and CBR pipeline scheme (GLS Consulting, 2012).

6 Situational Analysis

The situational analysis is important as it develops the understanding of the existing waste management practices or systems of the LLM Solid Waste and is essential for the development of the IWMP in terms of the following:

- Identification of gaps and needs;
- Development of goals, targets and projects;
- Implementation strategy and plan; and
- Monitoring and review.

The situational analysis section will discuss the following topics:

- Applicability of existing legislation and plans and how these are being implemented;
- The demographic profile of LLM;
- The classification and nature of waste in LLM;
- The existing waste management structures;
- Previous waste management objectives; and
- The economic and financial aspects of waste management in LLM.

6.1 Legislation

Legislation is important as it advises how waste should be managed, monitored and enforced. This section will discuss the legislation and international treaties applicable to waste management, the current level of implementation of the legislation and plans and the adequacy and effectiveness of current legislation.

6.1.1 Applicable Legislation and Plans

The legislation most pertinent to the management of waste in South Africa is the National Environmental Management Waste Act, (Act 59 of 2008). The Act was promulgated to provide for institutional arrangement and planning matters, to provide for national norms and standards for regulating management of waste by all spheres of government, and to provide for the licensing and control of waste management activities and all matters connected therewith. It provides the much needed legislative framework for the management of waste in South Africa. All legislation relevant to solid waste management are listed below:

- Constitution of the Republic of South Africa, 1996
- National Environmental Management: Waste Act, 2008
- National Waste Management Strategy, November 2011
- Environment Conservation Act No. 73 of 1989
- White Paper on Integrated Pollution and Waste Management of South Africa, Government Gazette, No. 20978, March 2000
- National Health Act, Act 61 of 2003
- Western Cape Health Care Waste Management Act, Act 7 of 2007.
- Western Cape Health Care Waste Management Amendment Act, Act 6 of 2010.National Health Act, Act 61 of 2003, Department of Health, 2004
- Department of Environmental Affairs and Development Planning (DEA&DP) Directorate: Waste Management [2012]. Integrated Waste Management Planning: A Guide for Waste Management Planning, Volume 1- Conducting a Status Quo Analysis (ISBN: 978-0-621-40822-5), and Volume 2 – Section A – Identification of Waste Management Needs and Objectives; Section B – Development, Implementation and Evaluation of IWMPs, (ISBN: 978-0-621-40822-5), Cape Town, South Africa.
- National Environmental Management Act, Act 107 of 1998
- The Municipal Structures Act, 1998 (Act No. 117 of 1998)
- Municipal Systems Act, No. 32 of 2000
- National Environmental Management: Waste Amendment Act, No. 26 of 2014
- The National Environment Management: Air Quality Act, No. 39 of 2004
- Hazardous Substances Act, No. 5 of 1973
- Health Care Waste Management Amendment Act, No. 6 of 2010
- Western Cape Health Care Waste Management Act, No. 7 of 2007
- Western Cape Health Care Waste Management Act, 2007 (Act 7 of 2007): Western Cape Health Care Risk Waste Management Regulations, 2013
- National Water Act, No. 36 of 1998

- National Domestic Waste Collection Standards (GG No. 33935 GN. No. 21)
- Waste Classification and Management Regulations (GG No. 36784 GN. No. 634)
- National Norms and Standards for the Assessment of Waste for Landfill Disposal (GG No. 36784 GN. No. 635)
- National Norms and Standards for Disposal of Waste to Landfill (GG No. 36784 GN. No. 636)
- List of Waste Management Activities (GG No. 37083 GN. No. 921)
- National Waste Information Regulations (GG No. 35583 GN. No. 625)
- Integrated Pollutant and Waste Information System
- National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) Notice of Approval of an Integrated Industry Waste Tyre Management Plan of the Recycling and Economic Development Initiative of South Africa (GG No. 35927)
- Plastic Carrier Bag and Plastic Flat Bag Regulations (GG No. 24831 GN. No. 625)
- National Environment Management: Waste Act, No. 59 of 2008: Waste Management Plans for Approval (GG No. 39018 GN. No. 736)
- National Environment Management: Waste Act, No. 59 of 2008: Industry Waste Management Plans (P.N. 365/2013)
- 1989 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
- Stockholm Convention on Persistent Organic Pollutants 2001
- Langeberg Spatial Development Framework (CNdV, 2015)
- Langeberg Local Municipality IDP 2016-17
- The 1st Generation WCIWMP (DEA&DP, 2011)
- The National Development Plan Vision for 2030 (National Planning Commission, 2011)
- The Western Cape Spatial Development Framework (DEA&DP, 2009)6.1.1.1 Constitution of the Republic of South Africa

A detailed description of each can be found in Appendix B.

6.1.2 Current level of implementation of existing legislation

The current level of implementation of legislation, discussed in Section 6.1, by LLM is summarised in Table 6.1. LLM is providing solid waste collection services to its residents and performing waste planning, waste minimisation, re-use, and recycling. However, it to improve with respect to the following:

- Increasing the diversion from landfill through increased recycling efforts,
- Full cost accounting through true cost reflective tariffs,
- Acquisition of skilled staff in Solid Waste Management, and
- Completing the rehabilitation and closure of its WMFs.

Table 6.1: Current level of implementation

Legislation / Plan	Level of implementation
Constitution of the Republic of South Africa, 1996	Currently LLM is promoting socio-economic development and environmental health by providing refuse collection services to most of its residents (63.7% in 2001 which increased to in 71.7% in 2011), managing its WMFs and also providing cleansing services in the various towns.
National Environmental Management: Waste Act, 2008	To protect health, well-being and the environment by providing reasonable measures for: i. minimising the consumption of natural resources - Recycling and materials recovery is being done by the municipality ii. avoiding and minimising the generation of waste - Recycling and materials recovery is being done by the municipality iii. reducing, re-using, recycling and recovering waste - Recycling and materials recovery is being done by the municipality iv. treating and safely disposing of waste as a last resort - Recycling and materials recovery is being done by the municipality v. preventing pollution and ecological degradation - LLM is remediating and rehabilitating its older sites vi. securing ecologically sustainable development while promoting justifiable economic and social development –LLM is diverting waste from its WDF vii. promoting and ensuring the effective delivery of waste services - LLM delivers waste services to most of its residents viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment - LLM is remediating and rehabilitating its older sites. As part of the National Department of Environmental Affairs (DEA) initiative to licence all unpermitted facilities, sites identified for closure in LLM include McGregor, Montagu and Bonnievale WMFs. Closure licences are currently underway for these facilities. Closure report stating the closure design, closure requirements and end use plans will need to be developed for these facilities by the municipality after waste management licences for closure have been granted ix. achieving integrated waste management reporting and planning. - LLM is currently updating their IWMP and reports to IPWIS and does annual IWMP reviews b) to ensure that people are aware of the impact of waste on their health, well-being and the environment - LLM has created littering and illegal dumping posters and has some EPWP campaigns c) to provide for compliance with the measures set out in paragraph (a) - LLM is in regular contact with DEA&DP to ensure that audits and necessary reporting is complied with d) generally, to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being. - This is part of the vision and strategic objective of LLM
National Waste Management Strategy, November 2011	To protect health, well-being and the environment through sound waste management and application of the waste management hierarchy -Recycling and materials recovery is being done by the municipality, LLM is remediating and rehabilitating its older sites, LLM is currently updating their IWMP and reports to IPWIS and does annual IWMP reviews, LLM is promoting socio-economic development and environmental health by providing refuse collection services to most of its residents, managing its WMF and also providing cleansing services in the various towns.
Environment Conservation Act No. 73 of 1989	LLM does clean ups of illegal dumping as and when reported by residents but greater enforcement and prosecution of offenders is needed.
White Paper on Integrated Pollution and Waste Management of South Africa, Government Gazette, No. 20978, March 2000	This IWMP will inform the key issues to be addressed as listed in the White Paper (2000).
Western Cape Health Care Waste Management Act, 2007 (Act 7 of 2007): Western Cape Health Care Risk Waste Management Regulations, 2013	All health facilities and health care risk waste is monitored and enforced by the provincial government of the Western Cape.
Western Cape Health Care Waste Management Amendment Act, Act 6 of 2010.National Health Act, Act 61 of 2003, Department of Health, 2004	Same as National Health Act, Act 61 of 2003
Department of Environmental Affairs and Development Planning (DEA&DP) Directorate: Waste Management [2012]. Integrated Waste Management Planning: A Guide for Waste Management Planning, Volume 1- Conducting a Status Quo Analysis (ISBN: 978-0-621-40822-5), and Volume 2 – Section A – Identification of Waste Management Needs and Objectives; Section B – Development, Implementation and Evaluation of IWMPs, (ISBN: 978-0-621-40822-5), Cape Town, South Africa.	This IWMP is being developed using these guidelines as the basis for the report
National Environmental Management Act, Act 107 of 1998	A complaints register for solid waste does exist and is used to monitor illegal dumping or poor service delivery. Response to cleaning up illegal dumping also occurs but no enforcement or penalties are applied. This shall form part of the future by-law for solid waste. This IWMP will aim to encompass the principles of NEMA, some of which are not being performed.
The Municipal Structures Act, 1998 (Act No. 117 of 1998)	Solid waste collection services are provided to most of the community but not all have access to basic services due to the remoteness of towns and farms. Resources are not utilised optimally and the activities of solid waste management are not currently financially or environmentally sustainable. Reviewing of services occurs infrequently.
Municipal Systems Act, No. 32 of 2000	LLM does have tariffs but the solid waste does not appear to be cost reflective and needs revision. This IWMP will undergo a public participation process before being finalised and incorporated into the next IDP of LLM
National Environmental Management: Waste Amendment Act, No. 26 of 2014	DEA&DP are involved with all stages of this IWMP thus far and have also compiled the 1st Generation WCIWMP.
The National Environment Management: Air Quality Act, No. 39 of 2004	No air quality monitoring or measures to improve air quality are in place.
Hazardous Substances Act, No. 5 of 1973	Container for hazardous waste from Ashton MRF is transported to Vissershok
National Health Act, Act 61 of 2003	All health facilities and health care risk waste is monitored and enforced by the provincial government of the Western Cape.
Heath Care Waste Management Amendment Act, No. 6 of 2010	The Montagu and Robertson Hospitals have a health care risk waste management plan in place. The municipality must ensure that all clinics and mobile clinics have plans in place. All health facilities and health care risk waste is monitored and enforced by the Provincial Government of the Western Cape.
Western Cape Health Care Waste Management Act, No. 7 of 2007	Montagu and Robertson Hospitals have a health care risk waste management plan in place. The municipality must ensure that all clinics and mobile clinics have plans in place. All health facilities and health care risk waste is monitored and enforced by the Provincial Government of the Western Cape.
Western Cape Health Care Waste Management Act, 2007 (Act 7 of 2007): Western Cape Health Care Risk Waste Management Regulations, 2013	The Montagu and Robertson Hospitals have a health care risk waste management plan in place. The municipality must ensure that all clinics and mobile clinics have plans in place. All health facilities and health care risk waste is monitored and enforced by the Provincial Government of the Western Cape.
National Water Act, No. 36 of 1998	Waste and leachate from LLM WMFs are being managed properly and safeguarded against water pollution risks. LLM will rehabilitate and close the McGregor, Montagu and Bonnievale WMFs once the application has been approved.
National Domestic Waste Collection Standards (GG No. 33935 GN. No. 21)	LLM is providing refuse collection services to most of its residents (63.7% in 2001 which increased to in 71.7% in 2011),
Waste Classification and Management Regulations (GG No. 36784 GN. No. 634)	LLM complies with these regulations in their management of waste.

Legislation / Plan	Level of implementation
National Norms and Standards for the Assessment of Waste for Landfill Disposal (GG No. 36784 GN. No. 635)	These limits must be abided by any waste producer in the municipality in order for them to properly dispose of waste and ensure that the environment is protected.
National Norms and Standards for Disposal of Waste to Landfill (GG No. 36784 GN. No. 636)	LLM must ensure that if it does accept waste at the Ashton WDF is within the limits as prescribed within this piece of legislation
List of Waste Management Activities (GG No. 37083 GN. No. 921)	LLM is aware of the processes and procedures triggered by the various listed activities and conducts them as needed for WDF application licenses.
National Waste Information Regulations (GG No. 35583 GN. No. 625)	LLM is registered on IPWIS and logs their monthly waste quantities for all WMFs
Integrated Pollutant and Waste Information System	LLM is registered on IPWIS and logs their monthly waste quantities for all WMFs. There has been no contraventions as of yet.
Integrated Tyre Waste Management Plan (GG No. 35927)	Tyre companies within LLM are registered with REDISA and collection occurs twice a month
Plastic Carrier Bag and Plastic Flat Bag Regulations (GG No. 24831 GN. No. 625)	Supermarkets and other distributors of plastic bags in LLM are compliant with the regulations
National Environment Management: Waste Act, No. 59 of 2008: Notice of Intention to Require the Paper and Packaging Industry, Electrical and Electronic and Lighting Industry to Prepare and Submit to the Minister Industry Waste Management Plans for Approval (GG No. 39018 GN. No. 736)	Paper and Packaging Industry, Electrical and Electronic and Lighting Industries within LLM must submit their Industry Waste Management Plans to the Minister for approval
National Environment Management: Waste Act, No. 59 of 2008: Industry Waste Management Plans (P.N. 365/2013)	Paint, Ink, Adhesive, Cosmetic, Pharmaceutical and Cleaning Chemicals subsectors of the Consumer Formulated Chemical Sector Industries within LLM must submit their Industry Waste Management Plans to the Minister for approval.
Basel Convention	Health care risk waste is handled by the provincial government. All other hazardous waste generated by industries is taken to Vissershok WMF.
Stockholm Convention	WMFs are being operated according to the Minimum Requirements (1998) and waste is not burnt so harmful pollutants are not being released into the atmosphere. Any reportings of burning waste is immediately reported and dealt with accordingly.
Relevant by-laws and policies	LLM has no by-laws and policies for waste management. The waste by-law is seen as a future project.
Langeberg Spatial Development Framework 2015 (CNdV, 2015)	LLMs SDF ensures that that future developments are easily accessible in terms of waste services provided
Langeberg Local Municipality IDP 2016-17	The IDP takes cognisance of this IWMP as a key requirement for Solid Waste Management
The Western Cape Integrated Waste Management Plan (DEA&DP, 2011)	Increase diversion of waste from WMFs up to 15% by 2014 against the 2010 waste generation data - Currently 9% in LLM. License 80% of waste disposal facilities by 2014 - Most are licensed with application of closure license being applied for the McGregor WMFs. Ensure that 75% of households receive basic waste collection services by 2014 - 71.7% of households receive basic collection services as of 2011.
The National Development Plan Vision for 2030 (National Planning Commission, 2011)	Economy and Employment – employing staff to manage solid waste Economic infrastructure – the solid waste removal tariffs include the cost of operating and managing infrastructure. Environmental sustainability and resilience – rehabilitation of WMFs.
The Western Cape Spatial Development Framework (DEA&DP, 2009)	LLM is taking cognisance of the recommendations and encourages densification and urban development.

6.2 Demographics

This section will assess the current demographics in LLM. Understanding the demographics will help in identifying current and future needs such as education and training, job creation, waste services and infrastructure for the residents of LLM.

6.2.1 Current Population

6.2.1.1 Population, Household Size and Growth

Overall LLM experienced a population growth between 2001 and 2011 of approximately 1.79% per annum (Stats SA, 2011). Assuming a 0.69% p.a. as the per the *Western Cape Population Projections 2011-2040* (PricewaterhouseCoopers, 2014), the 2016 figure should be approximately 102 472 people living in approximately 26 337 households. Table 6.2 highlights that approximately half of the population of LLM live within the non-urban areas (30%) and Robertson (22.4%). The remaining half live in the formal town areas (Ashton, Bonnievale, McGregor) have populations which are of similar population size in comparison to township areas of Zolani and Nqkubela. This indicates that there should be an equal focus on the provision of waste services for urban and non-urban settings. The household sizes for the township areas of Zolani and Nqkubela have smaller household sizes in comparison to the urban towns. This indicates that there is a growing trend of urbanisation as people are moving from the townships and farms towards the urban towns.

Table 6.2: Population and household figures by sub-place

Area name	2011 Households	2011 Population	Average Household size 2011	2016 Households	2016 Population	Population share of LLM (%)
Ashton	1775	7725	4.35	1861	8100	7.9%
Bonnievale	2377	9091	3.82	2492	9532	9.3%
Langeberg NU (Non-Urban or farms)	7182	29291	4.08	7531	30713	30.0%
Mcgregor	653	3127	4.79	685	3279	3.2%
Montagu	4028	15177	3.77	4224	15914	15.5%
Nkqubela	1849	5788	3.13	1939	6069	5.9%
Robertson	5675	21929	3.86	5951	22994	22.4%
Zolani	1578	5599	3.55	1655	5871	5.7%
LLM	25117	97727		26 337	102 472	100%

Source: Stats SA, 2011 & PricewaterhouseCoopers, 2014

6.2.2 Future Population

Future population projections based on the *Western Cape Population Projections 2011-2040* (PricewaterhouseCoopers, 2014) are shown in the table below.

Table 6.3: Population projections

Area Name	Year			
	2016	2026	2036	2040
Ashton	8100	8768	9293	9438
Bonnievale	9532	10319	10936	11107
Langeberg NU (Non-Urban)	30713	33246	35235	35787
Mcgregor	3279	3549	3762	3820
Montagu	15914	17226	18257	18543
Nkqubela	6069	6570	6962	7072
Robertson	22994	24890	26379	26792
Zolani	5871	6355	6735	6841
LLM	102472	110924	117557	119399
Increase in population compared to 2016 (%)		8%	15%	17%

The population of LLM will grow to approximately 119 399 by 2040 which is a 17% increase in the total population compared to the current 2016 population. This is important as it gives an indication that any waste services that are implemented and that any planned WMFs should account for this increase in population and the associated increase in waste generation.

6.2.3 Socio-economic profile of LLM

6.2.3.1 Income

There are three income levels namely low, middle and high. These income levels are defined in Table 6.4. The DEA&DP have outlined incomes for the income levels but the income level definition data obtained from the Western Cape Provincial Treasury differs slightly. Therefore, the Western Cape Provincial Treasury groupings, closest to those in DEA&DP as shown in Table 6.4, will be used for this report.

Table 6.4: Income level definition

Income level group	DEA&DP Annual income (DEA&DP, 2012)	Income Level to suit Western Cape Provincial Treasury data (Rands)
Low	R0 - R50 613	R0 - R47 885
Middle	R50 614 - R404 901	R47 886 – R383 081
High	R404 902 - R3 239 207 or more	R383 082 and more

The distribution of income levels obtained from the Western Cape Provincial Treasury has been populated in Table 6.5. The majority of households, almost 55%, in LLM can be categorised as low income households earning below R47 885 per annum (Table 6.5). Middle income households make up 40% of the total households in LLM with high income households contributing to 5% of households.

The areas with the greatest number of low income households are the townships of Zolani and Nkqubela. The most affluent areas are Robertson and McGregor followed by the remaining urban towns. The figures do not correspond with the household sizes as the household sizes are larger for the higher income urban towns compared to the low income townships. This indicates that in LLM, the household size is not an indication of income level but that it is rather an outcome of cultural and behavioural values such as large families. This has an implication on waste generation where low income households will generate considerably less waste than high income households.

Table 6.5: Income levels and distribution

	Income level		
	Low	Middle	High
Area Name	R0 - R47 885	R47 886 – R383 081	R0 - R47 885
Ashton	51%	43%	5%
Bonnievale	53%	43%	4%
Mcgregor	50%	45%	5%
Montagu	54%	40%	6%
Nkqubela	84%	16%	0%
Robertson	42%	51%	7%
Zolani	79%	20%	1%
LLM	55%	40%	5%

Source: Western Cape Provincial Treasury, 2016

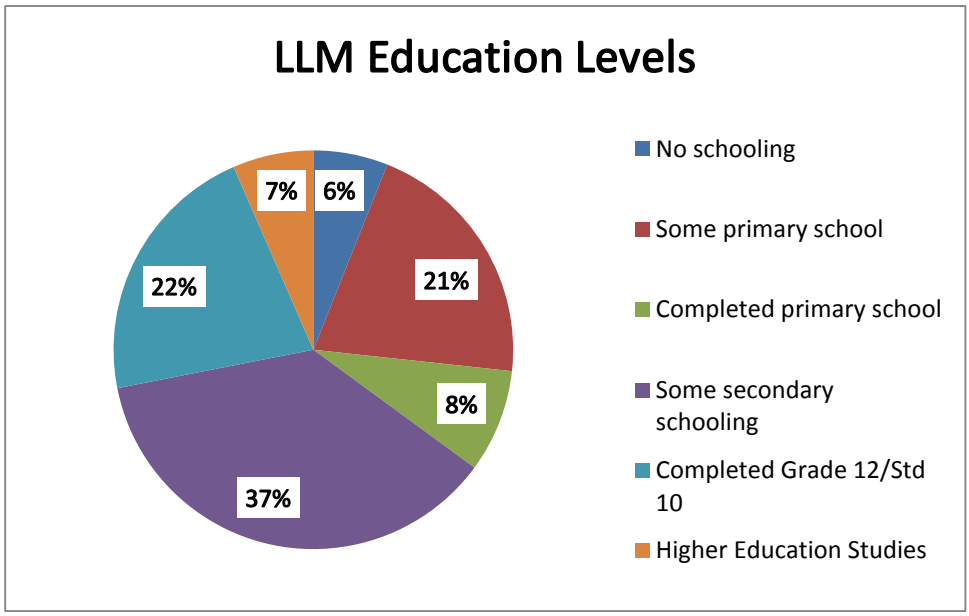
6.2.3.2 Education

The education levels are divided into the categories of:

- People with no schooling,
- Some primary school education,
- Completed primary school education,
- Some secondary school education,
- Completed high school education, and
- Higher education.

Only 22% have completed high school and 7% have some form of higher education, which translates to limited opportunity for high income employment (Figure 6.1). McGregor and Montagu have the best education levels whilst Langeberg NU (farms) have the most basic levels of education (Stats SA, 2011). The distribution of education levels in LLM is shown in Figure 6.1. The majority of the population have some secondary education indicating that there is a high rate of high school students leaving school. This may be either to seek work or because they cannot afford it. This is not surprising as in the previous section on income, it was established that the majority of households are low income.

Figure 6.1: LLM Education Levels



Source: Stats SA, 2011

6.2.3.3 Age

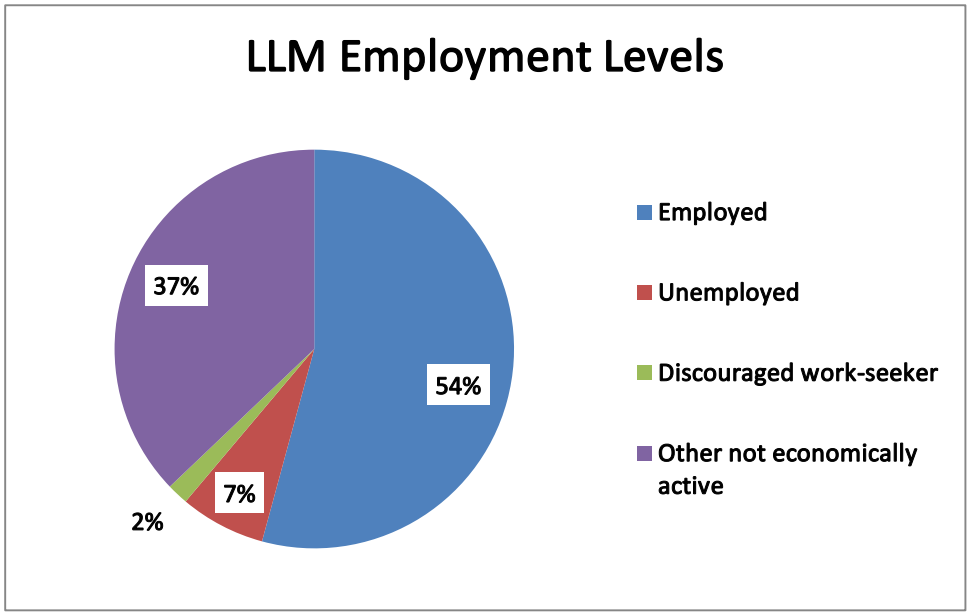
The population has increased and the age distribution has matured between 2011 and 2016, as the elderly population of 65 and older increased from 5.5% to 6.1% (PricewaterhouseCoopers, 2014). However, the population is still quite young and approximately 32% (33 226) of the population are 18 years or younger (PricewaterhouseCoopers, 2014). Considering the youth and the elderly, the working population forms approximately 61% (62 976) of the total population (PricewaterhouseCoopers, 2014).

The age distribution is important as it indicates the need for educational, healthcare and work requirements and that LLM is poor, has high household size numbers and high unemployment levels. These considerations will need to be considered during the needs analysis.

6.2.4 Employment

According to census 2011 data, the workforce of LLM is such that 37% of the population is not economically active whilst 54% are employed, 7% are unemployed and 2% are discouraged work seekers (Figure 6.2).

Figure 6.2: LLM Employment Levels



Source: Stats SA, 2011

Most the workforce originates from Langeberg NU (farms), Robertson and Bonnievale (Stats SA, 2011). This information agrees with the household incomes and the agricultural associated industries and activities in these areas (Table 6.6). The townships, previously noted as low income or poor areas can now be contributed to the low number of employment amongst the working class. This informs the waste generation as lower income households generate less waste compared to high income households.

Table 6.6: LLM Employment Statistics 2011

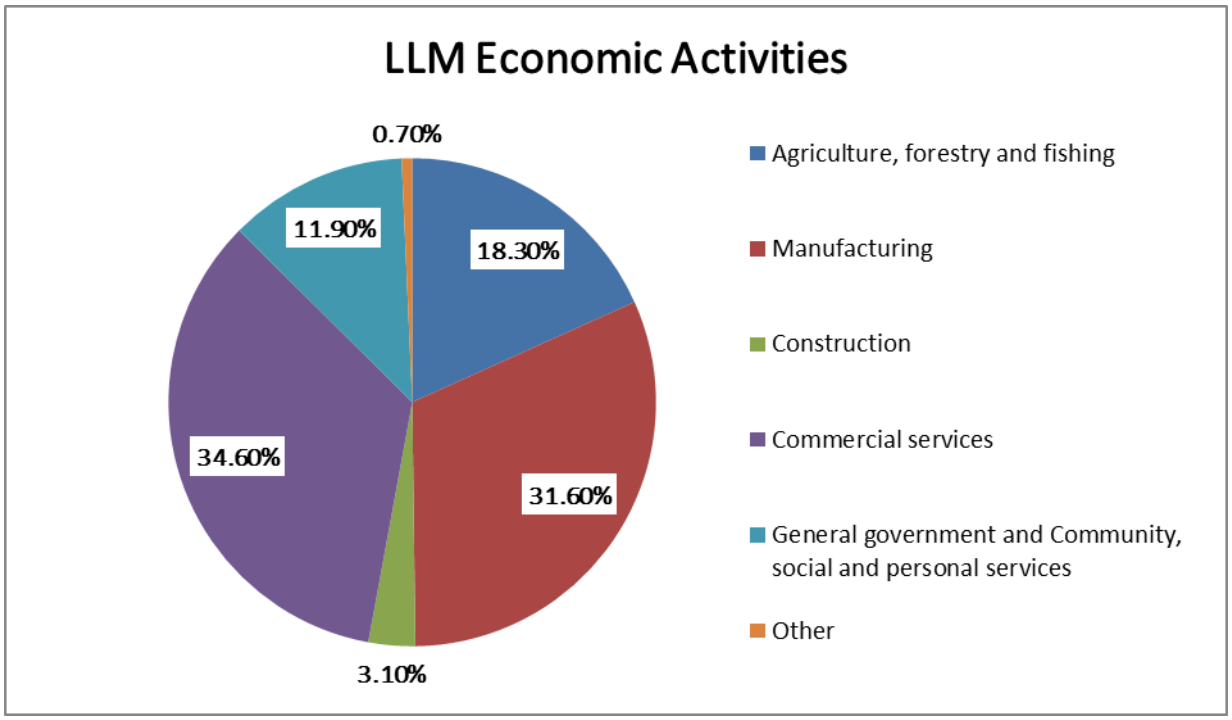
Area Name	Employed	Unemployed	Discouraged work-seeker	Other not economically active
Ashton	2109	488	32	2474
Bonnievale	3427	353	231	1795
Zolani	848	412	217	2162
Nkqubela	1572	1213	190	916
Robertson	7048	936	252	6089
Langeberg NU	14067	300	56	4898
Montagu	4721	578	118	4475
Mcgregor	921	151	14	963
LLM	34713	4431	1110	23772

Source: Stats SA, 2011

6.2.5 Economic Activities

LLM generated approximately R5.8 billion gross value added in 2013 (Municipal Economic Review and Outlook, 2015). Figure 6.3 illustrates that the economy of LLM is strongly driven by commercial services (34.6%), manufacturing (31.6%) and agriculture, forestry and fishing (18.3%). These sectors also account for most of the employed population. As per the Municipal Economic Review and Outlook 2015, LLM has been experiencing a slow recovery after the recession of 2009. The slump in growth has been most notable in the agriculture, forestry and fishing industry.

Figure 6.3: LLM Economic Activities by Gross value added and employment in 2013



Source: Municipal Economic Review and Outlook (MERO), 2015

6.2.6 Current and Projected Development and Infrastructure

Based on visits to the towns of LLM, it can be stated that LLM has good road and rail infrastructure. Waste collection services are provided via road networks. Province in conjunction with LLM is currently in the process of upgrading and expanding the main roads between Ashton and Montagu which will accommodate future increases in traffic volumes.

In addition to the site visits, the main documents used in this report to assess the development and infrastructure of LLM are the Western Cape Potential Growth Potential Study 2014 (DEA&DP, 2014) and the Langeberg SDF (CNdV, 2015). Both studies indicate that there is medium or moderate growth potential.

6.2.6.1 Western Cape Growth Potential Study 2014

The Western Cape Growth Potential Study 2014 (DEA&DP, 2014) indicated that LLM is a medium growth potential municipality. A summary of the growth potential of the towns in LLM is shown in Table 6.7.

Table 6.7: Western Cape Growth Potential for LLM

	Area					
Parameter	LLM	Ashton	Bonnievale	McGregor	Montagu	Robertson
Growth Potential	Medium	Medium	Medium	Medium	Medium	Medium
Socio-economic needs	Medium	Medium	Medium	Very Low	Medium	High
Human Capital Index	Low	Low	High	Medium	High	Medium
Economic Index	Medium	Medium	Medium	Medium	Medium	High
Physical Index	High	Medium	Medium	High	High	Medium
Infrastructure Index	Low	Low	Low	Low	Low	Low
Institutional Index	Medium	Medium	Medium	High	High	High

Source: DEA&DP, 2014

The human capital (work-force) and infrastructure levels are low whilst there is a medium potential in the institutional index (ability to govern) physical index (access to natural resources) and the economic index (income generation and value generation).

This indicates that there is a need in LLM to improve infrastructure and increase efforts in education and training whilst improving service delivery. The economic index is to an extent dependent on the socio-economic conditions of LLM residents which are impacted by the provision of the other resources or indices e.g. (human capital, physical, infrastructure and institutional).

6.2.6.2 Langeberg SDF

The development plans from the SDF (CNdV, 2014) indicate that LLM has moderate growth potential and that most of the growth will be in terms of residential and industrial developments. The proposed developments for the towns are as follows:

- Robertson:
  - Industrial expansions along the Breede River.
  - GAP social housing in Droehewuwel.
  - Possible school and agricultural or mix use development between Droeheuwel and Moreson or alternatively adjacent to Nkqubela in the South.
  - Possible market site in Robertson North.
- Montagu:
  - Middle income housing in Bergsig and market related housing to the south near the Breede River.
  - Mixed use industrial and education areas for area south of Ashbury.
  -
- Ashton:
  - Residential areas expanded in Zolani and also along the abutting intersection with R60.

  - Emphasis on connecting Zolani and Ashton.
- Bonnievale:
  - Mixed income residential properties amounting to approximately of 60 ha required in the future by Happy Valley and Mountain View.
  - Extension to Industrial area.
- McGregor:
  - Low cost housing to be integrated with existing communities.
  - Future residential area expansion to the South West of the town.

6.2.7 Migration

No data on migration was available but the growth rate used for population will include permanent migration. Out migration by skilled youth to urban areas was cited as a major problem in the LLM LED Strategy Review (LLM, 2013).

6.3 Waste Classification

This section of the report looks at the classification of waste in terms of the generation areas, types and characteristics of waste, service levels of waste services, characterisation studies and waste quantities. Understanding the types of waste and associated properties can influence the needs identified for collection services, transportation, waste management facilities (WMFs), treatment, disposal and organisational resources.

6.3.1 Waste Generation Areas

Waste generation sources can broadly be divided into the following areas:

- Residential areas including private gardens and public open spaces;
- Businesses, commercial activities, government institutions and offices;
- Mining industry and light industrial;
- Small farms, small agricultural producers and animal keeping, game farms;
- Health care facilities; and
- Wastewater treatment works (sludge).

6.3.2 Waste Types and Characteristics

This section defines the key waste categories, sources of origin and characteristics.

6.3.2.1 General Waste

General waste "does not pose an immediate hazard or threat to the health or the environment" and includes the following waste flows/categories:

- Domestic waste
- Building and demolition waste
- Business waste
- Inert waste; or
- Any waste classified as non-hazardous waste in terms of the regulations made under section 69 and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles as outlined below:

1. General Waste: Domestic waste

Domestic waste means "waste, excluding hazardous waste that emanates from premises that are used wholly or mainly for residential, educational, health care, sport or recreation purposes, which include:

a) Garden and park waste
b) Municipal waste
c) Food waste" (Waste Amendment Act, 2014).

Major domestic waste generators in the municipality are residents of the various towns, settlements, health care clinics, guest houses and farms. The residents of the formal and informal housing are serviced by LLM.

Most of the domestic waste stream is taken to the Ashton WDF. Recyclables are taken to the Ashton MRF.

2. General waste: Business waste

As per the Waste Amendment Act, No. 26 of 2014, business waste is defined as “waste that emanates from premises that are used wholly or mainly for commercial, retail, wholesale, entertainment or government administration purposes, which include:

1. Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing:
   a) wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing not otherwise specified in Category A
   b) wastes from the preparation and processing of meat, fish and other foods of animal origin
   c) wastes from fruit, vegetables, cereals, edible oils, cocoa, coffee, tea and tobacco preparation and processing; conserve production; yeast and yeast extract production, molasses preparation and fermentation
   d) wastes from sugar processing
   e) wastes from the dairy products industry
   f) wastes from the baking and confectionery industry
   g) wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea and cocoa)
2. Wastes from wood processing and the production of panels and furniture, pulp, paper and cardboard:
   a) wastes from wood processing and the production of panels and furniture not otherwise specified in Category A
   b) wastes from wood preservation not otherwise specified in Category A
   c) wastes from pulp, paper and cardboard production and processing not otherwise specified in Category A
3. Wastes from the leather, fur and textile industries
   a) wastes from the leather and fur industry not otherwise specified in Category A
   b) wastes from the textile industry not otherwise specified in Category A
4. Wastes from thermal processes
   a) wastes from power stations and other combustion plants not otherwise specified in Category A
   b) wastes from the iron and steel industry not otherwise specified in Category A
   c) wastes from casting of ferrous pieces not otherwise specified in Category A
   d) wastes from casting of non-ferrous pieces not otherwise

e) wastes from manufacture of glass and glass products not otherwise specified in Category A
f) wastes from manufacture of ceramic goods, bricks, tiles and construction products not otherwise specified in Category A
g) wastes from manufacture of cement, lime and plaster and articles and products made from them not otherwise specified in Category A

5. Waste from the photographic industry
   a) waste from the photographic industry not otherwise specified in Category A
6. Wastes from shaping and physical and mechanical surface treatment of metals and plastics
   a) wastes from shaping and physical and mechanical surface treatment of metals and plastics not otherwise specified in Category A
7. Oil wastes and wastes of liquid fuels
   a) oil wastes not otherwise specified in Category A
8. Other wastes not specified in the list
   a) wastes from end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance not otherwise specified in Category A
   b) wastes from electrical and electronic equipment not otherwise specified in Category A
   c) wastes from off-specification batches and unused products not otherwise specified in Category A
9. Food wastes
   a) waste from kitchen and restaurant facilities
10. Wastes from waste management facilities
    a) wastes from incineration or pyrolysis of waste not otherwise specified in Category A
    b) wastes from aerobic treatment of solid wastes not otherwise specified in Category A
    c) wastes from anaerobic treatment of waste not otherwise specified in Category A
    d) wastes from shredding of metal-containing wastes not otherwise specified in Category A
    e) wastes from the mechanical treatment of waste not otherwise specified in Category A (for example sorting, crushing, compacting, pelletising) not otherwise specified

Business areas have a different waste generation profile. They are significant waste generators but with a proportionately higher percentage of packaging material in the waste except restaurants, fast food outlets and hotels. The composition of business waste can vary significantly between different types of businesses. Business waste in general has a higher potential for recycling, owing to the fact that waste materials are more homogeneous or exist in higher concentrations within the waste stream, compared to, for example, household waste. Most businesses generate what is classified as a general waste originating from offices, common areas and lounges and service areas. If this waste is properly managed by being separated at source, businesses can contribute to a sustainable solution for waste management.

LLM provides waste collection services to businesses in all the towns. These include retail stores, office blocks, small, medium, micro enterprise (SMME) business and information trading. The waste is taken to the Ashton WDF. Spar, Shoprite and Checkers make use of the LLM disposal facilities for disposal of dry general waste. The wet waste is used as pig feed by local farmers. Certain outlets of

large retailers such as the Spar in Robertson compact their own recyclable waste (mainly packaging plastics and cardboard waste) using machines and then have the waste collected by their own internal operations (Photo 6.1 and Photo 6.2).

Photo 6.1: Plastic re-packaging at Robertson Spar

Photo 6.2: Cardboard compaction at Robertson Spar

The composition of general waste varies considerably between households, businesses and industry, with lower income households in general generating waste with a lower level of recyclable material. The proportion of recyclable and compostable materials in the general waste stream varies between 50% and 80%, respectively (DEAT, 2010).

3. Building and Demolition Waste

LLM has moderate quantities of building and demolition waste which is collected and taken to various WDFs in the municipality. Bessieskop Montagu WDF accepts building and demolition waste from Montagu and Bonnievale WDF accepts building and demolition waste from Bonnievale. The remainder of building and demolition waste is taken directly to Ashton WDF. The building and demolition waste from all facilities is then used as cover material at the Ashton WDF. Bessieskop has reached capacity but Bonnievale will continue to be used as a building and demolition waste site until the regional transfer station in Worcester will be operational. The WDFs are discussed in greater detail in section 6.4.8.

4. Inert Waste

Most of the building and demolition waste can be defined as inert waste as per the definition within the Waste Amendment Act, No. 26 of 2014:

a) does not undergo any significant physical, chemical or biological transformation after disposal;
b) does not burn, react physically or chemically biodegrade or otherwise adversely affect any other matter or environment with which it may come into contact; and
c) does not impact negatively on the environment, because of its pollutant content and because the toxicity of its leachate is insignificant; and which include:
(a) discarded concrete, bricks, tiles and ceramics
(b) discarded glass
(c) discarded soil, stones and dredging spoil.

5. Garden and park waste

Garden and park waste is collected by the municipality and taken to Bonnievale WDF if the waste emanates from Bonnievale. All other garden and park waste is sent to Robertson Composting Facility. The waste is laid in windrows, chipped twice a year using hired chippers, and then sold to farmers as compost.

6. Agricultural and farm waste

Agricultural waste is disposed of with the garden and park waste at the Robertson Transfer Station. However, most farmers are using their own dumps to dispose of their waste as will be illuminated later in this report. LLM Solid Waste Management does provide remote farmers with waste services upon request.

7. Government and Educational Institutions Waste

General waste and recyclables from government and educational institutions are serviced on a weekly basis by LLM. Waste is often disposed of in green drums or plastic bins (Photo 6.3).

Photo 6.3: Waste collection at Bonnievale High School

8. Tyre waste

Tyres are among the largest and most problematic sources of waste. Waste tyres pose an environmental problem, both as pollutants and as breeding grounds for mosquitoes and vermin. Tyres are not desired at WDF sites due to the large volumes and void space, which quickly consumes valuable WDF airspace. The Waste Tyre Regulation (2009) sets out the duties of tyre producers and dealers.

The prohibition of unauthorised disposal of tyres as per Regulation 4 of the Waste Tyre Regulations (2009 including the 11 August 2016 Amendment) is as follows:

"4. No person may-

a) dispose of a waste tyre, or knowingly or negligently cause or permit a waste tyre to be disposed of, in or on any land, water body or at any facility, unless the disposal of that waste tyre is authorised by law;
b) dispose of a waste tyre in a manner that is likely to cause pollution of the environment or harm to health and well-being; or
c) dispose of a whole tyre at a waste disposal facility.
d) dispose of a waste at a waste disposal facility"

Following the Waste Tyre Regulation, an Integrated Industry Waste Tyre Management Plan (IIWTMP) was developed by The Recycling and Economic Development Initiative of South Africa and approved

by Department of Environmental Affairs (DEA) and published in the Government Gazette (No. 35927) in November 2012. The aim of the IIWTMP is to support and promote tyre recycling by providing the collection and depot infrastructure to collect waste tyres from across the country and deliver the tyres to approved recyclers (http://www.redisa.org.za).

Through the REDISA Waste Tyre Management Plan, tyres will now be recycled into useful products instead of polluting the environment (http://www.redisa.org.za).

The tyre dealers in LLM stockpile the tyres at their facilities and REDISA collects the tyres twice a month (Photo 6.4 and Photo 6.5).

.Photo 6.4: Dunlop tyre dealer in Montagu

Photo 6.5: Dunlop tyre dealer in Robertson

6.3.2.2 Definition of hazardous waste

The National Environmental Management: Waste Act (No. 59 of 2008) defines general, hazardous and industry waste as follows:

Hazardous waste means “any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment”.

1. Hazardous Business Waste:

The definition of business waste that is hazardous is defined as one of the following:

1. Wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing
   a) hazardous portion of wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing
2. Wastes from wood processing and the production of panels and furniture, pulp, paper and cardboard:
   a) hazardous portion of wastes from wood processing and the production of panels and furniture
   b) hazardous portion of wastes from wood preservation
   c) hazardous portion of wastes from pulp, paper and cardboard production and processing
3. Wastes from the leather, fur and textile industries
   a) hazardous portion of wastes from the leather and fur industry
   b) hazardous portion of wastes from the textile industry
4. Wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal
   a) wastes from petroleum refining
   b) wastes from the pyrolytic treatment of coal
   c) wastes from natural gas purification and transportation
5. Wastes from inorganic chemical processes
   a) wastes from the manufacture, formulation, supply and use (MFSU) of acids
   b) wastes from the MFSU of bases
   c) wastes from the MFSU of salts and their solutions and metallic oxides
   d) metal-containing wastes
   e) wastes from the MFSU of sulphur chemicals, sulphur chemical processes and desulphurisation processes
   f) wastes from the MFSU of halogens and halogen chemical processes
   g) wastes from the MFSU of silicon and silicon derivatives
   h) wastes from the MSFU of phosphorous chemicals and phosphorous chemical processes
   i) (wastes from the MFSU of nitrogen chemicals, nitrogen chemical processes and fertiliser manufacture
   j) wastes from the manufacture of inorganic pigments
   k) other wastes from inorganic chemical processes

6. Wastes from organic chemical processes
   a) wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals
   b) wastes from the MFSU of plastics, synthetic rubber and man-made fibres
   c) wastes from the MFSU of organic dyes and pigments
   d) wastes from the MFSU of organic plant protection products, wood preserving agents and other biocides
   e) wastes from the MFSU of pharmaceuticals
   f) wastes from the MFSU of fats, grease, soaps, detergents, disinfectants and cosmetics
   g) other wastes from the MFSU of fine chemicals and chemical products

7. Wastes from thermal processes
   a) hazardous portion of wastes from power stations and other combustion plants
   b) hazardous portion of wastes from the iron and steel industry
   c) wastes from aluminium thermal metallurgy
   d) wastes from lead thermal metallurgy
   e) wastes from zinc thermal metallurgy
   f) wastes from copper thermal metallurgy
   g) wastes from silver, gold and platinum thermal metallurgy
   h) wastes from other non-ferrous thermal metallurgy
   i) hazardous portion of wastes from casting of ferrous pieces
   j) hazardous portion of wastes from casting of non-ferrous pieces
   k) hazardous portion of wastes from manufacture of glass and glass products
   l) hazardous portion of wastes from manufacture of ceramic goods, bricks, tiles and construction products
   m) hazardous portion of wastes from manufacture of cement, lime and plaster and articles and products made from them

8. Waste from the photographic industry
   a) hazardous portion of waste from the photographic industry

9. Wastes from the manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks
   b) wastes from MFSU and removal of paint and varnish
   c) wastes from MFSU of other coatings (including ceramic materials)
   d) wastes from MFSU of printing inks
   e) wastes from MFSU of adhesives and sealants (including waterproofing products)

10. Wastes from chemical surface treatment and coating of metals and other materials; non-ferrous hydrometallurgy
    a) wastes from chemical surface treatment and coating of metals and other materials (for example galvanic processes, zinc coating processes, pickling processes, etching, phosphating, alkaline degreasing, anodising)
    b) wastes from non-ferrous hydrometallurgical processes
    c) wastes from sludges and solids from tempering processes
    d) wastes from hot galvanising processes

11. Wastes from shaping and physical and mechanical surface treatment of metals and plastics
    a) hazardous portion of wastes from shaping and physical and mechanical surface treatment of metals and plastics
    b) wastes from water and steam degreasing processes

12. Oil wastes and wastes of liquid fuels (except edible oils)
    a) waste hydraulic oils
    b) waste engine, gear and lubricating oils
    c) waste insulating and heat transmission oils
    d) oil/water separator contents
    e) wastes of liquid fuels
    f) hazardous portion of other oil wastes

13. Waste organic solvents, refrigerants and propellants
    a) waste organic solvents, refrigerants and
    b) foam/aerosol propellants

14. Other wastes not specified in the list
    a) hazardous portion of wastes from end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance
    b) hazardous portion of wastes from electrical and electronic equipment
    c) hazardous portion of wastes from off-specification batches and unused products
    d) wastes from discarded gases in pressure containers and discarded chemicals
    e) wastes from discarded batteries and accumulators
    f) wastes from transport tank, storage tank and barrel cleaning
    g) spent catalysts wastes
    h) oxidising substances wastes
    i) aqueous liquid wastes destined for off-site treatment
    j) waste linings and refractories

15. Construction wastes
    a) wastes from bituminous mixtures, coal tar and tarred products
    b) discarded metals (including their alloys)
    c) waste soil (including excavated soil from contaminated sites), stones and dredging spoil

d) wastes from insulation materials and asbestos- containing construction materials
e) wastes from gypsum-based construction material
f) wastes from other construction and demolition wastes

16. Wastes from human or animal health care and/or related research (except kitchen and restaurant wastes not arising from immediate health care):
    a) wastes from natal care, diagnosis, treatment or prevention of disease in humans
    b) wastes from research, diagnosis, treatment or prevention of disease involving animals

17. Wastes from waste management facilities:
    a) hazardous portion of wastes from incineration or pyrolysis of waste
    b) hazardous portion of wastes from physico/ chemical treatments of waste
    c) hazardous portion of stabilised/solidified wastes
    d) hazardous portion of wastes from aerobic treatment of solid wastes
    e) hazardous portion of wastes from anaerobic treatment of waste
    f) landfill leachate wastes
    g) wastes from shredding of metal-containing wastes
    h) wastes from oil regeneration
    i) wastes from soil remediation

Hazardous waste must be managed in accordance with DWAF's Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste. The SABS Code 0228 classifies hazardous waste into the following classes:

Table 6.8: SABS Code 0228, Hazard Classes

Class	Type
1	Explosives
2	Gases
3	Flammable liquids
4	Flammable solids
5	Oxidising substance and organic peroxides
6	Toxic and infectious substances
7	Radioactive substances
8	Corrosiveness
9	Other miscellaneous substances

Source: DWAF 1998

Hazardous waste is produced mainly by industries and health care facilities with businesses occasionally also contributing to the waste stream. In LLM the healthcare facilities are one of the main producers of hazardous waste.

The “Principles of Integrated Waste Management Planning Participants Manual” developed by DEA&DP (2004) which is based on the National Waste Management Strategy, indicates that a local municipal IWMP must include hazardous domestic waste in detail. “Framework planning for: hazardous industrial waste, agricultural and forestry waste (pesticides), medical waste, mining waste, power station waste, radioactive medical waste and radioactive mining waste will be done at the provincial government level”.

Household hazardous waste: Currently household hazardous waste such as batteries and compact fluorescent lights (CFLs) are included in the general waste, which is disposed of at the Ashton WDF. These wastes contain highly toxic substances such as mercury and cadmium, which can, in small amounts, contaminate large volumes of groundwater when disposed of at WDFs. These waste items decompose very slowly and therefore accumulate in the soil.

Industry waste “includes commercial activities, commercial agricultural activities, mining activities and the operation of power stations”.

Waste streams which include hazardous components and which present particular strategic challenges include (DEAT, 2010):

- Health care waste
- E-waste
- Batteries
- Fluorescent lamps
- Pesticide waste
- Oil
- Sewage sludge.

Industrial activities are concentrated in Ashton, Bonnievale and Robertson. The major businesses in LLM are the wine distilleries and fruit packaging companies.

6.3.2.3 Abattoir waste

LLM is not accepting abattoir waste at Ashton WDF no longer. The amount of abattoir waste is estimated to be 200 tonnes per month and approximately 1200 tonnes per annum. Abattoirs in Robertson and Bonnievale are planning to dispose of their waste at a composting plant.

6.3.2.4 Sewage sludge waste

LLM produces sewage sludge from its waste water treatment works. The sludge has been tested and delisted as waste that can be used for agricultural applications. The waste is blended with soil and sold to farmers as fertilizer. Table 6.9 gives an overview of the operational waste treatment works in the LLM area.

Table 6.9: Waste Water Treatment Works in LLM

Waste Water Treatment Works
Robertson Water Treatment Works
Ashton Water Treatment Works
Montagu Water Treatment Works
Bonnievale Water Treatment Works
McGregor Water Treatment Works

6.3.2.5 Health care risk waste

Health care risk waste (HCRW) comprises the hazardous component of the health care waste stream. HCRW has the potential to create several environmental, health and safety risks, depending on the waste type and the way it is handled.

HCRW includes the following:

- Infectious waste
- Pathological waste, including body fluids, secretions and surgical specimens
- Sharps, especially contaminated sharps
- Pharmaceutical waste
- Chemical waste
- Heavy metals
- Radioactive waste
- Genotoxic waste
- Cytotoxic agents
- Pressurised containers.

In terms of implementing the waste hierarchy, the key challenges in terms of HCRW management lie in the safe treatment and disposal of this waste.

There are 16 healthcare facilities operational in the Langeberg municipal area. These include 8 fixed clinics, 6 mobile or satellite clinics and 2 district hospitals. These healthcare facilities serve 101 543 people within LLM. Hence for every 7 253 people there is one health facility. This indicates a need for more healthcare facilities within the municipal area.

Environmental Health Practitioners, who are stationed at hospitals, are responsible for the control of waste management at hospitals and clinics, being under the supervision of a Chief Environmental Health Practitioner.

In the LLM, HCRW from all clinics is collected to by private contractors called “Solid Waste” which transport the waste to Vissershok hazardous WDF in Cape Town.

6.3.2.6 Other Hazardous waste

No other such hazardous waste was observed on any of the sites or in any of the areas visited.

6.3.2.7 Illegal dumping

Illegal dumping is an issue in some areas (Photo 6.6). The solid waste teams for each town report the illegal dumping incident which is then remedied using a front-end loader (FEL) and two tipper trucks. The waste is then transported to the Ashton WDF. Skips are also provided for garden and park waste in open residential areas.

Photo 6.6: Illegal dumping in Montagu

6.3.2.8 Street Cleaning

Street cleaning is conducted on a daily basis by Solid Waste Management (Photo 6.7). Most towns in LLM appeared to be moderately clean during the site visits. Street cleaning waste is sent to Ashton WDF.

Photo 6.7: Street cleaners in LLM

6.3.3 Service Levels

The service levels of LLM were surveyed in the Stats 2011 survey were categorised as:

- Removed by the local authority (LLM) at least once a week,
- Removed by LLM less often,
- Using a communal refuse dump,
- Using own refuse dump,
- No rubbish disposal, and
- Other.

The results of the service levels in LLM As per the 2011 census data are shown in Table 6.10.

Table 6.10: Service Levels in LLM

Main Area	Removed by local authority/private company at least once a week	Removed by local authority/private company less often	Communal refuse dump	Own refuse dump	No rubbish disposal	Other
Ashton	90%	1%	2%	6%	1%	1%
Bonnievale	97%	0%	0%	0%	1%	1%
Langeberg NU (Non-urban farms)	10%	8%	3%	69%	6%	4%
Mcgregor	95%	0%	1%	3%	1%	0%
Montagu	97%	0%	0%	2%	0%	0%
Nkqubela	90%	0%	0%	6%	2%	1%
Robertson	99%	0%	0%	0%	0%	0%
Zolani	99%	0%	0%	0%	0%	0%
LLM	72%	3%	1%	21%	2%	1%

Source: Stats SA, 2011

Most households in LLM receive waste collection by the municipality (72%), whilst a moderate percentage of farmers (21%) opt are still disposing of their waste illegally. This indicates that there are significant amounts of illegal dumping in the municipality probably due to insufficient waste removal services. The main town areas and townships have high levels of waste service provision by the municipality of 90% and above but the major area of concern is the Langeberg NU areas. Approximately 69% of these households use their own “dumps”. The main issue is the distance and spread of these farms that poses not only a collection issue but also an environmental compliance and enforcement challenge for LLM. Only 2% reported that they do not use any rubbish disposal services.

6.3.4 Waste Characterisation

6.3.4.1 Waste Characterisation Methodology

The waste characterisation of Langeberg was conducted and overseen by the DEA&DP (Photo 6.9). A total of 600 waste samples (Photo 6.8) was collected from the towns between 20 and 26 October Table 6.11.

Table 6.11: Collection of waste samples

Main Town	Sub-area	Total number of households	% of households	# of samples/ households sampled	Waste Collection day	Collection date
Ashton	CONRADIE DORP	1083	7	43	WEDNESDAY	26/10/2016
	KOGMANSKLOOF	967	6	38	WEDNESDAY	26/10/2016
	ZOLANI	1391	9	55	TUESDAY	25/10/2016
Montagu	MONTAGU WEST	345	2	14	MONDAY	24/10/2016
	MONTAGU CDB	1365	9	54	MONDAY	24/10/2016
	MONTAGU OU WOONGEBIED	742	5	29	MONDAY	24/10/2016
	BERGSIG	346	2	14	MONDAY	24/10/2016
	ASHBURY	1487	10	59	TUESDAY	25/10/2016
	MONTAGU SOUTH	432	3	17	TUESDAY	25/10/2016
Bonnievale	HAPPY VALLEY	633	4	25	THURSDAY	20/10/2016
	MOUNTAIN VIEW	649	4	26	THURSDAY	20/10/2016
	BONNIEVALE CBD AND KOP AREA	864	6	34	THURSDAY	20/10/2016
	B/VALE INFORMAL HOUSES	251	2	10	THURSDAY	20/10/2016
Robertson	MôRESON	353	2	14	MONDAY	24/10/2016
	PANORAMA	294	2	12	TUESDAY	25/10/2016
	DORPSIG	300	2	12	TUESDAY	25/10/2016
	UITBREIDING 15	222	1	9	TUESDAY	20/10/2016
	DROEHEUWEL	513	3	20	THURSDAY	20/10/2016
	ROBERTSON CBD	871	6	35	THURSDAY	20/10/2016
	NKQUBELA	1148	8	46	THURSDAY	20/10/2016
	UITBREIDING 14	112	1	4	FRIDAY	21/10/2016
McGregor	McGregor	729	5	29	WEDNESDAY	26/10/2016

The waste characterisation was then conducted in five groups of EPWP workers from the Ashton MRF (Photo 6.10). The following process was followed:

- Black bags were weighed and recorded on the recording sheet as the total weight of the bag
- Black bags opened and sorted
- The waste from each black bag was then sorted by waste type and placed in the tubs.
- Each of the tubs was then weighed and the observed volume and weight for each was then recorded on the record sheet

The waste types were categorised into the following categories:

- Plastic (soft)
- Plastic (dense)
- Paper
- Cardboard
- Glass
- Metals
- Organics (food & green waste)
- Composite packaging/ Tetrapak
- e-waste (computers, electrical appliances, batteries, globes)
- Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)
- Nappies, sanitory towels & condoms
- Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)

The results of the waste characterisation can be found in Appendix C.

Photo 6.8: Collected black bag samples

Photo 6.9: DEA&DP representatives briefing EPWP workers

Photo 6.10: EPWP workers sorting waste into tubs

6.3.4.2 Waste Characterisation Results

In terms of volume, recyclables occupy 61% of the total waste volume in LLM with organic waste accounting for a further 16% of the volume (Table 6.12). This leaves non-recyclables with a 23% volume of the total waste in LLM. Of the recyclables portion soft and dense plastics as well as cardboard and paper were the major contributors to overall volume. McGregor had the lowest volume share of recyclables and the greatest amount for organic waste. In terms of mass (Table 6.13), recyclables accounted for 43% of the mass followed by organic waste which accounted for a further 32% of the waste by mass. The remaining 25% was for non-recyclables. The heaviest recyclable was glass which accounted for 11% of the total mass. McGregor had the greatest percentage share for organics at 45% and Bonnievale had a notable 16% of mass contributed by other wastes. The amount of hazardous household waste accounts for 2% in volume and mass of all waste in LLM. The results of the waste characterisation indicate that there is a significant portion of organic waste and recyclables within the LLM waste stream and if these waste streams are diverted that there would be airspace and savings in the rendering solid waste management services.

Table 6.12: Waste characterisation in terms of volume (m^3)

	Area					
	Ashton	Bonnievale	McGregor	Montagu	Robertson	LLM
Total Volume (m^3)	10.8	1.6	6.5	46.8	43.8	109.5
Plastics (soft)	17%	15%	12%	14%	15%	15%
Plastic (dense)	13%	15%	12%	11%	14%	13%
Paper	11%	9%	10%	10%	9%	10%
Cardboard	15%	14%	12%	12%	14%	13%
Glass	4%	3%	4%	5%	5%	5%
Metals	5%	6%	4%	6%	6%	6%
Organics (food & green waste)	13%	10%	21%	19%	12%	16%
Composite packaging/ Tetrapak	4%	2%	5%	3%	3%	3%
e-waste (computers. electrical appliances. batteries. globes)	1%	1%	1%	1%	1%	1%
Household Hazardous waste (Needles. medicine. tablets. paints. cleaning products etc.)	2%	3%	1%	2%	2%	2%
Nappies. sanitary towels & condoms	4%	3%	6%	3%	4%	4%
Other (wrappers. chips packets. foil. cling wrap. faeces. sand. stone)	13%	19%	12%	12%	14%	13%
Recyclables	**64%**	**62%**	**54%**	**59%**	**64%**	**61%**
Organic waste	**13%**	**10%**	**21%**	**19%**	**12%**	**16%**
Non-recyclables	**23%**	**27%**	**25%**	**21%**	**24%**	**23%**

Table 6.13: Waste characterisation results in terms of mass

	Area					
	Ashton	Bonnievale	McGregor	Montagu	Robertson	LLM
Total Mass(kg)	905.9	387.9	113.2	1 224.4	825.8	3 457.2
Plastics (soft)	3%	5%	2%	4%	4%	4%
Plastic (dense)	5%	6%	4%	9%	8%	8%
Paper	5%	6%	8%	9%	5%	7%
Cardboard	5%	7%	6%	5%	14%	9%
Glass	14%	10%	7%	13%	10%	11%
Metals	3%	5%	2%	4%	5%	4%
Organics (food & green waste)	41%	28%	45%	35%	25%	32%
Composite packaging/ Tetrapak	7%	4%	2%	3%	2%	3%
e-waste (computers. electrical appliances. batteries. globes)	3%	1%	0%	5%	1%	3%
Household Hazardous waste (Needles. medicine. tablets. paints. cleaning products etc.)	1%	4%	0%	3%	1%	2%
Nappies. sanitary towels & condoms	6%	9%	16%	5%	12%	9%
Other (wrappers. chips packets. foil. cling wrap. faeces. sand. stone)	7%	16%	8%	5%	12%	8%
Recyclables	**36%**	**39%**	**29%**	**43%**	**46%**	**43%**
Organic waste	**41%**	**28%**	**45%**	**35%**	**25%**	**32%**
Non-recyclables	**23%**	**33%**	**26%**	**22%**	**28%**	**25%**

6.3.5 Waste Quantities

6.3.5.1 Current Waste Generation

Being able to estimate the quantity of waste generated in a municipality is crucial to all elements of solid waste as it influences collections, WMF operations, long haul transportation and disposal or treatment requirements all associated with human and fiscal resources.

Waste quantities can be estimated via various ways:

- Weighbridge records of waste entering and leaving WMFs;
- Using waste collection vehicle records;
- Using waste generation rates.

The following waste generation rates are prescribed as per DEA&DP (2013).

Table 6.14: Waste Generation Rates

Income group level	Lower limit (kg/person/day)	Upper limit (kg/person/day)	Average Waste Generation Rate (kg/person/day)
High	1.2	2.5	1.85
Middle	1.1	1.2	1.15
Low	0.7	1.1	0.9
Very Low	0.4	0.7	0.55
Informal Settlements	0.2	0.4	0.3

However, rather than using the waste generation rates to estimate waste tonnages the records of vehicles and waste types arriving at the WMFs in LLM was used. The records consist of building and demolition waste, garden and park waste and general waste from households and businesses from the Ashton WDF, Ashton MRF, Bonnievale WMF, Bessieskop (Montagu) WDF and Robertson Transfer Station. The waste records were quantified into tonnes per day (tpd) on the assumption of 22 working days per month (Table 6.15).

Table 6.15: Waste quantities generated based on waste received at WMFs

m		Ashton WDF	Ashton MRF	Bonnievale WMF	Bessieskop (Montagu) Building and demolition waste WDF	Robertson Transfer Station
IPWIS number		W401000704	W401000699	W401001952	W401001945	W401000700
Waste Received at WMF		General Waste	Recyclables	Garden and park waste	Building and demolition waste	Garden and park waste
Monthly tonnages (tpm)	May-15	2345	60	26	146	122
	Jun-15	2260	46	3	7	105
	Jul-15	2593	43	72	72	110
	Aug-15	2092	31	14	30	100
	Sep-15	2471	58	7	72	105
	Oct-15	2768	37	12	248	110
	Nov-15	2496	52	21	59	111
	Dec-15	3092	72	1	19	Weighbridge out of order
	Jan-16	2757	58	2	40	69
	Feb-16	3574	76	4	40	65
	Mar-16	3370	29	3	38	82
	Apr-16	4101	46	1502	21	85
Total tonnages (tpa)		33919	608	1666	792	1063
Average tonnages (tpd)		128	2	6	3	4
Share of total waste tonnage (%)		90%	1%	4%	2%	3%

Currently 143 tpd of waste are taken to WMFs of which only 10% of the waste is being diverted from WDFs. This figure is half of the 1ST Generation WCIWMP target of 20% diversion by 2019. The transfer station being built in Ashton and Bonnievale will contribute to increasing diversion efforts. This in addition to the contribution of private recyclers will enable LLM to achieve the diversion target.

However, the waste records as shown in the table above only accounts for all waste generated, collected and transported to the WMFs.

6.3.5.2 Future Waste Generation and Airspace Requirements

The following assumptions were made in estimating the future waste generation and airspace requirements:

- Population figures were adopted from the *Western Cape Population Projections 2011-2040* report for the 2016 to 2040 period.
- Recyclables comprise 41% of the domestic waste stream by mass as per the waste characterisation study.
- Remaining waste is mixed waste (business and household).
- Density of compacted recyclables and mixed waste is 250kg/m^3. Compacted waste is 500kg/m^3 (DEAT, 2006).
- Garden and park waste are assumed to have a density of 200kg/m^3.

Based on these assumptions the waste quantities and airspace projections were estimated from 2016 to the year 2040 (Table 6.16 and Table 6.17).

Table 6.16: LLM Waste Generation Tonnages

	2016	2020	2025	2030	2035	2040
Recyclables (tpa)	20771	21350	22097	22870	23670	24498
Organic Waste (tpa)	5394	5545	5739	5940	6147	6362
Building and Demolition Waste (tpa)	1666	1713	1773	1835	1899	1965
Garden and Park Waste (tpa)	792	814	842	872	902	934
Non- recyclables	7754	7970	8249	8537	8836	9145
Total Waste (tpa)	36 377	37 391	38 699	40 053	41 454	42 904

Table 6.17: Cumulative Airspace Volume Requirement Projections

	2016	2020	2025	2030	2035	2040
Recyclables (m3)	138 473	701 985	1 428 524	2 180 478	2 958 735	3 764 214
Garden and Park Waste(m3)	26 972	136 736	278 254	424 723	576 315	733 210
Building and Demolition Waste(m3)	2 222	11 263	22 921	34 986	47 473	60 397
Garden and Park Waste(m3)	3 958	20 063	40 828	62 318	84 561	107 582
Non- recyclables (m3)	15 507	78 615	159 980	244 190	331 347	421 552
Total Waste (m3)	187 132	948 661	1 930 506	2 946 695	3 998 430	5 086 954

In 2016 approximately 36 400 tonnes of waste will be disposed annually and will need approximately 187 000m^3 of airspace. Between 2016 and 2040 approximately 5 million m^3 of airspace would be needed to dispose of waste in LLM. This is if recycling does not occur if recycling does occur then there is potential

airspace saving of 3.7 million m^3 of airspace. If it is assumed that a third of the recyclables are recoverable this equates to approximately 1.2 million m^3 which is more than the 20% diversion target set by DEA&DP.

6.4 Existing Waste Management Structure

6.4.1 Organisational Structure

Solid Waste Management is a division of Engineering Services. Solid Waste Management is headed up by a Solid Waste Manager who is assisted by two Solid Waste Superintendents. Each Superintendent oversees either the eastern or western catchment areas. The eastern catchment consists of Ashton, Bonnievale and Montagu and the west comprises Robertson and McGregor. A full organogram of LLM Solid Waste Management for both catchments is shown in Figure 6.4 and Figure 6.5. One Superintendent is responsible for McGregor and Robertson and the other is responsible for Ashton, Bonnievale and Montagu. Supervisors in each of the towns oversee the cleaning teams and the collections team which consists of vehicle and equipment operators and general workers. In addition to the supervisors, there are team leaders for the Ashton, Robertson and Montagu refuse transfer stations and Bonnievale and McGregor drop off facilities. Currently, the role of Waste Management Officer is fulfilled by the LLM Solid Waste Manager. There are currently vacancies in the following positions:

- Two Superintendents.
- Team Leader for Ashton Transfer Station.
- Ashton waste collections tractor driver with skip trailer.
- Ashton compactor operator.
- Weighbridge operator at Ashton WDF.
- Dump scraper operator at Ashton WDF.
- Bonnievale Supervisor.
- Bonnievale waste collections tractor driver with skip trailer.
- Team Leader for Montagu Transfer Station.
- Montagu waste collections tractor driver with skip trailer.
- Team Leader for McGregor drop off.
- Team Leader for Robertson Transfer Station.
- Supervisor in Robertson.
- Weighbridge operator at Robertson Transfer Station.
- Skip truck driver waste collections in Robertson.

HR department assess the competency of prospective employees by performing background checks, using references, assessing CVs and using interviews.

The largest teams are in Robertson and Ashton whilst McGregor has the smallest amount of dedicated staff (1 general worker which has been included as part of the general workers team for McGregor and Robertson). The LLM Solid Waste Management has a compliment of 100% historically disadvantaged staff under employ. LLM Solid Waste currently employs 99 staff consisting of 16 females and 83 males.

The performance is measured by the key performance indicators (KPIs) as listed in Table 6.18.

Figure 6.4: LLM Waste Management Organogram (East)

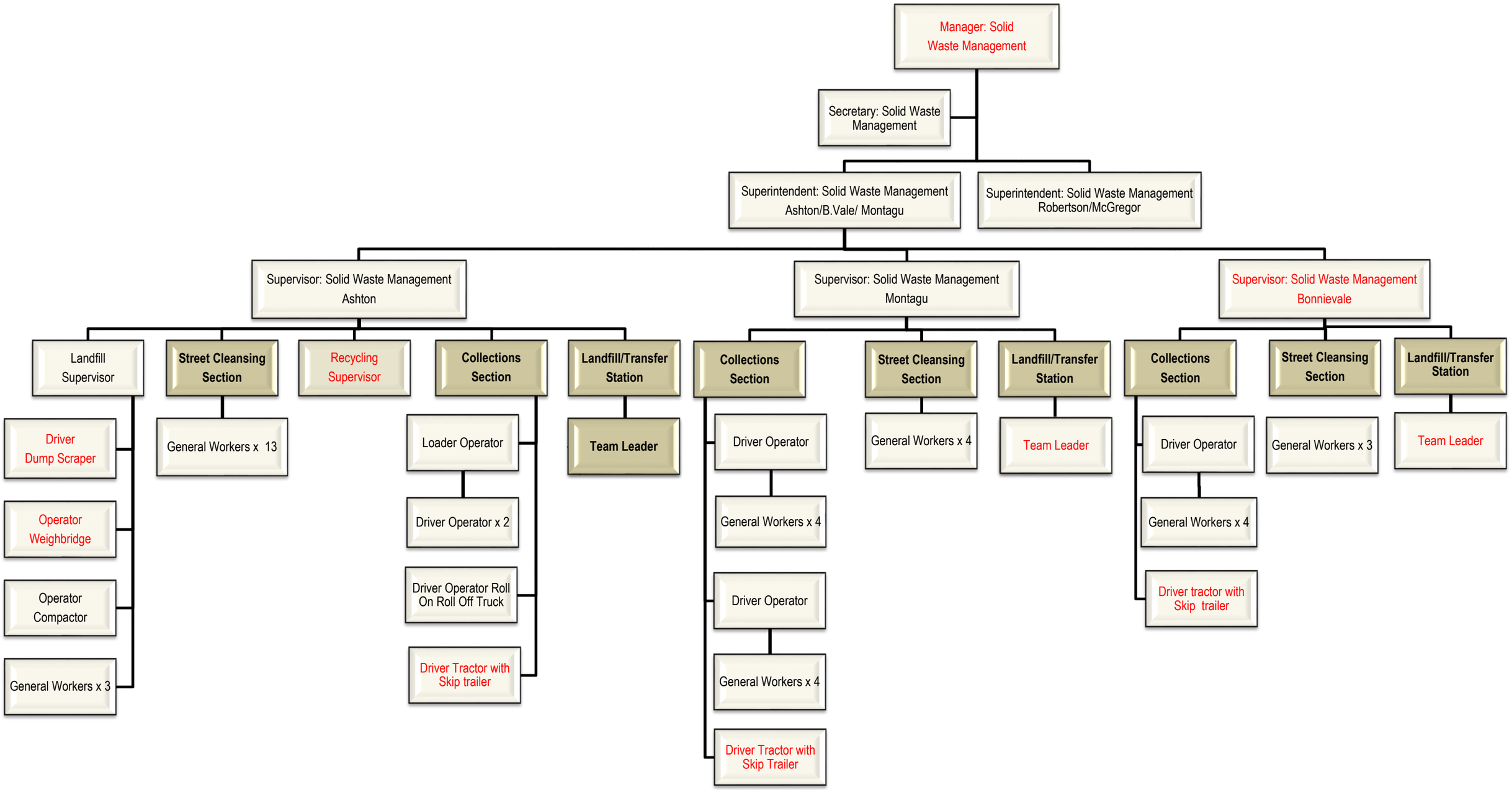


Figure 6.5: LLM Waste Management Organogram (West)

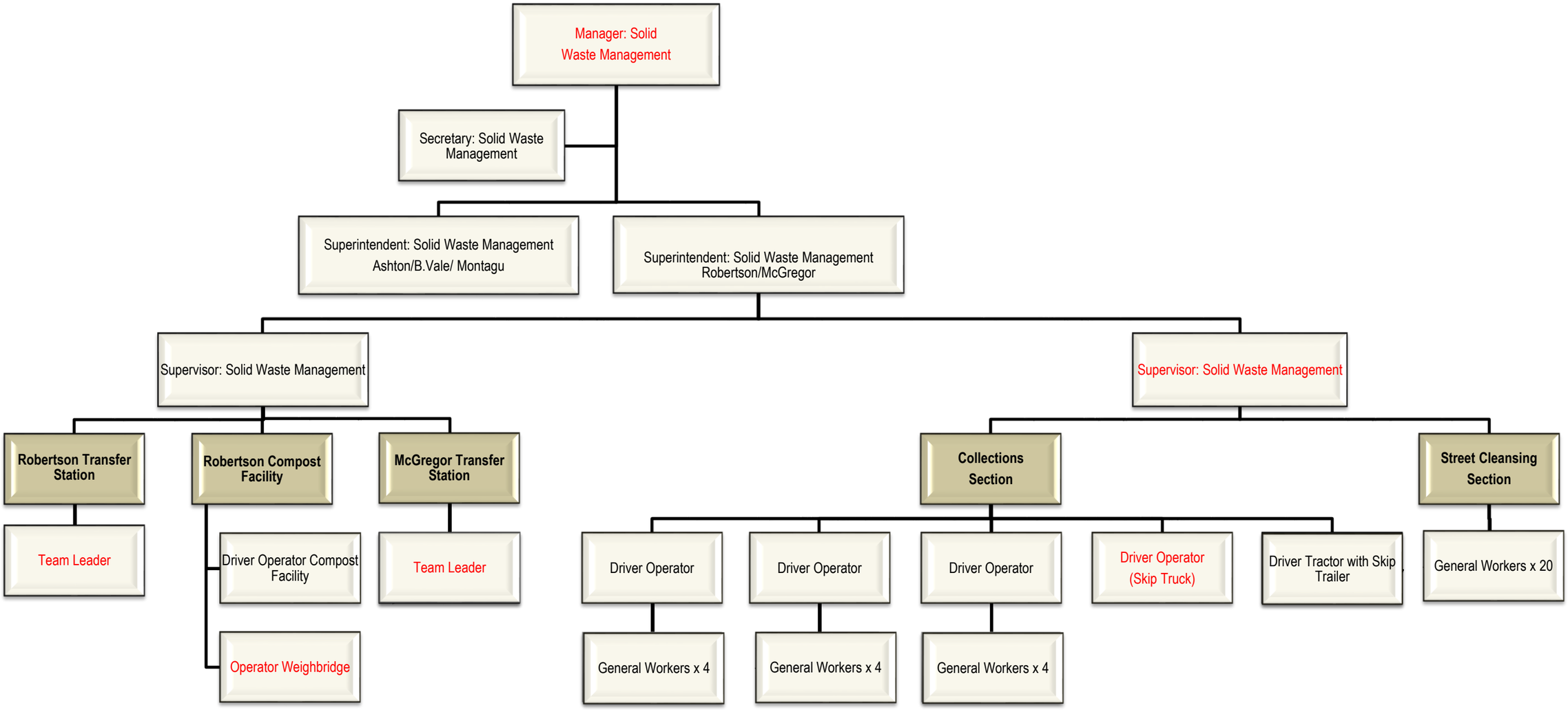


Table 6.18: KPIs for Solid Waste Management

	KPI Name	Unit of Measurement	KPI Owner	Performance Standard	Target Type	Annual Target
1	Perform an internal audit of landfill sites (Ashton, Montagu, Bonnievale) quarterly within one month of the end of the quarter	Number of audits	Manager: Solid Waste Management	3 Audits internally performed by February	Number	12
2	Perform an external audit of landfill sites (Ashton, Bonnievale) annually by the end of January 2017	Number of audits	Manager: Solid Waste Management	Annual external audit	Number	2
3	Report monthly on the IPWIS on waste volumes at Bonnievale, Montagu, Ashton and Robertson	Number of reports submitted	Manager: Solid Waste Management	Annual external audit	Number	48
4	Report annually on compliance with the National Waste Management Strategy to the Department of Environmental Affairs (DEA) by 30-Jun-17	Number of reports submitted	Manager: Solid Waste Management	Annual report submitted	Number	1
5	Address cleansing/waste removal related complaints within 7 days	% of complaints addressed within 7 days	Manager: Solid Waste Management	100% of complaints addressed within 7 working days	Percent age	100%
6	Remove waste from all business areas as per weekly schedule	Number of weeks maintained as per weekly schedule	Manager: Solid Waste Management	48 weeks waste removed from all business areas	Number	52
7	Submit the monthly statistics report by the 15th of the following month to the Director	Number of reports submitted	Manager: Solid Waste Management	12 reports submitted	Number	12
8	Review the Integrated Waste Management Plan by 30 June 2017	Integrated Waste Management Plan reviewed	Manager: Solid Waste Management	Plan reviewed every 5 years	Number	1
9	Report monthly to the Director on all activities by the 5th day of the following month	Number of reports submitted	Manager: Solid Waste Management	Monthly	Number	12
10	Submit the reconciled fleet statements monthly to finance	Number of fleet statements submitted	Manager: Solid Waste Management	Monthly	Number	12
11	Submit attendance register monthly to director with the attached copies of approved leave forms	Number of attendance registers submitted	Manager: Solid Waste Management	Monthly	Number	12

	KPI Name	Unit of Measurement	KPI Owner	Performance Standard	Target Type	Annual Target
12	Attend to all correspondence received from internal audit within 10 working days	% of Internal Audit correspondence attended to within 10 working days	Manager: Solid Waste Management	Within 10 working days	Percentage	90
13	Respond to all correspondence received within the Directorate within 10 working days of receipt	% of correspondence responded to within 10 working days	Manager: Solid Waste Management	Within 10 working days	Percentage	90
14	100% of deviations adhere to the requirements for deviation as indicated in the SCM policy	% of Deviations that adhere to the the SCM policy	Manager: Solid Waste Management	100%	Percentage	100%
15	Proper procurement practices with the adherence to the approved SCM policy to promote good governance	0 successful appeals against procurement processes practices	Manager: Solid Waste Management	0	Number	0

6.4.2 Collection and Cleaning Services

The collections are split into four teams as mentioned in the waste organogram. Collections are done for all towns but the four teams are based in Ashton, Bonnievale, Montagu and Robertson. The teams collect recyclables in addition to the general waste. Street cleaning is also divided into four teams based in Ashton, Bonnievale, Montagu and Robertson.

In LLM waste is collected in four ways:

- Black Bags for non recyclables
- 240 litre wheelie bin for non recyclables
- Clear bags for recyclables.
- Skip containers for garden and park waste.
- Cages for business waste

Black bags are provided to all the urban residents of LLM. These are often placed inside wooden receptacles, wheelie bins or green steel drums (Photo 6.11 - Photo 6.13). The black bags are collected and transported by rear-end loader (REL) vehicles to Ashton WDF. Clear bags are provided to the main town areas in each town for the collection of recyclables. The recyclables are then taken to the Ashton MRF and sold to private recycling companies. Skip containers are provided to all the low income areas in open spaces for garden and park waste.

Photo 6.11: Wooden receptacle containing black bin bag

Photo 6.12: Black 240 litre wheelie bin

Photo 6.13: Skip container for garden and park waste

Some businesses such as Parmalat in Bonnievale make use of cages for disposal of their recyclables and general waste. The collection service schedules are discussed in the transportation (routing) section later in this report (Section 6.4.7).

Table 6.19: Level of services provided to LLM residents and businesses

Area	Frequency	Receptacles	Comment
Ashton	Once a week	Wheelie bins and or black bags for general waste, clear bags for recyclables	Most of residents serviced by LLM. Recycling collection services provided in main town areas.
Bonnievale	Once a week	Wheelie bins and or black bags for general waste, clear bags for recyclables	Most of residents serviced by LLM. Recycling collection services provided in main town areas.
Langeberg NU (Non-urban and farms)	Once a week	No waste receptacles provided	Most of residents using own dumps. Residents can dispose of waste at WDF or Transfer stations but they must apply with the municipality.
Mcgregor	Once a week	Wheelie bins and or black bags for general waste, clear bags for recyclables	Most of residents serviced by LLM. Recycling collection services provided in main town areas.
Montagu	Once a week	Wheelie bins and or black bags for general waste, clear bags for recyclables	Most of residents serviced by LLM. Recycling collection services provided in main town areas.
Robertson	Once a week	Black bin bags for general waste, skip containers for garden	Most of residents serviced by LLM. Recycling collection services provided in main town areas.
Businesses in all towns	Once a week	Cages or containers that businesses have in storage areas	All businesses in town receive waste services

Households who have a household income of less than R3500 qualify as indigents. Currently there are more than 6400 households which qualify for this and as a result receive free waste services.

The solid waste teams for each town report the illegal dumping incident which is then remedied using a front-end loader (FEL) and two tipper trucks. The waste is then transported to the Ashton WDF. Skips are also provided for garden and park waste in open residential areas. The costs incurred by LLM from illegal dumping are estimated to be approximately R1million per annum.

6.4.3 Complaints Register

LLM has a hotline for logging complaints about service delivery. Complaints can also be logged on LLM's website at: http://www.langeberg.gov.za/index.php/complaintsqueries.Complaints pertaining to solid waste are forwarded to the Solid Waste Manager and then to the respective Solid Waste Supervisor for that town. The problems together with the actions and solutions are documented.

6.4.4 Service Providers

LLM is the sole service provider for domestic waste. "Solid Waste" is contracted to provide hazardous waste removal from hospitals and clinics. The municipality also puts out a separate contract for a service provider to provide chipper plant and equipment.

6.4.5 Role of private sector participation

The range of opportunities for participation by the private sector in the provision of municipal service and activities, where the municipality acts as service provider, is limited.

There is no assistance from the private sector in LLM. Private sector participation in municipal service delivery in South Africa has become increasingly popular in the collection of municipal solid waste, the managing of WMFs, recycling and education and training.

A fundamental change in waste disposal practices will be supported by the development of a national recycling infrastructure through partnerships among the various role-players. The infrastructure will enable separation at source of organic waste, hazardous waste and clean general recyclable waste, and the collection of particular waste types that contaminate general household waste through specialised infrastructure. The responsibility of different role players for providing the recycling infrastructure for management of the different waste streams is set out in Table 6.20 (NWMS, 2011).

Table 6.20: Role players' contribution to re-use, recycling and recovery of waste

Role	General waste	Organic waste	Recyclables (paper, plastic, metal, glass and tyres)	Hazardous (batteries, solvents, CFLs, etc.)
Advocacy and education	Municipality	Municipality (with national and provincial support)	Industry participation with municipality	Industry
Providing bins at source or take back facilities	Municipality	Municipality	Municipality to provide additional bins at source, industry to provide accessible take back facilities	Industry
Collecting waste	Municipality	Municipality	SMEs supported by industry	Industry
Processing waste	Municipality	Municipality	Municipality	Industry
Dispose of waste	Municipality (landfill)	Municipality (composting facility)	No disposal as per set target	Industry

6.4.6 Plant and Equipment

LLM has plant and equipment depots in every town and as well as at the Ashton WDF. No operational issues were mentioned but 23 of the 34 vehicles in the fleet are older than the prescribed seven years. The collection fleet compactor vehicles total six in number of which two are over seven years old. Tractor trailers are used to transport garden and park waste as well as assist FELs with moving waste at the composting sites. Waste compactor are used in Ashton WDF with a forklift used for the Ashton MRF to move baled recyclables around on site.

Table 6.21: Plant and Equipment

Asset No.	Type	Base Depot / WMF	Allocation	Make	Capacity	Notes	Date Purchased
17221	Tip Truck	Ashton	Depot	Man M2000	2000cc diesel	CBR2111	2006
203	LWB	Ashton	Depot	Nissan	2L diesel	CBR2625	2000
21923	Hooklift	Ashton	Depot	NissanUD 460	diesel	CBR4054	2012
23143	Loader	Ashton	Depot	Volvo	L30B ZX	CBR5628	2015
9796	LWB	Ashton	Depot	Isuzu	2L petrol	CBR7224	1996
37	Tractor	Ashton	Depot	Ford tractor	4000	CCD4789	1972
53	Tractor	Ashton	Depot	Ford tractor	3000	CCD5337	1973
250	Tractor	Ashton	Depot	Case with loader	DT 345	CCD5512	1996
22508	Damskrop	Ashton	Landfill	Erdvark	N/A	N/A	2013
22500	Tractor	Ashton	Landfill	Landini DT145	260	CBR2481	2013
16958	SWB	Ashton	Landfill	Nissan	1400	CBR8149	2005
17311	Waste compact	Ashton	Landfill	Bomag	BC572	CBR8630	2006
23070	Forklift	Ashton	Landfill	Linde	diesel 3ton	CBR10066	2013
17977	Compacter	Bonnievale	Depot	Nissan	UD90	CBR3187	2007
218	Waste truck	Bonnievale	Depot	Isuzu	SBR150	CBR6183	1983
21469	SWB	Bonnievale	Depot	Nissan NP200	1600cc	CBR8410	2012
229	Tractor	Bonnievale	Depot	John Deere	5100	CER1443	1997
15928	Trailer	Bonnievale	Depot	Tip trailer	N/A	CER2004	1975
108	Tractor	McGregor	Depot	John Deere	N/A	CCD4724	1979
226	Tractor	Montagu	Depot	New Holland	604	CBR1040	1988

Asset No.	Type	Base Depot / WMF	Allocation	Make	Capacity	Notes	Date Purchased
19993	Compacter	Montagu	Depot	Isuzu	FTR800	CBR10900	2010
213	Waste truck	Montagu	Depot	Nissan	CM12	CBR1456	1996
19047	LWB	Montagu	Depot	Ford Ranger	2.2petrol	CBR1804	2008
19048	LWB	Robertson	Depot	Ford Ranger	2.2petrol	CBR1779	2008
17618	Skip loader	Robertson	Depot	Man M2000	2000cc diesel	CBR3195	2006
239	Loader	Robertson	Depot	Cat 914G	diesel	CBR3951	1999
220	Tip truck	Robertson	Depot	Nissan UD70	UD70	CBR4919	2002
20163	Trailer	Robertson	Depot	skip trailer	N/A	CBR5688	2012
22886	Compacter	Robertson	Depot	Nissan	UD90	CBR6486	2013
5661	SWB	Robertson	Depot	Nissan	1400	CBR6708	2003
22600	SWB	Robertson	Depot	Nissan NP200	1600cc	CBR9579	2013
23149	Compacter	Robertson	Depot	Nissan	UD370	CBR11623	2015
20283	Tractor	Robertson	Depot	Landini 65	diesel	CCD2827	2010
251	Tractor	Robertson	Depot	Same tractor	explorer	CCD5510	1994
249	Compacter	Robertson	Depot	Isuzu	FTR800	CCD7295	2003
60	Waste truck	Robertson	Depot	Toyota	Hino	CCD9583	1975
16086	Trailer	N/A	Depot	Trailer	N/A	CBR6789	2003
247	Trailer	N/A	Depot	skip trailer	N/A	CCD6847	N/A
248	Trailer	N/A	Depot	skip trailer	N/A	CCD6848	N/A
16929	Trailer	N/A	Depot	skip trailer	N/A	CCD6849	N/A
17726	Trailer	N/A	N/A	Trailer	N/A	CBR4880	2007
3245	Trailer	N/A	N/A	Trailer	N/A	CBR8203	N/A
5623	Trailer	N/A	N/A	trailer	N/A	CBR10877	N/A
246	Trailer	N/A	N/A		N/A	CCD6408	N/A
45	Trailer	N/A	N/A	Trailer	N/A	CCD6592	1991

6.4.7 Transportation

The collection of general waste from businesses, households, schools and other organisations is carried out by five rear end loading (REL) vehicles. The number of loads per day are shown in the Table 6.22 below. Currently there are 2 vehicles servicing Robertson and McGregor and the other 3 split between the three remaining towns and nearby farms. The main transportation routes are along the main roads between the towns, namely the R60, R62, R317 and R318. The R60 links Robertson and Ashton, the R317 links Robertson to Bonnievale and the R62 links Montagu to Ashton. The R318 traverses the north west of the municipality from the N1 through to Montagu. All non-recyclable household waste from towns is taken to Ashton WDF whilst all household and business recyclables are collected by LLM at source and transported to Ashton MRF. Bonnievale garden and park waste is taken to Bonnievale WMF. All other garden and park waste is taken to Robertson composting facility. Building and demolition waste is taken to Montagu (Bessieskop) WDF and Bonnievale (WMF). Hazardous waste is transported approximately 160km via the R60 and N1 to Vissershok WDF in Cape Town.

Table 6.22: Waste collection trips

	Number of trips per day of the week				
Town	Monday	Tuesday	Wednesday	Thursday	Friday
Ashton	5	5	4	4	4
Bonnievale			4		
Mcgregor	3	2			
Montagu	4	4	4	4	4
Robertson	8	8	8	8	4

LLM does not have a map of existing routes to determine round trip times and levels of efficiency for waste collection services. No studies have been conducted to determine the optimum routes and this is believed to be a key action going forward.

6.4.8 Waste Management Infrastructure

LLM has 11 WDF and WMFs, of which eight are operational:

- Ashton WDF (Operational)
- Ashton MRF (Operational)
- Ashton Transfer Station (operational in May 2017)
- Bonnievale WMF (Operational)
- McGregor Historical WDF (Closure and Rehabilitation needed)
- McGregor Drop Off Facility (Operational)
- Bessieskop (Montagu) WDF (Operational but will need closure and rehabilitation)
- Montagu Transfer Station (Operational)
- Robertson WDF (Closed)
- Robertson Transfer Station (Operational), and
- Robertson Composting Facility (Operational).

The list above excludes the Bonnievale drop off facility which will be completed in June 2017. All operational facilities are open and manned six days per week, Monday to Friday: 08:30 – 16:30 and on Saturdays: 08:00 – 13:00. The facilities are also open on selected public holidays.

6.4.8.1 Ashton WDF

The Ashton WDF is classified as a G:S:B- under permit 16/2/7/H300/D41/Z1/P332/A1. The site is located less than 400m north of the township of Zolani and about 2km east of the town of Ashton is located at 33°50'6.15"S; 20° 6'4.93"E.

It is currently operational and receives all of LLMs general waste. It also receives abattoir waste that is covered with lime. Whilst this is not preferable, DEA&DP are aware of the activities. Ashton WDF requires an application for additional airspace to accommodate future waste generation. The extension will serve until the Worcester Regional WDF (WRWDF) is operational. Once WRWDF is operational all the general waste will travel from the transfer stations in LLM to WRWDF.

The Ashton WDF site can be accessed via a dirt road. The site is also fenced, has security at the gate, a guardhouse, an office for administration and data capturing, a weighbridge, equipment and restrooms for workers (Photo 6.14 - Photo 6.16).

DEA&DP conducted an audit on 11/08/2015 and Ashton WDF scored an overall compliance of 54.6%. The main non-compliances were as follows:

- Presence of pigs on site.
- Wind-blown litter.
- Blocked stormwater channel.
- An unmanned gate entrance.
- Incomplete testing as set out by the Minimum Requirements for Waste Disposal.

- Stormwater was not separated from leachate.
- Surface water monitoring not done bi-annually.
- No monitoring committee is in place.

Photo 6.14: Security at gate

Photo 6.15: Weighbridge and office

Photo 6.16: Covered waste cell and access road

6.4.8.2 Ashton MRF

The Ashton MRF (Photo 6.17) lies next to the Ashton WDF landfill offices, located less than 400m north of the township of Zolani and about 2km east of the town of Ashton (33°50'9.38"S, 20° 6'7.37"E). The facility is owned and operated by LLM. The recyclables are piled in the MRF using a forklifter (Photo 6.18). The waste is then fed onto the conveyor belt and sorted by 16 sorters (Photo 6.19). The non-recyclables are collected in a skip and taken to the Ashton WDF whilst the recyclables are baled and stored inside and outside the MRF (Photo 6.20 - Photo 6.22). The recyclables are sold to private recycling companies and transported to Cape Town.

Photo 6.17: Ashton MRF main building

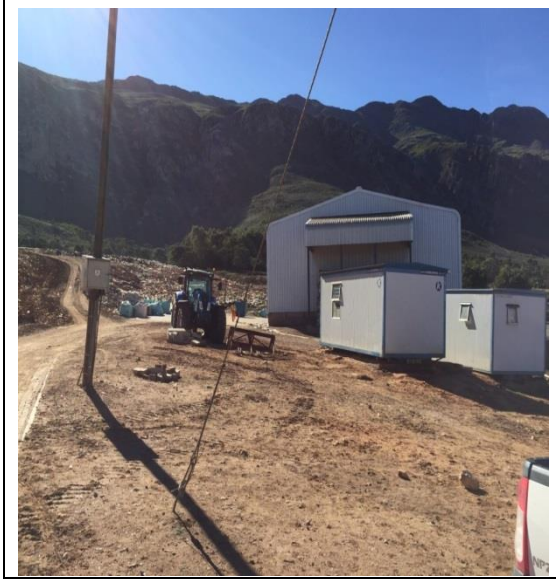


Photo 6.18: Forklifter moving waste

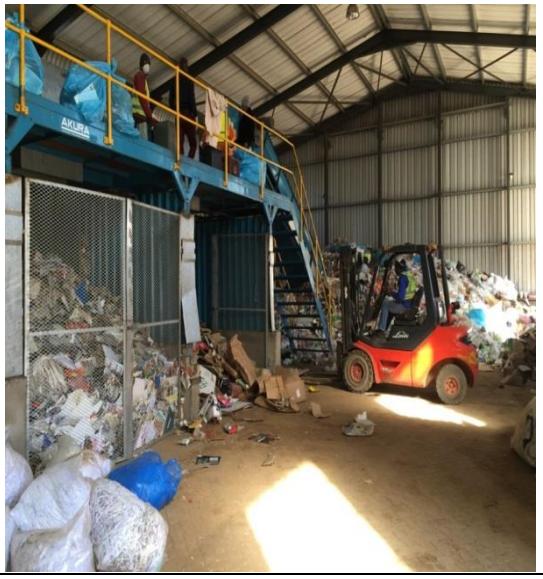


Photo 6.19: Waste being sorted on conveyor belt

Photo 6.20: Baling of recyclables

Photo 6.21: Baled material stored inside MRF

Photo 6.22: Baled material stored outside MRF

6.4.8.3 Ashton Transfer Station

The Ashton Transfer Station has been recently constructed and will service the Ashton (33°50'1.12"S, 20° 5'35.86"E). In the interim it will serve as a transfer station point for Ashton WDF but once WRWDF is operational it will serve as a local transfer station that will then relay waste onto WRWDF.

Photo 6.23: Guardhouse

Photo 6.24: Recyclables drop-off section

Photo 6.25: Refuse Transfer Station Building and access ramp

Photo 6.26: Working Apron of Refuse Transfer Station

6.4.8.4 Bonnievale WDF

Bonnievale WDF permit 16/7/H500.D79.Z1.P304, is an operational G:S:B- landfill site. The site is located approximately 1.5km west of the main town of Bonnievale (30°55´36.2070”S, 20°4`49.8690”E). The Bonnievale WDF currently receives garden and park waste and builders rubble from Bonnievale. The waste is stockpiled, windrowed, chipped and sold twice a year (Photo 6.29). The site will continue to

receive garden and park waste until 2020 and has capacity to receive garden and park waste up until 2050 when WRWDF is operational. During the site visit the site was observed to be in neat condition. The site was fenced, had gated access, had ablution facilities was manned and no fires or animals were present on site (Photo 6.27 - Photo 6.29).

Photo 6.27: Notice board and security outhouse

Photo 6.28: Security outhouse and ablution

Photo 6.29: Garden and park waste piles

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6.4.8.5 McGregor Historical WDF

McGregor WDF has been issued with a closure licence. The site is located approximately 2km south west of the town of McGregor, behind the current McGregor drop off facility (33°57'43.76"S, 19°48'28.31"E). The site is one of the CRR funded projects that LLM has prioritised within the next 3 years.

The site was identified by DEA&DP audits to have a compliance rating of 18%. The score was attributed to the following:

- No waste management compliance officer.
- No leachate monitoring.
- No water quality monitoring.
- Lack of external auditing.
- No record keeping.
- No soil contamination test.
- Inadequate soil erosion measures.

A test for volatile organic compounds including methane was conducted on 11 May 2016. No Methane Gas was detected.

Photo 6.30: McGregor Historical WDF

6.4.8.6 McGregor Drop Off Facility

The McGregor Drop Off Facility is located approximately 2km south west of the town of McGregor (33°57'44.78"S, 19°48'30.25"E). The site can be accessed via a dirt road to the south of the town. The site is fenced, has gated access, and security building with ablutions (Photo 6.31 and Photo 6.32). Waste can be dropped off into skip containers for general waste, garden and park waste, building and demolition waste and recyclables, which is accessed via a concrete ramp that loops around the site (Photo 6.33 - Photo 6.35).

Photo 6.31: Access to site

Photo 6.32: Security building

Photo 6.33: Ramp with skips

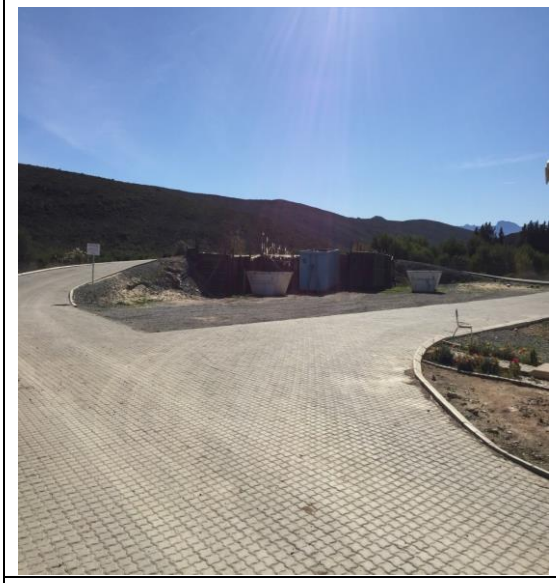
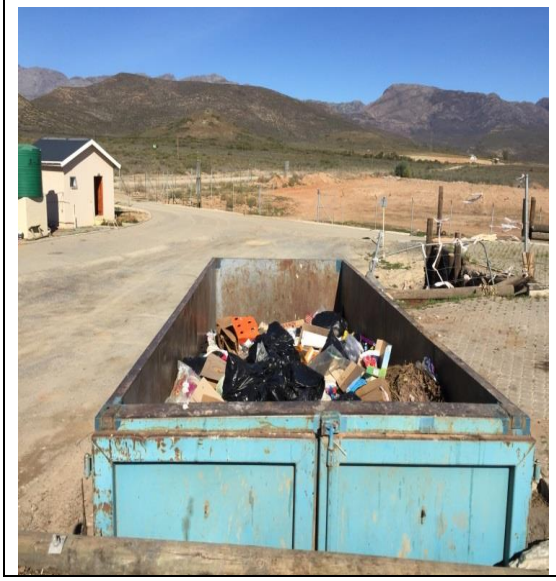


Photo 6.34: Skip for garden and park waste

Photo 6.35: Skip with general waste



6.4.8.7 Bessieskop (Montagu) WDF

Bessieskop in Montagu permit B33/2/800/45/2/P169 receives building and demolition waste. The site is located approximately 1km east of the town of Montagu (33°47'37.50"S, 20° 8'5.63"E), adjacent to the Montagu Transfer Station. The site is accessed via a dirt road from the R62 (Photo 6.36). The site is

situated on top of a hill, with the waste pile being much higher than the fences surrounding it (Photo 6.37 - Photo 6.39).

Photo 6.36: Gated access

Photo 6.37: Waste pile looking west

Photo 6.38: Waste pile looking south

Photo 6.39: Looking north east of site

6.4.8.8 Montagu Transfer Station

The Montagu Transfer Station is located approximately 1km east of the town of Montagu and is accessed via a turn off from the R62 to Barrydale (33°47´39.5280.”S, 20°8`1.6008”E). The site is well run and neat. It hosts controlled access, a security building, parking for waste vehicles and a ramp for dropping of waste. Skips are provided on the elevated level of the ramp for plastic, paper and cardboard, metal and tin and glass. Containers for garden and park waste and non-recyclable waste are placed at the lower level of the retaining wall so that waste can be dropped from top. The garden and park waste containers are then transported to the garden and park waste chipping facility in Robertson. The recyclables are then sent to Ashton MRF, sorted, baled and sold to private recycling companies.

Photo 6.40: Notice board

Photo 6.41: Access to site

Photo 6.42: Skips for recyclables

Photo 6.43: Plastic skip

Photo 6.44: Paper and Cardboard skip

Photo 6.45: Metal and tins skip

Photo 6.46: Glass skip

Photo 6.47: Non-recyclables drop off platform

Photo 6.48: Garden and park waste

Photo 6.49: non-recyclable general waste

6.4.8.9 Robertson WDF

The Robertson WDF is a class B landfill that has been closed and rehabilitated. The site scored 51.67% for compliance audit done by DEA&DP and requires attention. There is no leachate dam and no monitoring of water quality testing.

6.4.8.10 Robertson Transfer Station

The Robertson Transfer Station is located approximately 1.3km south west of the town of Robertson (33°49'15.55"S, 19°52'15.27"E). The site has a dedicated area for drop-off of recyclables waste and non-recyclables (Photo 6.50 - Photo 6.55). The site is gated, manned, has a good condition access road and an access ramp that allows waste to be offloaded from a platform into skips and containers. The sign was well kept and has good sign posts for waste streams.

Photo 6.50: Site access and security building

Photo 6.51: Containers for non-recyclable waste

Photo 6.52: Skips for recyclables

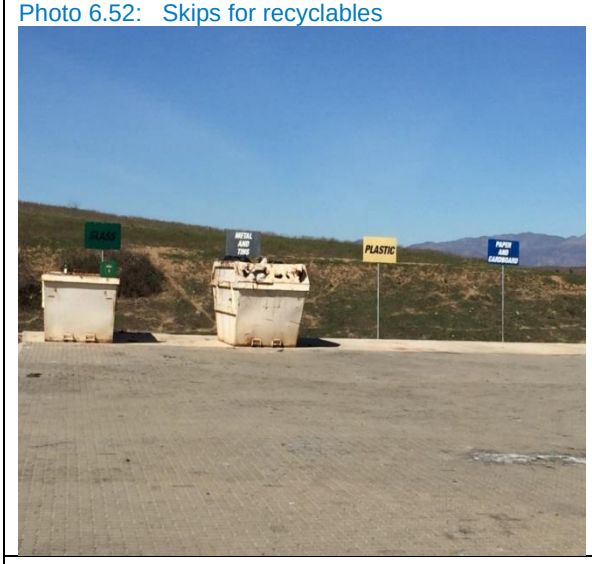


Photo 6.53: Rusted glass skip

Photo 6.54: Non-recyclables waste platform

Photo 6.55: Non-recyclables waste

6.4.8.11 Robertson Composting Facility

The Robertson Composting Facility shares the same site as the Robertson Transfer Station and is located approximately 1.3km south west of the town of Robertson (33°49'11.68"S, 19°52'16.46"E). The site is gated, manned and makes use of a FEL for the operations with respect to garden and park waste. The garden and park waste is moved and laid in windrows to produce compost.

Photo 6.56: Hired chipper for Robertson Composting Facility

Photo 6.57: Windrows of compost at Robertson Composting Facility

6.4.9 Waste Minimisation, Re-use and Recycling Initiatives

LLM is engaged in multiple waste minimisation, reuse and recycling initiatives. Besides offering separation at source for the main towns, the municipality provides educational programmes that drive and increase the levels of participation of the community. These initiatives include:

- LLM presentations to school and organisations about waste reduction, re-use and recycling
- Tedcor (Youth in Waste) door to door campaign - The main aim of the intervention was to increase community involvement and participation in recycling. The campaign also was used to inform communities of solid waste services offered by the municipality and collect information on the performance of solid waste management through the use of surveys.
- LLM hosts educational tours of the Ashton MRF for schools and organisations

6.5 Previous Waste Management Objectives

The 2nd generation LLM IWMP prescribed five main objectives (JPCE, 2012):

- Awareness and Education
- Quantifying Prevention, post collection recovery, post collection composting & data collection
- Engineered Waste Disposal Facilities & Monitoring of Waste Disposal
- Collection Service Review
- Cleansing

LLM has partially met its objectives as can be seen in Table 6.23, and the outstanding actions will need to be included as part of the needs assessment and gap analysis processes of the 3rd generation IWMP.

Table 6.23: Previous Waste Management Objectives as per 2ND generation IWMP

Objective	Actions being carried out	Outstanding Actions	Overall Achievement of Objective
Awareness and Education	Talks are given to schools and organisations, Tedcor have a door-door campaign, Ashton MRF hosts site tours for schools and organisations	None – ongoing process	Goal has been met
Quantifying Prevention, Post Collection Recovery, Post Collection Composting & Data Collection	LLM is registered on IPWIS, Ashton MRF and composting in Robertson are assisting diversion of waste	Increase diversion of waste through completion of transfer stations at Ashton	Goal has been partially met
Engineered Waste Disposal Facilities & Monitoring of Waste Disposal	Closure and Rehabilitation applications have been submitted	Completion of closure and rehabilitation of WMFs Addressing non-compliances	Goal has been partially met
Collection Service Review	No action has been taken	Route Optimisation Study for waste collection services	Goal has not been met
Cleansing (Waste collection services)	Waste collection services are provided by the municipality	Ongoing process	Goal has been met

6.6 Economics & Financing of Waste Management Practices

This section discusses existing projects, expenditure, solid waste tariffs and income for the LLM Solid Waste Management.

6.6.1 Projects

The majority of projects are capital replacement reserve (CRR) funded projects with the new transfer station in Montagu and the drop off facility being MIG funded. The total medium term revenue expenditure (MTREF) for the next 3 years is estimated to be R26 million, with the bulk being in 2018/19 for the closure and rehabilitation of the McGregor landfill site. These are some of the identified action items for compliancy that will ensure that LLM meets its objectives. The Assessment of Municipal Integrated Waste Management Infrastructure Summary Report (JPCE, 2016) states that no further projects are required to meet the 20% waste diversion target. As per the report, the Ashton and Bonnievale WDFs are scheduled to commence closure in 2017 for compliance purposes, but this may be financially prohibitive for the municipality to do so within the next 5-year period. The cost of compliance with existing licenses is approximately R4.1 million for operational compliance and a further R23.7 million for rehabilitation compliance. The cost requirement for infrastructure to meet the 20% diversion is estimated at R18 million for Ashton WDF and R12.5 million for Bonnievale WDF. The table below shows scheduled projects from the municipality prior to the development of the Assessment of Municipal Integrated Waste Management Infrastructure Summary Report. All the projects will be examined in the gap analysis and needs assessment of this IWMP.

Table 6.24: Projects Summary and Expenditure

	Wards	Total MTREF	2016/17	2017/18	2018/19	Source of funding
Closure and Rehabilitation of the McGregor Landfill Site	5	16000000	-	-	16000000	CRR
Purchase of 2Axle Single Bin Trailer With Extra	All	350000	-	350000	-	CRR
Purchase of new Skip Truck	All	950000	950000	-	-	CRR
Supply and Installation of Street Bins in Robertson	1,2 & 5	150000	-	150000	-	CRR
Purchase of Wheelie Bins	All	1500000	500000	500000	500000	CRR
Purchase of Skips	All	560000	110000	450000	-	CRR
Double Axle High Lifter Compactor Refuse Removal	All	2300000	-	2300000	-	CRR
New Drop Off Facility Bonnievale	4, 8	4251850	4251850	-	-	MIG
Total		26061850	5811850	3750000	16500000	

6.6.2 Solid Waste Expenditure

The LLM Solid Waste cost expenditure budgeted for the 2016/17 financial year has been split into the main subcategories of salaries, wages & allowances (Table 6.25), general expenditure (Table 6.26), repairs (Table 6.27), capital gains tax (Table 6.28) and contribution to capital expenditure (Table 6.29).

Table 6.25: Salaries, wages & allowances

Salaries, wages & allowances	2016/17 Expense (Rands)
Housing	213931
Bonus	705013
Group Insurance	19435
Leave reserves	315147
Medical help	229445
Medical contribution pensioner	220423
Overtime	705020
Pension fund	1447792
Registrations	7458
Salaries	8045469
Allowances - Travel and Accommodation	11151
Allowances - Motor	0
Allowances - Other	139110
Unemployment insurance	92989
Long service awards	74485
Sub total	**12226868**

Table 6.26: General expenditure

General expenditure	2016/17 Expense (Rands)
Administration fees	636162
Delegation fees	5976
Developers	0
Fuel	2303946
Municipal services	34522
Sundry expenditure	9825
Recycling material	27154
Impairment	0
Composting works	54054
Contractors	1041439
Licences	0
Plant hire	20426
Nuisance control	877
Professional services	139382

General expenditure	2016/17 Expense (Rands)
Rehabilitation	596225
Cleaning substances	19731
Cleaning of erven	0
Cleanup projects	13750
Uniforms	126001
Loss on Sale on Assets	584
Insurance Premiums	98532
Refuse bins	0
Refuse bags	689216
Depreciation	11535204
Sub total	**17353006**

Table 6.27: Repairs

Repairs	2016/17 Expense (Rands)
Equipment	131786
Buildings	12892
Sites and lawns	8374
Vehicles	2199286
Sub total	**2352337**

Table 6.28: Capital gains tax

Capital cost	2016/17 Expense (Rands)
External interest	1810
Post retirement medical	412118
Long service awards	62982
Provision - Landfill site	3279513
Sub total	**3756422**

Table 6.29: Contribution to capital expenditure

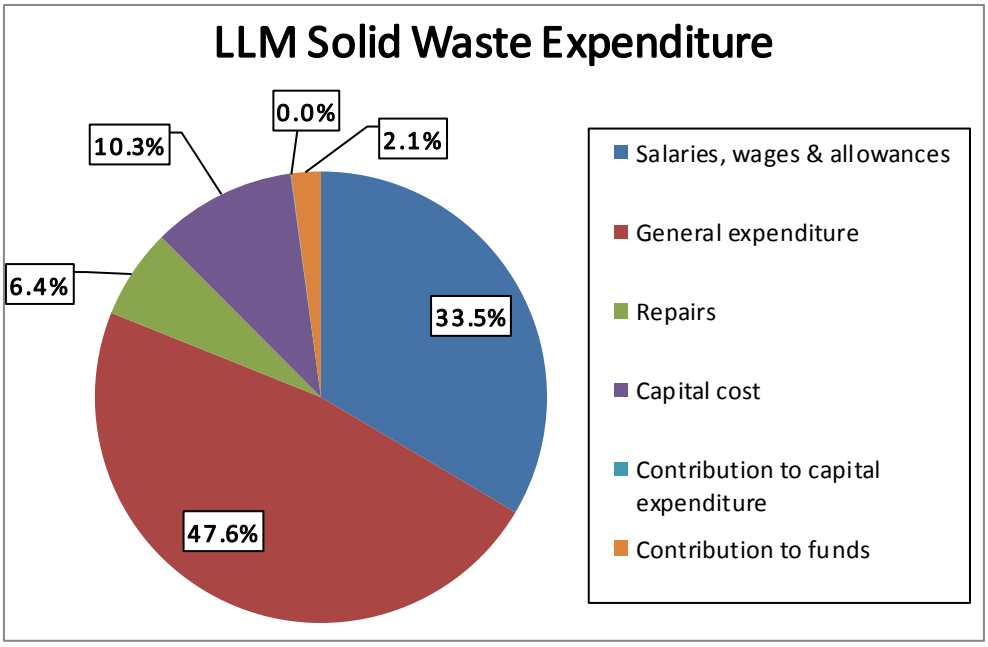
Contribution to capital expenditure	2016/17 Expense (Rands)
Inventory items	16716
Sub total	**16716**

In 2016/17, the LLM Solid Waste Management spent approximately R36.5 million (Table 6.30). The largest allocations are general expenditure (47.6%) and salaries, wages & allowances (33.5%). The major expenses in general expenditure include the depreciation, contractors and impairments. The results are also displayed in Figure 6.6. This information is important as it may inform future actions such as reducing costs such as revising contracts and or staffing. The issues will be looked at in the gap analysis.

Table 6.30: Expenditure Summary

Expense Category	2016/17 (Rands)	Share of expense category as percentage of total expense (%)
Salaries, wages & allowances	12226868	33.5%
General expenditure	17353006	47.6%
Repairs	2352337	6.4%
Capital cost	3756422	10.3%
Contribution to capital expenditure	16716	0.0%
Contribution to funds	771540	2.1%
Total Expenditure	**36476889**	**100.0%**

Figure 6.6: LLM Solid Waste Expenditure



6.6.3 Solid Waste Tariffs

The LLM Solid Waste Tariffs are rendered to LLM residents and businesses under seven general categories:

- General Refuse removal – residential and business waste
- Building and demolition waste – large quantities of building and demolition waste
- Rejected material – waste that is generated because of non-conformance with business or industry service//product standard including poor quality, old or damaged goods.
- Skips – skips for hire by businesses
- Garden refuse – residential and businesses garden and park waste including purchasing of chipping operations
- Special services – waste disposal services for special waste such as asbestos and tyre waste.
- Refuse bags – sale of refuse bags

LLM has created a comprehensive set of tariffs and uses a combination of measurements for their tariffs including mass (kg and tons), frequency (monthly), or volume (m^3).

Table 6.31: LLM 2016/17 Solid Waste Tariffs

Category	Subcategory	2016/17 Tariff (excl. VAT)	2016/17 Tariff (incl. VAT)
General Refuse Removal	Removal of rejected tins per ton	304	266.67
	Removal of garden refuse per m³	99	86.84
	Removal of garden refuse per ton	268	235.09
	Special removal of household refuse per ton	372	326.32
	Special removal of business refuse per ton (afterhours)	475	416.67
	Removal of industrial refuse per ton	424	371.93
	Small holdings that dump refuse up to 4 households (farms)	89	78.07
	Rural businesses that dump refuse up to 12 times (households/farms)	288	252.63
	Additional dumpings per household more than 12 times	25	21.93
	Rural businesses that dump refuse on an ad-hoc basis per ton	180	157.89
	Removal of illegal dumpings	-	-
	Clean building rubble / top soil self dump at landfill site	-	-
Building and demolition waste	Clean (only sand, stone, soil, small pieces of concrete, bricks less than 100mm)	Free	Free
	Contaminated with tree stumps and refuse and contains concrete pieces greater than 100mm(price per ton)	180.00	157.89
Disposal of rejected material	Removal of rejected material per kg	3.00	2.63
	Self dumping of rejected material per kg	2	1.75
	Fruit delivered at compost area per ton	243	213.16
Skips	1603 Monthly rent 6 m³ (One removal per month)	530	464.91
	1604 Monthly rent 9 m³ (One removal per month)	648	568.42

Category	Subcategory	2016/17 Tariff (excl. VAT)	2016/17 Tariff (incl. VAT)
	1606 Additional removal of skip 6m³ (Additional to first removal per month)	295	258.77
	Additional removal of skip 9m³ (Additional to first removal per month)	377	330.7
Garden Refuse	Disposal of Clean Approved Garden Refuse	Free	Free
	Compost per m³	201	176.32
	Compost per 30 kg bags	25	21.93
	Green Chippings per/ton	198	173.68
	Green Chippings per/m³	86	75.44
	Compost per ton	266	233.33
Special Services	Safe disposal of Asbestos (R/kg)	450	394.74
	Safe disposal of Tyres (R/tyre)	18	15.79
	Safe disposal of Fluorescent Tubes (pre tube)	5	4.39
Refuse Bags	Refuse Bags (Per Pack)	25	21.93

The LLM solid waste tariff projections for the next years increased by 8.4% between the previous year and the current 2016/17 financial year. The waste is in categories for general household waste, mega industries which pay for collections and disposal, sports grounds, rejected wastes which are not accepted at the Ashton WDF and municipal waste.

Table 6.32: Insert Table Title here

Category	Subcategory	2015/16 Tariff (incl. VAT)	2016/17 Tariff (excl. VAT)	Increase (%)
General	One removal per week - general	100.14	108.55	8.40%
	One removal per week - additional levy per bag > 2 bags per removal	5.50	5.96	8.40%
	Indigent tariff (income =< 3000 per month) (100% subsidized)	100.14	108.55	8.40%
	Informal Housing (100% subsidized)	100.14	108.55	8.40%
	Two - Three removals per week	421.68	457.10	8.40%
	Bulk removals and perishable products	792.77	859.36	8.40%
	Complexes/developments liable for internal services	90% of basic fee	90% of basic fee	
Mega Industries – rejected material	Langeberg & Ashton Foods factory 1	14439.94	15652.89	8.40%
	Langeberg & Ashton Foods factory 2	11345.58	12298.72	8.40%
	Fruit Packers	1488.17	1613.16	8.40%
	Parmalat	2781.61	3015.27	8.40%
	All wine cellars	1390.81	1507.64	8.40%
	Small cheese factories	1390.81	1507.64	8.40%
	Moreson	1001.39	1085.51	8.40%

Category	Subcategory	2015/16 Tariff (incl. VAT)	2016/17 Tariff (excl. VAT)	Increase (%)
Sports Grounds	Sports Grounds	90.41	98.00	8.40%
Rejected Material	Robertson Abattoir	9429.70	10221.79	8.40%
	Robertson Abattoir (Manure)	6147.38	6663.76	8.40%
	Bonnievale Abattoir	4464.50	4839.52	8.40%
	Excull	6147.38	6663.76	8.40%
	Delgado Fishery	3379.67	3663.56	8.40%
	Parmalat	11905.33	12905.38	8.40%
Municipal Departments	One removal per week	100.14	108.55	8.40%
	Two - Three removals per week	403.35	437.23	8.40%
	Department of Sport	90.41	98.00	8.40%

6.6.4 Income Summary

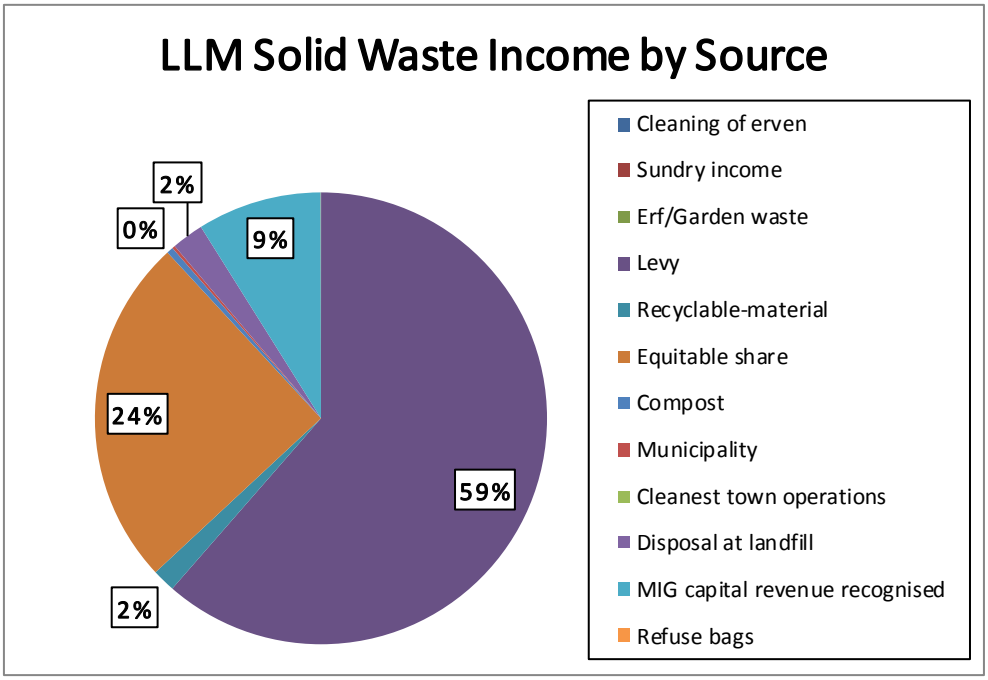
The main income categories are shown in Table 6.33. The total income for LLM is approximately R28.3 million. This total represents the amount less the cost of covering the free waste services afforded to the 5500 indigent households within LLM (as per the LLM IDP 2016/17). The income generated by the billing of residents and businesses for waste services (levy), is the largest component of the income accounting for 59% of the total income followed by the equitable share allocation (24%) and MIG capital which accounts for a further 9% of the total share.

The expenditure of the LLM Solid Waste Management as mentioned in the previous section on expenditure, was approximately R36.5 million. Hence, there is a deficit amounting to nearly R8.2 million for Solid Waste Management.

Table 6.33: Summary of Income

Income source	Income (Rands)	Income source as a percentage of total income (%)
Cleaning of erven	0	0%
Sundry income	484	0%
Erf/Garden waste	2393	0%
Levy	20119648	59%
Recyclable-material	540507	2%
Income due to change in discount rate	1244505	4%
Equitable share	8205861	24%
Compost	154518	0%
Municipality	68675	0%
Cleanest town operations	0	0%
Disposal at landfill	749693	2%
MIG capital revenue recognised	2914970	9%
Refuse bags	5111	0%
Indigents - Income foregone	-5705472	
Previous years corrections	-5703	
Total Income	28295192	100%

Figure 6.7: LLM Solid Waste Income by Source



6.6.5 Prosecution

Currently LLM does not have an applicable waste by-law and so cannot impose penalties or fines or properly enforce or prosecute any persons or parties for contraventions of national and provincial solid waste legislation. The Waste By-law is viewed by the LLM Solid Waste Management as a key component to be addressed in the needs assessment.

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Appendix B. Waste Legislation

1.1.1.1 Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)

The South African Constitution (Act 108 of 1996) is the supreme law of the land. Section 24 of the Constitution states that, it is the right of every person living in South Africa to experience an environment that is not harmful to their health or well-being. This imposes a duty on all organs of state to promulgate legislation and to implement policies that ensure that this right is upheld. Chapter 7 of the Constitution specifically describes the role and responsibility of local government as:

- to promote social and economic development
- to promote a safe and healthy environment.

The municipality is responsible for refuse removal, managing waste disposal facilities and cleansing, as it sees it as part of the basic service and as per Schedules 4 and 5 of the Constitution.

1.1.1.2 National Environmental Management: Waste Act, 2008

Chapter 1, Section 2 of the Act describes the objectives of the Act as follows:

a) "to protect health, well-being and the environment by providing reasonable measures for

i. minimising the consumption of natural resources
ii. avoiding and minimising the generation of waste
iii. reducing, re-using, recycling and recovering waste
iv. treating and safely disposing of waste as a last resort
v. preventing pollution and ecological degradation
vi. securing ecologically sustainable development while promoting justifiable economic and social development
vii. promoting and ensuring the effective delivery of waste services
viii. remediating land where contamination presents, or may present, a significant risk of harm to health or the environment
ix. achieving integrated waste management reporting and planning.

b) to ensure that people are aware of the impact of waste on their health, well-being and the environment

c) to provide for compliance with the measures set out in paragraph (a)

d) generally, to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being."

The Act requires the drafting of a national waste management strategy for achieving the objectives of the Act. The Act sets waste service standards, covering areas such as tariffs, quality of service and financial reporting. The Act requires that each municipality designate a waste management officer.

The Act requires each municipality to produce an Integrated Waste Management Plan (IWMP) and to submit this plan to the MEC for endorsement. The approved IWMP must be included in the municipal Integrated Development Plan (IDP).Before finalising the IWMP the municipality is required to follow the consultative process as defined in section 29 of the Municipal Systems Act. This can be done either as a separate process or as part of the consultative process relating to its IDP.

1.1.1.3 National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014)

The major amendments to the National Environmental Management: Waste Act, 2008 included in the Amendment Act are the changes to basic definitions such as waste and the involvement of Department of Environmental Affairs (DEA) in the integrated waste management planning and implementation processes.

Waste has been redefined as:

"any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act;

….but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste—

a) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;
b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the Gazette, "

More recognition is also given to re-using and recovering materials previously considered waste:

"but any waste or portion of waste, referred to in paragraphs (a) and (b), ceases to be a waste—

i. once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;
ii. where approval is not required, once a waste is, or has been re-used, recycled or recovered;"

Section 12 of the principal Act was amended by ensuring that the Department of Environmental Affairs (DEA) is involved with the integrated waste management planning in the following respects:

- Preparing Integrated Waste Management Plans for the province after consulting all other provincial departments
- Identification of measures to implement,
- Setting out the priorities and objectives,
- Planning of any new facilities for disposal and decommissioning of existing waste disposal facilities
- Describing how the IWMP requirements shall be met.

1.1.1.4 Environment Conservation Act No. 73 of 1989

The main purpose of this Act is to provide for the protection of the natural environment (Section 16) to control environmental pollution by prohibiting littering and controlling the removal of littering, and controlling waste management (Section 20) where the owner of a disposal landfill is required to apply for a permit from the minister of Water Affairs to operate such a facility. The Act further provides for the control of activities which may have a detrimental effect on the environment (Section 21).

The Act defines a disposal landfill as:

"A landfill used for the accumulation of waste with the purpose of disposing or treatment of such waste."

Sections 24 to 28 of the Act contain regulations regarding waste management, littering, noise, vibration and shock, environmental impact reports, limited development areas and general regulatory powers.

1.1.1.5 National Environmental Management Act No. 107 of 1998

The National Environmental Management Act (NEMA) was promulgated in November 1998 and is the key legislation for environmental management in South Africa. NEMA promotes social, economic and environmental sustainability, with a focus on the conservation of the environment. The Act requires environmental process to be transparent and to provide capacity for disadvantaged stakeholders to participate. NEMA promotes the need for cooperative governance where more than one government department may be involved in the decision-making for a development.

The EIA Regulations in terms of the NEMA was amended in 2014, providing a new list of activities that require environmental authorisation through different processes. The list describes those activities that require a basic assessment (BA) and those that require a full environmental impact assessment (EIA).Both the BA and EIA involve public participation, however the latter is a more detailed and involved process.

NEMA promotes some of the following key principles:

- Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
- Development must be socially, environmentally and economically sustainable. The Act further defines in considerable detail the approach to sustainable development.
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated.
- Environmental justice must be pursued so that adverse environmental impacts are not in any way discriminatory to any part of the population.
- There must be equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being.
- The participation of all interested and affected parties in environmental governance must be promoted throughout the life cycle of any project or programme and any decision-making process.
- Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and the recognition of all forms of knowledge, including traditional and ordinary knowledge.
- The social, economic and environmental impacts must be considered, assessed and evaluated.
- The process must be transparent.
- The rights of workers must be protected and the vital role of women and youth in environmental management and development must be recognised and their full participation promoted.

- There must be harmonisation between policies, legislation and actions relating to the environment and global and international responsibilities relating to the environment must be discharged in the national interest.

1.1.1.6 National Environment: Air Quality Act 39 of 2004

The objective of this Act is:

a) "To protect the environment by providing reasonable measures for -

i. The protection and enhancement of the quality of air in the Republic;
ii. The prevention of air pollution and ecological degradation, and
iii. Securing ecologically sustainable development while promoting justifiable economic and social development; and

b) Generally to give effect to the section 24(b) of the Constitution in order to enhance the quality of ambient air for the sake of securing and environment that is not harmful to the health and well-being of people."

The Act emphasises that the key to ensuring that air quality is improved is by the minimisation of pollution through vigorous control, cleaner technologies and cleaner production practices.

1.1.1.7 National Waste Management Strategy, November 2011

The NWMS is a legislative requirement of the Waste Act, 2008 (Act No. 59 of 2008). The purpose of the NWMS is to achieve the objects of the Waste Act. Organs of state and affected persons are obliged to give effect to the NWMS.

The overall purpose of the strategy is to give effect to the objects of the Waste Act, which are to protect health, well-being and the environment through sound waste management and application of the waste management hierarchy. The strategy provides a plan to give practical effect to the Waste Act, and as such it seeks to ensure that responsibility for waste management is properly apportioned.

The legacy of inadequate waste services, poorly planned and maintained waste management infrastructure, and limited regulation of waste management persistently threaten the health and wellbeing of everyone in the country. Addressing this legacy and its negative environmental and social consequences, advances people's constitutional right to a healthy environment. The NWMS aims to redress the past imbalances in waste management. For example, waste licensing will not permit WMF sites within a particular radius of a human settlement.

The eight strategic goals around which the NWMS is structured are as follows:

Goal 1: Promote waste minimisation, re-use, recycling and recovery of waste

Focuses on implementing the waste management hierarchy, and with the ultimate aim of diverting waste from WMF

Goal 2: Ensure the effective and efficient delivery of waste services

Promotes access to at least a basic level of waste services for all and integrates the waste management hierarchy into waste services, including separation at source

Goal 3: Grow the contribution of the waste sector to the green economy

Emphasises the social and economic impact of waste management, and situates the waste strategy within the green economy approach

Goal 4: Ensure that people are aware of the impact of waste on their health, wellbeing and the environment

Seeks to involve communities and people as active participants in implementing a new approach to waste management

Goal 5: Achieve integrated waste management planning

Creates a mechanism for integrated, transparent and systematic planning of waste management activities at each level of government

Goal 6: Ensure sound budgeting and financial management for waste services

Provides mechanisms to establish a sustainable financial basis for providing waste services

Goal 7: Provide measures to remediate contaminated land

Addresses the massive backlog of public and privately owned contaminated land in South Africa

Goal 8: Establish effective compliance with and enforcement of the Waste Act

Ensures that everyone adheres to the regulatory requirements for waste management and builds a culture of compliance.

1.1.1.8 White Paper on Integrated Pollution and Waste Management of South Africa, Government Gazette, No. 20978, March 2000

The White Paper aims to view pollution and waste management from a holistic point of view by accounting for environmental, social and institutional issues.

The White Paper is proactive by placing emphasis on the waste hierarchy – reduction of waste, recycling and diversion from WMF.

It covers key issues of pollution and waste management, proactive measures, approach, strategic objectives and the roles of government.

The goals of the policy are as follows:

- Goal 1: Effective institutional framework and legislation
- Goal 2: Pollution prevention, waste minimisation, impact management and remediation
- Goal 3: Holistic and integrated planning
- Goal 4: Participation and partnerships in integrated pollution and waste management governance
- Goal 5: Empowerment and education in integrated pollution and waste management
- Goal 6: Information management
- Goal 7: International cooperation

IWMPs are identified as part of the short term deliverables for goal 1 because IWMPs inform and serve improve the functioning of local government by providing a roadmap for local government to effectively manage waste.

At national level DEAT was assigned the responsibility of integrated pollution and waste management in South Africa. DEAT are responsible for the following functions:

- Policy, strategy and legislation
- Coordination
- Enforcement
- Dissemination of information
- Participation and appeals (against government decisions, authorisations, etc.)
- Monitoring, auditing and review
- Capacity building.

Different departments are responsible for setting regulations, guidelines and standards for different types of waste but in consultation with DEAT.

DWAF is responsible for permitting of WMFs and waste regulations, guidelines and standards.

Department of Minerals and Energy is responsible for regulations and standards for mining, radioactive and coal combustion waste. The Department of Health sets regulations and guidelines for all medical wastes and treatment facilities. The Department of Agriculture is responsible for agricultural waste.

The functions of provincial government are as follows:

- "Develop a provincial environmental implementation plan
- Reviewing the first-generation integrated waste plans received from the municipalities and where necessary, assisting with the drafting of these
- Monitor compliance with provincial implementation plans
- Intervene if the implementation plans are not being complied with
- Develop provincial guidelines and standards
- Develop and enforce provincial regulations
- Act on environmental hazards as required
- Participate in the Committee for Environmental Co-ordination.
- Ensure that all industries have access to appropriate waste disposal facilities
- Assisting national government in drafting regulations and guidelines
- quality assurance of the Waste Information System
- developing and enforcing provincial regulations for general waste collection, and supporting local government in the implementation of waste collection services
- Implementing and enforcing waste minimisation and recycling initiatives, and in particular, promoting the development of voluntary partnerships with industry registration and certification of hazardous waste transporters, the waste manifest system and the establishment and control of hazardous waste collection facilities
- Supporting the Department of Environmental Affairs (DEA) in planning for a system of medical waste treatment facilities, and investigating the feasibility of centralised (regional) waste treatment plants."

The functions of local government are as follows:

- Compiling and implementing general waste management plans, with assistance from provincial government
- Implementing public awareness campaigns
- Collecting data for the Waste Information System

- Providing general waste collection services and managing waste disposal facilities within their areas of jurisdiction
- Implementing and enforcing appropriate waste minimisation and recycling initiatives, such as promoting the development of voluntary partnerships with industry, including the introduction of waste minimisation clubs
- Where possible, regional planning, establishment and management of WMF =, especially for regionally based general waste WMFs.

1.1.1.9 National Water Act (Act 36 of 1998)

The National Water Act (Act 36 of 1998) serves as the basis of legislation for all water resources in South Africa.

Chapter 4 focuses on regulating water use (Chapter 4 Part1). The most applicable clause in this part of the document is clause 22(l) which states:

"22, (l) A person may only use water:

(c) in the case of the discharge or disposal of waste or water containing waste contemplated in section 2 l(j), (g), (h) or (j) must comply with any applicable waste standards or management practices prescribed under section 26(l)(h)."

Chapter 3 focuses on the protection of existing and future water resources. In Part 4 of Chapter 3 prevention and remedying the effects of pollution is discussed. Clause 19 is the most relevant in terms of waste management:

"(1) An owner of land, a person in control of land or a person who occupies or uses the land on which—

a) any activity or process is or was performed or undertaken; or
b) any other situation exists,

which causes, has caused or is likely to cause pollution of a water resource, must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring."

"(2) The measures referred to in subsection (1) may include measures to -

a) cease, modify or control any act or process" causing the pollution;
b) comply with any prescribed waste standard or management practice;
c) contain or prevent the movement of pollutants;
d) eliminate any source of the pollution;
e) remedy the effects of the pollution; and
f) remedy the effects of any disturbance to the bed and banks of a watercourse."

The Water Act is important to waste management as it enforces the polluter pays principle and also ensures that any waste released must be aligned with legislative requirements.

1.1.1.10 National Health Act, Act 61 of 2004

The main objectives of the National health Act are to provide clean, affordable, equitable and righteous services to all citizens in South Africa. The most applicable objective of the National Health Act in terms of waste management is:

b) “setting out the rights and duties of health care providers, health workers, health establishments and users”

The duties of National Health is to facilitate the provision of indoor and outdoor pollution control services (Chapter 3 Section 21.2 j)

The function of Provincial Health is to provide pollution control services (Chapter 4 Section 25.2 u)

The investigation of pollution at health facilities is designated to Health Officers (Chapter 10 Section 83.1)

Chapter 11 Section 90.1 (n) allows the Minister after Consultation with the Heath Council to develop regulations for “nuisance and medical waste”

1.1.1.11 Western Cape Health Care Waste Management Act No. 7 of 2007

The main objectives of this Act are as follows:

a) “reducing the risks of health care waste to human health;
b) preventing the degradation of the environment;
c) preventing the illegal dumping of health care waste;
d) promoting sustainable development, and
e) ensuring responsible management of health care waste in the Province.”

The Act covers the topics of reporting and processes for spillage and dumping of health care risk waste, the appointment of inspectors and power thereof, penalties for contravention, reporting of incidents by municipalities to the department and relevant regulations.

The main duties of the municipality, as mentioned in terms of clause 12, are to:

a) “enforce the relevant provisions of this Act within its area of jurisdiction;
b) “notify the Department of any incident of spillage or illegal dumping;
c) “perform audits of generators, transporters, treaters and disposers of health care waste within its area of jurisdiction to ensure compliance with the provisions of this Act;
d) (d) report annually to the Provincial Minister:
    i. the number of incidents of dumping and spillage of health care waste within its area of jurisdiction;
    ii. the number of incidents of dumping of health care risk waste pursued in a court of law; and
    iii. the number of incidents of health care waste successfully prosecuted in a court of law.”

1.1.1.12 Western Cape Health Care Waste Management Amendment Act, Act 6 of 2010.

This act amends the Western Cape Health Care Waste Management Act, 2007, so as to align the terminology with that used in the National Environmental Management: Waste Act, 2008.

1.1.1.13 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) National Domestic Collection Standards

The National Domestic Collection Standards are very important for municipalities as it sets out what principles, level of services collection services should embody and should as a minimum be provide to citizens of the

municipality. It details pertinent issues such as the use of receptacles, frequency of collection and collection vehicles. It also mandates the provision of drop-off centres where viable, health and safety that meets the requirements, provision of good communication channels between the municipality and the community, the use of awareness campaigns to prevent littering and promote the use of collections, receptacles and drop-offs, a system to register complaints and the implementation of service standards for the collection of waste.

1.1.1.14 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) National Norms and Standards for the Assessment of Waste for Landfill Disposal

This Act prescribes the requirements of waste in terms of elemental and chemical composition leachable limits of the waste and the applicable tests. The aim of the acts is to prevent toxic waste from leaching into the surrounding environment. Waste must be within these tolerances to be accepted for disposal as general waste. Amounts surpassing the limits are considered as hazardous waste and will need to follow the processes as prescribed within the act.

1.1.1.15 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) Amendments to the List of Waste Management Activities that have, or are Likely to Have a Detrimental Effect on the Environment

This Act makes amendments to the definition of “Residue stockpiles or reside deposits” for both Category activity lists.

1.1.1.16 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) List of Waste Management Activities that have, or are Likely to Have a Detrimental Effect on the Environment

The Act prescribes the list of waste management activities that require a Basic Assessment (Category A), Environmental Impact Assessment (Category B) or Category C which must comply with the following standards:

a) “Norms and Standards for Storage of Waste, 2013; or
b) Standards for Extraction, Flaring or Recovery of Landfill Gas, 2013; or
c) Standards for Scrapping or Recovery of Motor Vehicles, 2013”

The activities are listed in terms of storage, reuse, recycling or recovery of waste, treatment, disposal and construction of waste structures and infrastructure. The Act also makes provision for waste management license applications which were applied for under legacy legislation.

1.1.1.17 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) National Waste Information Regulations

The Act regulates the collection of data and information that enables the national waste information system to fulfil its functions.

The main aspects covered include the registration and application process for interested parties, reporting and recording of waste information and verification which enables the provincial authority DEA&DP to query the information provided. Non-compliance by responsible parties can result in offences and penalties.

1.1.1.18 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) Notice of Approval of an Integrated Industry Waste Tyre Management Plan of the Recycling and Economic Development Initiative of South Africa

The Act outlines the business plan of REDISA (Recycling and Economic Development Initiative South Africa). REDISA was initiated as a Non-Profit Company (NPC) by DEA to reduce the amount of tyre waste being sent to landfill and in so doing addresses the Waste Act objective of protecting health, well-being and the environment.

All tyre producers are required by law "part 3 of the Waste Tyre Regulation, must subscribe to an Integrated Industry Waste Tyre Management Plan (IIWTMP) approved by the Minister." Failure to comply results in a penalty being given to the offender.

REDISA should be incorporated into the IIWTMP for tyre producers. The tyre producers must register with REDISA and will collect the tyres and transport them to their depots for re-use, recycling and recovery.

The Act details all the processes, responsibilities and actions required to ensure compliant IIWMTMPs.

1.1.1.19 Regulations Under Section 24(d) of the Environment Conservation Act (Act No. 73 of 1989) – Plastic Carrier Bags and Plastic Flat Bags, 2003

The production and distribution of plastic bags is restricted to only those which meet the Compulsory Specification d in terms of the Standards Act, 1993 (ActN o 29 of 1993).

1.1.1.20 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) Notice of Intention to Require the Paper and Packaging Industry, Electrical and Electronic and Lighting Industry to Prepare and Submit to the Minister Industry Waste Management Plans for Approval

Industries must compile an industry waste management plan and submit it the Minister for approval. The Industry Waste Management Plan must contain all information regarding waste such as waste generation, projections, processes, management of waste, stakeholders involved, measures in place, transportation and storage of waste, treatment, re-use and recycling of waste, job creation, training and development and an implementation plan for a 5 year cycle. The plan must also undergo a stakeholder consultation process by which comments can be made, before approval is granted.

This Act mandates industries to follow certain procedures when writing, submitting and seeking approval of their waste management plans.

1.1.1.21 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) Industry Waste Management Plans

The DEA&DP promulgated a provincial notice requesting certain subsectors within the Consumer Formulated Sector to develop and submit Industry WMP`s to the DEA&DP for assessment and approval.

This Act mandates that "Paint, Ink, Adhesive, Cosmetic, Pharmaceutical and Cleaning Chemicals subsectors of the Consumer Formulated Chemical Sector in the Western Cape producers who generate on average more

than 20 kg of hazardous waste per day", must prepare and submit an Industry Waste Management Plan to DEA&DP for approval. The contents of the plan must include the following information:

a) "the amount of waste generated;
b) measures taken to prevent pollution or ecological degradation;
c) targets for waste minimisation, which can include re-use, recycling, recovery, cleaner production and resource efficiency;
d) (d) measures or programmes to minimise the generation of waste, that can include re-use, recycling or recovery, and the final disposal of waste;
e) (e) measures or actions to be taken to manage waste;
f) (f) measures to reduce or eliminate the use and generation of hazardous chemical substances;
g) (g) opportunities for the reduction of waste generation through changes to packaging, product design or production processes;
h) (h) mechanisms for informing the public of the impact of waste-generating products or packaging on the environment;
i) (i) the extent of any financial contribution to be made to support consumer-based waste reduction programmes;
j) (j) the period required for implementation of the plan;
k) (k) methods for monitoring, evaluation and reporting; and
l) (l) any other matters that may be necessary to give effect to the objects of the Waste Act."

1.1.1.22 National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) Waste Classification and Management Regulations

The main objectives of the regulation are prescribed as follows:

a) "regulate the classification and management of waste in a manner which supports and implements the provisions of the Act;
b) establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management Licence;
c) prescribe requirements for the disposal of waste to landfill;
d) prescribe requirements and timeframes for the management of certain wastes; and
e) prescribe general duties of waste generators, transporters and managers."

LLM must ensure that they follow the requirements of the regulation in their collection, storage, transportation, treatment, recovery and disposal of waste.

1.1.1.23 Occupational Health and Safety Act (Act 85 of 1993)

The main aim of the act relevant to waste management staff is the:

- Provision of health and safety for persons at work.
- Protection of non-working persons exposed to hazards from a working environment

The employer is responsible for ensuring a safe working environment, identification and prevention of health and safety risks, prescribe actions and measures to be taken by workers in terms of health and safety and health and safety training and instructions.

In the case of the LLM Solid Waste division, LLM staff must be provided with resources and training and education concerning health and safety. This will include but is not limited to:

- The provision of personal protection equipment (PPE) to protect collection staff from being directly exposed to leachate produced from waste,

- ensuring that staff are loading and offloading waste safely,
- staff driving vehicles are following the rules and regulations of the roads,
- vehicles are roadworthy,
- and safety of staff at WMF.

1.1.1.24 Hazardous Substances Act (Act 5 of 1973)

The main purpose of this Act is to:

“To provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products; to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products; and to provide for matters connected therewith.”

The Inspectors are responsible for inspecting premises that are involved with operations including hazardous substances for the presence of improperly dumped hazardous waste materials (group I, II, III and IV).

The Minister is responsible for making regulations for:

“e. prescribing the precautions to be taken for the protection from injury, ill health or death of persons in control of or employed or engaged in the manufacture, operation, application or use of grouped hazardous substances or of any other persons who is likely to or may be exposed to grouped hazardous substances as a result of the manufacture, operation, application, use, disposal or dumping thereof;”

The relevance of this legislation to waste is with respect to operations of hazardous waste found in the waste stream such as electronic waste (Group III).

1.1.1.25 Municipal Structures Act

The responsibility for refuse removal, refuse dumps and solid waste disposal has been assigned to local government according to the Constitution. District and local municipalities have different roles and responsibilities as described in the Municipal Structures Act (Act No. 117 of 1998).

The following section gives a helpful summary of these roles and responsibilities:

“District municipalities have powers and functions related to the integrated, sustainable and equitable social and economic development of the district. Local municipalities are responsible for the provisioning of specific services, including the removal and disposal of waste. Municipalities (district and local) are encouraged to practice the principles of co-operative governance to avoid conflict between overlapping functions. Combining efforts where there are similar initiatives may achieve better results.

District municipalities are responsible for:

- Ensuring integrated development planning for the district as a whole. This includes the development of a framework for IDPs and ensuring that IWMPs inform the IDP process;
- Promoting bulk infrastructure development and services for the district as a whole. The infrastructure refers to the establishment of regional waste disposal WMFs and bulk waste transfer stations that can be used by more than one local municipality within the district;
- Building local municipality capacity – where a local municipality fails to perform its management functions, Waste management governance encompasses the legal framework and institutions involved in waste management. As such the main players are National Departments of Environmental Affairs and Co-operative Governance and Traditional Affairs, the various Provincial departments responsible for environmental affairs and Local government including Metropolitan, District and Local Municipalities. The district municipality can enter into a Service Level Agreement (SLA) with the local municipality to provide the service for a stipulated period until such time that the local municipality can offer the service;
- Promoting equitable distribution of resources between the local municipalities in its area, for example, ensuring that resources are deployed in municipalities within their area of jurisdiction, where it is most needed.

Specific Local Municipality functions include:

- Compiling and implementing IWMPs and integrating these into IDPs;
- Running public awareness campaigns;
- Collecting data for the Waste Information System;
- Providing waste management services which includes waste removal, waste storage and waste disposal services, which are in line with national norms and standards. Municipality specific standards for separation, compacting and storage of solid waste that is collected as part of the municipal service will, may be set and enforced by the municipality;
- Implementing and enforcing waste minimisation and recycling (including the encouraging of voluntary partnerships with industry and waste minimisation clubs). (CSIR 2011)

The general duties of a municipality are as follows:

"8.7.1 (1) A municipality must give effect to the provisions of the Constitution and—

a) give priority to the basic needs of the local community;
b) promote the development of the local community; and
c) ensure that all members of the local community have access to at least the minimum level of basic municipal services.

(2) Municipal services must be: —

a) Equitable and accessible:
b) Provided in a manner that is conducive to:
   i. the prudent, economic, efficient and effective use of available resources; and
   ii. the improvement of standards of quality over time:

a) Financially sustainable:
b) Environmentally sustainable; and
c) Regularly reviewed with a view of upgrading, extension and improvement"

1.1.1.26 Municipal Systems Act (Act No. 32 of 2000)

Sections 11, 12 and 13 of the Municipal Systems Act 2000 (Act No. 32 of 2000) describes the municipal functions and powers, and states that a municipality may exercise its executive authority through the adoption of polices and the passing of by-laws.

Municipal tariffs must be set according to processes defined in Section 74 of the Municipal Systems Act (2000).

Before finalising the IWMP the municipality is required to follow the consultative process as defined in section 29 of the Municipal Systems Act. This can be done either as a separate process or as part of the consultative process relating to its IDP.

1.1.1.27 Mineral and Petroleum Resources Development Act (Act 28 of 2002)

The Mineral and Petroleum Resources Development Act (Act 28 of 2002) is the basis for equitable access to and sustainable management of mineral and petroleum resources. The pertinent clauses are clause 20 which discusses disposal of material and 38 which discusses the environmental management of impacts

“20 Permission to remove and dispose of minerals

1) Subject to subsection (2), the holder of a prospecting right may only remove and dispose for his or her own account any mineral found by such holder in the course of prospecting operations conducted pursuant to such prospecting right in such quantities as may be required to conduct tests on it or to identify or analyse it.
2) The holder of a prospecting right must obtain the Minister's written permission to remove and dispose for such holder's own account of bulk samples of any minerals found by such holder in the course of prospecting operations conducted pursuant to such prospecting right.”

"38 Integrated environmental management and responsibility to remedy

1) The holder of a reconnaissance permission, prospecting right, mining right, mining permit or retention permit -
    e) is responsible for any environmental damage, pollution or ecological degradation as a result of his or her reconnaissance prospecting or mining operations and which may occur inside and outside the boundaries of the area to which such right, permit or permission relates."

1.1.1.28 Western Cape Spatial Development Framework (DEA&DP, 2014)

The Western Cape Spatial Development Framework; serves to set out strategies for development in the Western Cape in accordance with key goals. The strategies are to be incorporated in planning documents at provincial and municipal level such as IDPs. The SDF has been centred around three central themes namely resources, space economy and settlement:

- "Resources
  - 1: Protect Biodiversity and Ecosystem Services
  - 2: Safeguard Inland and Coastal Water Resources, and Manage the Sustainable Use Of Water
  - 3: Safeguard the Western Cape's Agricultural and Mineral Resources, and Manage their Sustainable Use
  - 4: Recycle and Recover Waste, Deliver Clean Energy Sources, Shift from Private To Public Transport, Adapt to and Mitigate against Climate Change
  - 5: Safeguard Cultural and Scenic Assets
- Space Economy
  - 1: Use Regional Infrastructure Investment to Leverage Economic Growth
  - 2: Diversify and Strengthen the Rural Economy
  - 3: Revitalise and Strengthen Urban Space-Economies as the Engine of Growth
- Settlement
  - 1: Protect, Manage and Enhance Sense of Place, Cultural and Scenic Landscapes
  - 2: Improve Inter and Intra-Regional Accessibility
  - 3: Promote Compact, Mixed Use and Integrated Settlements
  - 4: Balance and Coordinate the Delivery of Facilities and Social Services
  - 5: Promote Sustainable, Integrated and Inclusive Housing in Formal and Informal Markets

The SDF identifies Robertson as a primary regional service centre, Ashton as a secondary regional centre in terms of social facilities and McGregor as a rural settlement with threshold to support permanent social services.

Regional facilities for waste management are described as having the ability to either "unlock opportunities or unnecessarily burden municipalities operationally." This must be considered in any regional facility that is proposed for Langeberg Local Municipality

Major challenges raised by the report are:

- illegal dumping,
- A lack of hazardous waste facilities
- growing informal settlements and urban sprawls, and
- a lack of recyclable collection from homes.

The areas neighbouring the Breede River including LLM, were identified as a key area for agricultural intensification. This in turn implies more waste service provision for the rural communities which support the agricultural sector.

1.1.1.29 Western Cape Integrated Waste Management Plan (2011)

The main objective of this plan is to give effect to the Waste Act by improving waste management in the Western Cape Province through an integrated waste management approach. It provides a framework to enable the Western Cape government, municipalities, industry and the civil society to minimise waste, improve waste management and to enact on its obligations and responsibility to build a resource efficient society (Western Cape Integrated Waste Management Plan, 2011).

The eight strategic goals around which this plan is structured are as follows:

Goal 1: Educate, strengthen capacity and raise awareness in integrated waste management

- Promote consumer and industry responsibility in integrated waste management
- Build the capacity of private and public sector with regard to basic waste management and integrated waste management
- Monitor progress and trends in implementing integrated waste management

Goal 2: Improve waste information management

- Ensure the waste information collection capacity
- Collect reliable waste information
- Continue to improve and update Integrated Pollutant Waste Information System (IPWIS) (soft & hardware)
- Provide access to reliable waste information

Goal 3: Promote sound, adequate and equitable waste management practices

- Capacitate waste managers in the public and private sectors with regard to the basic principles of sound waste management
- Ensure that basic waste management functions are executed in an environmentally and socially acceptable manner

Goal 4: Mainstream integrated waste management planning in municipalities and industry

- Facilitate and guide the development of municipal IWMPs and IndWMPs
- Build capacity in integrated waste management planning in both municipalities and industry

Goal 5: Mainstream sustainable waste management practices

- Promote principles, concepts and practices which are associated with sustainable waste management
- Maximise the diversion of waste from WMFs
- Promote waste recovery, recycling and re-use
- Improve the minimisation of waste throughout the product lifecycle
- Minimise the consumption of natural resources

Goal 6: Strengthen the waste regulatory system

- Licence all WMF
- Strengthen compliance monitoring and enforcement
- Remediate and rehabilitate contaminated land
- Goal 7: Ensure the safe and integrated management of hazardous waste
- Promote safe handling, storage, transportation and disposal of hazardous waste
- Treat and properly manage all hazardous, sector and priority waste before safe disposal
- Promote compliance monitoring and enforcement
- Reduce generation of hazardous waste

Goal 8: Facilitate access to funds to implement integrated waste management in the province

- Address funding constraints of waste management authorities
- Capacitate waste authorities on financial aspects with regard to improving waste management services
- Improve funding for waste management services

The following targets were set for 2014:

- The main target is to achieve a 15% waste diversion from WMF
- Other targets include licensing 80% of WMF and ensuring that 75% of households receive basic waste collection services

1.1.1.30 LLM Spatial Development Framework (2015)

Solid waste refuse is not mentioned in the SDF. The development plans from the SDF (CNdV, 2014) indicate that LLM has moderate growth potential and that most of the growth will be in terms of residential and industrial developments. The proposed developments for the towns are as follows:

- Robertson:
  - Industrial expansions along the Breede River
  - GAP social housing in Droehewuwel
  - Possible school and agricultural or mix use development between Droeheuwel and Moreson or alternatively adjacent to Nkqubela in the south
  - Possible market site in Robertson North
- Montagu:
  - Middle income housing in Bergsig and market related housing to the south near the .
  - Mixed use industrial and education areas for area south of Ashbury.
  -
- Ashton:
  - Residential areas expanded in Zolani and also along the abutting intersection with R60;
  - Emphasis on connecting Zolani and Ashton
- Bonnievale:
  - Mixed income residential properties amounting to approximately of 60 ha required in the future by Happy Valley and Mountain View
  - Extension to Industrial area.

- McGregor:
  - Low cost housing to be integrated with existing communities
  - Future residential area expansion to the south west of the town

1.1.1.31 International Treaties

South Africa is a signatory to the Basel and Stockholm Conventions. The key objectives of the Basel Convention are to:

- minimise the generation of hazardous wastes in terms of quantity and hazardousness;
- dispose of them as close to the source of generation as possible; and
- reduce the movement of hazardous wastes.

A central goal of the Basel Convention is "environmentally sound management", the aim of which is to protect human health and the environment by minimising hazardous waste production whenever possible. Environmental sound management means addressing the issue through an "integrated life-cycle approach", which involves strong controls from the generation of a hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal (World Health Organisation, 2009).

The Stockholm Convention is "…a global treaty to protect human health and the environment from Persistent Organic Pollutants (POPs)" (Magulov, 2009). POPs are particularly carcinogenic and are toxic to both humans and wildlife. The burning of waste, whether open burning, on landfill WMF or incineration, has the potential to produce high volumes of POPs into the atmosphere.

The Act requires each municipality to produce an Integrated Waste Management Plan (IWMP) and to submit this plan to the MEC for approval.

Appendix C. Waste Characterisation Recordings

Bonnievale - Happy Valley 25/10/16 MYRTLE

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other (wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
			5.98	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1			5,98	0,48	120	0,46	105	0,18	25	0,28	50	—		0,24	25	1,86	40	0,12	20	—		0,18	62	1,54	25	0,46	100		
2			6,44	0,04	25	0,06	13	0,38	110	1,72	150	0,28	17	1,06	25	—		—		0,26	18	1,64	150	0,80	18	—			
3			3,66	0,48	150	—		0,02	20	1,26	150	—		0,02	7	0,72	10	—		—		—		—		0,40	120		
4			2,34	0,08	25	0,14	25	0,64	20	0,92	150	—		—		3,44	160	—		0,96	75	—		—		0,42	50		
~~4~~ 5			~~8,90~~																										
				~~Mountain View~~																									
1			8,70	0,20	75	0,38	75	0,10	50	0,74	30	0,12	10	—		2,12	50	—		—		0,06	15	3,78	75	1,44	100		
2			2,94	0,62	100	0,28	75	0,18	25	0,72	100	0,56	25	0,18	15	1,28	75	—		—		—		0,66	25	0,61	150		
3			4,38	0,46	150	0,44	50	0,16	20	0,28	50			0,06	15	2,68	50	—		—		—		—		0,40	45		
4			5,64	0,10	25	0,10	25	0,02	10	0,04	20	—		0,06	20	0,50	50	—		—		0,24	25	—		3,68	150		
5			2,72	0,04	50	0,14	25	0,20	50	0,88	150	0,00	0	0,00	0	0,80	75	0,28	30	—		0,00	0	—		0,40	45		
~~6~~																													
						Informal Houses																							
1			5,04	0,06	45	0,28	25	0,30	75	0,08	50	0,10	10	—		—		—		—		—		0,64	25	0,34	58		
2			3,08	0,10	75	0,64	150	0,08	25	0,04	25	0,44	10	—		—		—		—		—		—		1,56	25		
3			6,28	0,02	20	0,66	150	0,08	18	0,00	0	1,14	20	—		—		—		—		0,02	15	3,64	50	0,10	75		
								0,08	18	—		—						—		—						0,42	20		
4			7,12	0,04	10	0,28	0,22	50	50			—		0,08	10	—		—		—						1,44	20		
						~~0,06~~	~~10~~																			4,60	25		
						0,04	10																						
								Bonnievale CBD / DoRP																					
1			6,28	0,34	100	0,40	50	0,42	25	0,35	150	1,06	20	0,14	25	—		~~0,08~~	~~20~~	—		—		—		0,48	100		
				0,26	100													0,08	20										
2			4,96	0,00	0	0,18	10	—		0,02	10	—		0,12	3,58	~~100~~	~~0,12~~	0,12	20	—		—		—		0,68	10		
				0,00	0																								
				0,04	10																								
3			4,46	0,24	20	0,08	10	—		0,38	25	—		0,08	18	3,20	50	0,00	0	—	0,00	0,00	0	0,00	0	0,00	0		
				0,12	100					~~0,35~~												0,22	10	0,66	50	0,00	0		
4			2,76	0,10	25	0,06	10	—		0,60	100	—		—		—		0,04	10			—		—		—			
						0,04	10											0,24	50							0,12	25		
5			6,34	0,36	100	0,04	10	—		0,18	25	0,32	10	0,12	10	—				0,04	0,06	4,86	20	—					
6			3,68			0,22	25			0,32	75	0,44	10	0,02	10	—		0,08	25	—		2,58	25	—		0,02	10		
7			4,24	0,14	25	0,74	100	0,06	25	0,32	25	1,44	25	0,20	10	0,94	50	0,06	25	—		0,12	25	—		0,08	50		
						0,13	25																						
8			5,58	0,20	100	0,28	50	—		0,18	20	1,02	10	—		3,36	50	—		—		—		—		0,04	20		
9			5,92	—		0,32	100	—		0,38	20	—		—		5,36	100	0,42	50	—		—		—		0,14	25		

25/10/16

Robertson - Nkqubela

MYRTLE

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft) Mass (Kg)	Plastic (soft) Vol (%)	Plastic (dense) Mass (Kg)	Plastic (dense) Vol (%)	Paper Mass (Kg)	Paper Vol (%)	Cardboard Mass (Kg)	Cardboard Vol (%)	Glass Mass (Kg)	Glass Vol (%)	Metals Mass (Kg)	Metals Vol (%)	Organics (food & green waste) Mass (Kg)	Organics Vol (%)	Composite packaging/ Tetrapak Mass (Kg)	Composite Vol (%)	e-waste (computers, electrical appliances, batteries, globes) Mass (Kg)	e-waste Vol (%)	Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc) Mass (Kg)	Household Hazardous Vol (%)	Nappies, sanitary towels & condoms Mass (Kg)	Nappies Vol (%)	Other (wrappers, chips packets, foil, cling wrap, faeces, sand, stone) Mass (Kg)	Other Vol (%)	Total Mass (Kg)	Total Vol (%)
1			6,38	0,28	100	0,10	20	2,22	100	—		0,34	10	—		1,40	100	—		—		0,10	10	—		1,82	75		
																										0,02	10		
2			2,72	0,38	100	0,56	50	0,14	25	0,64	100	—		—		—		—		—		—		0,08	10	0,86	20		
3			2,36	0,16	20	0,24	25	0,16	50	0,34	100							0,04	20							0,00	0		
																										1,08	50		
																										0,30	75		
4			7,66	0,24	20	0,58	100	0,22	10	0,30	50	0,52	10	—		—		—		—		0,02	10	—		0,12	50		
				0,04	10			0,16	20																	3,58	100		
~~5~~			~~2,24~~																							1,26	50		
5			2,24	0,06	75	0,26	50	—		0,18	75	0,36	20	0,10	10	—		0,10	25	—		0,10	10	—		0,92	50		
				0,02	20																	0,00	0						
6			4,12	0,22	100	0,16	50	0,02	15	0,28	20	—		0,22	50	—		—		—		—		—		1,12	150		
																										2,26	50		
7			6,44	0,14	100	0,38	100	2,54	100	0,28	50	0,14	10	0,12	10	—		—		—		—		—					
														0,04	10											2,62	100		
8			2,76	0,22	100	0,58	100	0,02	10	0,36	50	—		0,02	10	—		0,00	10	—		—		—					
														0,06	10											1,18	10		
9			4,52	0,18	110	0,26	10	0,02	10	0,22	50	0,06	10	0,18	15	—		0,08	10	—		—		—		3,50	100		
																										0,08	10		
10			1,18	0,28	150	0,48	160	—		0,88	150	—		0,02	20	—		0,46	100	—		—		—		0,04	10		
				0,08	20																					0,28	20		
11			2,13	0,32	100	0,18	15	1,52	50	0,44	50	0,36	10	0,12	10	—		0,00	0	—		—		0,60	10	0,46	15		
																										0,48	50		
																										3,30	100		
12			0,60	0,34	25	0,14	15	—		0,08	20	—		—		—		—		—		—		—					
																										0,02	25		
																										0,00	0		
13			2,42	0,56	160			0,06	20	0,92	170			0,06	20											0,44	20		
				0,18	25			0,00	0																				
				0,00	0																								
~~14~~																													
																								[illegible]		1,36	25		
1			1,44	0,16	20	0,40	100		~~0,48~~	~~25~~														0,00	0	0,70	25		
				0,06	10	0,26	25	0,48	25	0,48	20	—		0,02	10	—		—		—		—		—		0,24	100		
								1,12	0,02					1,12	20											0,44	150		
								0,20	25																				
2			3,04	1,08	75	0,36	20	0,02	10	0,40	25	—		—		—		—		—		—		—		0,58	25		

DroeHeuwel

0,20 25

25/10/16 MYRTLE

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft) Mass (Kg)	Plastic (soft) Vol (%)	Plastic (dense) Mass (Kg)	Plastic (dense) Vol (%)	Paper Mass (Kg)	Paper Vol (%)	Cardboard Mass (Kg)	Cardboard Vol (%)	Glass Mass (Kg)	Glass Vol (%)	Metals Mass (Kg)	Metals Vol (%)	Organics (food & green waste) Mass (Kg)	Organics Vol (%)	Composite packaging/ Tetrapak Mass (Kg)	Composite Vol (%)	e-waste (computers, electrical appliances, batteries, globes) Mass (Kg)	e-waste Vol (%)	Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc) Mass (Kg)	Household Hazardous Vol (%)	Nappies, sanitary towels & condoms Mass (Kg)	Nappies Vol (%)	Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone) Mass (Kg)	Other Vol (%)	Total Mass (Kg)	Total Vol (%)
3		.	2,28	1,12	15	0,22	25	0,02	15	0,06	25	—		—		—		—		—		—		—		1,08	15		
																										00,02	0		
4			5,94	0,00	0	—		0,12	15	0,34	100	—		—		—		—		—		—		0,34	15	5,28	150		
5			3,80	0,32	100	0,18	110	0,50	150	0,10	25	—		0,12	25	—		0,02	20	0,04	10	—		—		5,28	100		
																										2,02	25		
																										0,70	30		
								Robertson CBD																					
1			10,62	—		—		—		—		—		—		10,64	100	—		—		—		—		—			
2			2,96	0,06	25	.		~~0,59~~ ~~0,38~~		~~100~~		—		—				0,08	25	—		—		—		0,00	0		
								0,38	20																	0,02	10		
																										2,24	10		
3			2,42	—		0,40	100	0,00	0	—		—		0,04	10	—		0,40	25	—				—		0,10	25		
																										0,06	0		
																										1,68	20		
4			1,68	0,08	25	0,08	25	—		0,14	20	0,18	10	—		—		0,26	25	—		—		—		2,78	150		
						0,08	20																			0,04	20		
5			0,22													0,22	110												
6			5,64	—		0,10	25	—		—		0,06	20	0,04	0	—		0,06	20	—		—		—		—			
																		0,14	25										
7			3,69	—		—		—		—		—		—		3,69	100			—		—		—		—			
8			4,16	0,04	25	0,04	10	0,12	15	0,67	25	1,47	75	0,00	0	0,14	50	—		—		—		0,66	25	0,14	25		
						0,14	25																						
9			2,86	0,34	75			0,18	25					0,30	25			0,06	25							0,26	10		
																										1,44	50		
10																													

Date: 25/10/2016 Collected - Sorted - Data Capturer: Merea Simeon

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitory towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1	H Happy Valley		2.42	0.10	0.50	0.30	0.80	0.02	0.10	0.62	1.20	0.52	0.10	0.04	0.02	0.16	0.25					0.00	0.01			0.64	0.50				
2			4.16	0.10	0.20	0.12	0.50	0.28	0.50	0.28	0.50			0.14	0.10	2.76	0.50					0.16	0.10			0.32	0.90				
3			4.76	0.18	0.50	0.04	0.10	0.06	0.10	0.16	0.25			0.14	0.15	0.96	0.25							3.06	0.50	0.14	0.30				
4			3.90	0.02	10	0.38	70	0.04	10	0.30	60	0.56	10	0.12	0.05	2.26	50					0.04	2			0.22	75				
5			2.18	0.06	25	0.40	65	0.22	50	0.40	65	0.22	10	0.04	10	0.64	10					0.02	10			0.16	50				
6			1.90	0.08	50	0.24	25	0.06	20	0.28	75			0.06	10	0.28	50					0.12	10	0.34	10	0.46	50				
7																															
8			BONNIENALLE MOUNTAIN VIEW																												
9																															
10																															
11			1.32	0.10	75	0.12	20	0.20	50	0.04	10			0.06	5							0.00	0.5			0.82	75				
12			3.00	0.20	50	0.20	25	0.60	65	0.06	10			0.06	10	1.40	25					0.20	10	0.04	5	0.24	75				
13			~~2.36~~											~~1.32~~	~~10~~																
14			2.36											2.28	2.00																
15			~~1.96~~	~~0.18~~	~~0.58~~	~~1.20~~																									
16			1.96	0.18	50	0.58	120	0.06	15	0.28	75			0.06	10	0.62	35					0.08	10			0.08	75				
17			4.10	0.14	70			0.04	10	0.62	170	0.22	5	0.02	5	1.18	50	~~0.02~~	~~20~~					1.62	25	0.74	50				
18			1.34	0.08	25	0.18	50	0.20	25	0.16	30			0.20	10	0.40	25									0.16	30				
19																															
20			INFORMAL SETTLEMENT																												
21																															
22																															
23			3.46	0.06	50	0.62	120	0.10	25	0.00	5			0.14	10	0.32	25									0.06	25				
24			3.86	0.46	120	0.54	120	0.24	50	0.68	120	0.54	10	0.26	25	0.96	50									0.18	25				
25			6.10	0.68	~~0.26~~	~~0.80~~	120			0.44	80	1.80	25	0.52	30	0.72	30					0.02	5			0.76	80				
26																															
27			BONNIENALLE CBD																												
28																															
29			2.08	0.22	75	0.38	75	0.12	10	0.16	25					0.96	25					0.00	2			0.26	75				
30			3.30	0.20	75	0.46	75	0.04	25	0.40	75	1.26	25	0.36	25	0.48	50					0.02	10			0.12	50				
31			1.72	0.10	50	0.42	50	0.42	30	0.18	26					0.40	30					0.02	5			0.16	75				
32			4.40	0.16	75	0.36	75	0.08	25	0.06	10	3.28	65	0.06	10	0.32	30					0.02	5			0.08	25				
33			3.60			0.24	25	0.08	10	0.28	50			0.08	10	0.46	25					0.06	5	1.62	25	0.64	75				
34			4.22	0.12	50	~~0.50~~	75	0.16	75	0.44	50					1.72	50					0.02	5			0.08	25				
35			~~3.72~~																												
36																															
37																															
38																															
39																															
40																															

S/V: Happy Valley

Robertson NKQUBELA

Date: 25/10/16 | Collected - | Sorted - | Data Capturer: MERCIA Simon

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1			3.82																												
2			3.12	0.34	120	1.08	75	0.38	120	0.36	75			0.18	5	0.44	25					0.06	15			0.10	10				
3			2.32	0.12	30	0.12	25	0.40	50	0.30	50			0.06	5	1.18	50									0.18	50				
4			2.78	0.84	30	0.80	20	0.78	25	0.84	25					1.24	25							0.97	10	0.78	25				
5			3.82	0.80	50	0.32	60	0.84	50	0.14	25	0.74	5	0.18	5	1.16	5					0.70	5	2.28	50	0.82	50				
6			4.90	0.28	75	0.38	75	0.06	15	0.42	65	0.56	10	0.14	10	0.78	50					0.16	5	1.80	25	0.14	65				
7			2.22	0.28	30	0.12	15	0.06	10	0.08	10					1.10	5							0.14	10	0.04	20				
8			3.86	0.54	120	0.62	100	0.14	25	0.94	120	0.50	10	0.06	10	0.70	50					0.06	10	0.34	10	0.14	25				
9			3.46	0.20	75	0.70	120	0.08	20	0.62	120			0.06	5	1.02	60					0.04	10			0.44	75				
10			5.10	DROE HEUWEL R/SON																											
11																															
12																															
13			5.10	0.20	70	0.12	15	0.75	120	0.56	75			0.18	15	1.64	75					0.10	10	0.10	10	0.56	75				
14			3.16	0.46	100	0.02	5	0.16	30	0.22	50			0.04	10	2.02	50									0.16	50				
15			7.18	0.26	120	0.20	50	0.18	30	0.20	30	5.32	75	0.02	5	0.58	25									0.18	75				
16			3.26	0.34	100	0.22	50	0.04	5	0.14	20			0.06	5	2.26	25					0.02	3			0.20	50				
17			1.00			0.32	75	0.20	75	0.08	25	0.14	5		0.02	0.24	12									0.02	5				
18																															
19				R/SON CBD																											
20																															
21														0.02	TO																
22			1.64	0.04	4	0.08	5	0.02	5	0.30	50	0.78	5	0.02	10	0.28	25					0.08	5			0.14	10				
23			7.18	0.04	10	0.68	10	0.02	5	0.28	50	5.70	120	0.06	10	0.38	10									0.08	15				
24			4.48	0.30	75	0.12	10	0.10	20	0.04	5			0.10	5	1.46	25					0.00	5	1.34	50	0.08	25				
25			4.48	0.74	50	0.16	5	0.26	10	0.22	25	0.22	10	0.06	5	2.08	15							0.46	50	0.36	30				

BONNIEVAL HAPPY VALLEY

Date: Collected - 25/10/2016 Sorted - Data Capturer: PRAMILA MALTA

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)		
1			2,24	0,66	50	0,06	50	0,18	60	0,06	25			0,10	5	0,24	13			0,14	10			0,04	5	0,54	120		
2						0,75	180																						
3			1,40			0,08	25	0,02	20	0	0					1,04	25									0,34	50		
4			2,30					0,20	75	0,24	25			0,12	25											1,74	80		
5			1,60			0,06	20	0,18	25																	2,46	70		
6			2,40			0,08	30	0,20	25	0,42	70			0,06	20	0,40	55							0,80	30	0,60	125		
7			2,50			0,10	25			0,12	50					5,10	70			0,28	20	0,02	20			0,80	30		
8			2,48	0,02	10	0,22	50	0,12	25	0,30	10			0,14	10,15	0,48	25					0,46	20			0,54	75		
9			1,38	0,12	40	0,24	50	0,04	25	0,16	25			0,06	10	0,54	50									0,22	70		
10																													
11																													
12																													
13							BONNIEVAL MOUNTAIN VIEW																								
14																													
15			3,00											3,60	2,50											0,74	20		
16			5,32	1,26	70	0,80	25			1,78	50			0,82	25											1,40	25		
17			2,60											0,82	25	5,38	60					0,76	20						
18																													
19			1,60	0,10	10	0,76	25	0,10	20	0,86	30					1,04	40									0,76	30		
20			2,38	0,14	50	0,06	20	0,02	10	0,22	40			0,14	10	0,72	25					0,16	10			1,22	75		
21			2,08	0,02	15	0,12	25			0,20	45	0,36	25	0,14	15	0,88	50					0,04	10			0,34	75		
22			1,84	0,70	35			1,64	75	0,86	25			0,72	10	0,98	20									6,96	60		
23			4,72	0,82	55	0,94	75	1,72	65	0,82	25				30	2,14						0,70	25			1,24	75		
24			1,40	0,04	25	0,10	25	0,25	25	0,08	30			0,16	6,30	0,36	35									0,18	75		
25			5,20	0,24	50	0,60	75	0,16	25	0,74	50	0,70	20	0,40	30	2,02	40			0,70	20	0,12	30	0,72	25	1,04	80		
26			11,32	1,34	75	0,04	25	0,82	30	1,28	75	1,02		0,94	25	0,82	15					0,74	10	5,84	80				
27																													
28							BONNIEVAL KOP																						
29																													
30																													
31			2,90	0,04	25	0,04	10	0,14	50	0,04				0,40	25	1,76	55									0,48	65		
32			1,74	0,04		0,12	10	0,24	50	0,04						0,56	40							0,02	10	0,26	75		
33			5,50			0,04	25	0,26	50	0,06	20			0,02	25	5,80	50									0,36	75		
34			3,58	0,04	10					0,3				0,02	10	4,48	60					0,46	20			2,06	80		
35			6,36	0,16	50	0,04	10							0,14	20									0,82		1,82	70		
36																													
37								BONNIEVALE C.B.D.																					
38			4,32	0,06	1,02	0,14	10	1,11	0,24	50				0,08	10	1,96	50			0,04	25	0,10	20	0,10	15	0,40	75		
39			1,85	0,02	10	0,20		0,22	50	50						0,46	70					0,16	10			0,60	80		
40			2,72	0,2	10	0,06	10	0,02	5	0,24	50	0,20	10			1,72	30									0,46	70		

BONNIEVALE C.B.D.

PHUMLA MALITA

Date: | Collected - | Sorted - | Data Capturer:

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1			3.38							0,55	75			0.04	10	2.24	70			0,04	10	0.06	10					0,46	50		
2			6.48	0.02	10	0.06	25			0.18	10	1.16	25	0.10	25	0.40				2.04	30	0.12		2.00	30	0.30	70				
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ROBERTSON NKQUBELA. PHUMLA MAKITA

Date: 25/10/16 | Collected - | Sorted - | Data Capturer:

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1			4.88	0.4	10	0.10	20	0.2	10	0.4	10	0.80	30	0.8	10	3.30	55					0.2	10	0.36	20	0.98	75				
2			3.12	0.10	20	0.22	45	0.6	25	0.34	20	0.56	10	25.1	20							0.4	10			0.28	50				
3			7.60	0.42	60	5.18		0.90	70	0.20	40			0.2	10											0.86	50				
4			7.96	6.12		0.42	70	0.12	50	0.76	75	50	100	0.6	10									2.74	55	0.16	70				
5			3.46	0.6		0.36	60	0.0	0	0.20	50	0.20		0.38	20	1.30	45							0.30		0.94	80				
6			4.44	0.4	20	0.38	70	0.4	20	0.42		1.18	25	.		0.64	40					0.4	10	1.18	30	0.30	30				
7			6.20	0.10	30	0.64	75	0.36	40	0.12		0.64	10	0.28	20					0.6	25			1.48	40	0.70	70				
8			4.88	0.16	40	0.18	35	0.2	10	0.32	40	0.92	25	0.28	10	2.28	68									0.88	75				
9			8.64	0.20	80	0.18	30	0.02	20	0.04	20			0.02	10	0.22	50									0.64	75				
10		30	2.80	0.4	10	1.40	75	0.20	40	0.22	50			0.02	5	0.26	10.									0.64	78				
11										ROBERSTON				DROEHEUWEL.																	
12																															
13																															
14			5.42	0.20	70	0.46	75	0.14	50	0.10	25			0.28	20	2.50	55.							0.88	25	0.72	70				
15			1.80	0.12	20	0.50	75	0.2	10	0.48	70	0.18	10			0.14	20					0.2	10	0.18	10	0.12	55				
16			2.86	0.26	50	0.16	35	0.18	30	0.6	30	0.38	.10	0.20	15	1.02	25		.		.	0.26	10								
17			2.80	0.32	70					1.02	80	0.44	25			0.84	40		0.2	10							0.48	70				
18																															
19										ROBERSTON C.B.D																					
20																															
21			1.56	0.2	10	0.6	50	0.02	10	0.88	70					0.22	25		0.2							0.38	40				
22			4.98	0.2	10			0.96	75	0.6	20	0.20	15			3.56	75									0.18	70				
23			8.32	0.28	20	0.38	25	0.14	20	0.24	35	0.54	20	0.26	30	5.78	40					0.10	5			0.58	75				
24			7.96	0.22	10					0.20																7.40	80				
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BONNIEVALE - HAPPY VALLEY

ROSIE

Date: 25-10-

Collected -

Sorted -

Data Capturer:

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)		
1			4,40	0,04	75	0,42	120	0,18	60	0,04	50	1,82	50	0,44	50	0,94	75	—	—	—	—	—	—	—	—	0,20	75		
2			12,72	0,42	100	0,54	100	0,84	50	0,46	75	0,40	25	0,74	50	5,44	100	—	—	—	—	—	—	0,06	25	3,78	120		
3			1,08	0,22	75	0,10	25	0,08	25	0,34	100	—	—	0,10	25	—	—	0,06	25	—	—	—	—	—	—	0,22	50		
4			2,66	0,20	75	0,08	25	0,12	25	—	—	—	—	0,44	50	—	—	1,12	25	—	—	—	—	—	—	0,10	50		
5			3,18	0,08	75	0,40	120	0,28	50	0,16	25	0,36	25	0,20	25	0,66	25	0,18	25	—	—	—	—	—	—	0,56	120		
6			3,34	0,16	75	0,10	25	0,04	25	0,44	75	—	—	0,20	25	—	—	1,16	25	0,38	25	0,40	25	—	—	0,46	100		
7			7,38	0,14	100	0,28	75	0,60	50	0,24	25	0,46	25	0,38	25	—	—	5,04	75	—	—	0,04	25	—	—	0,22	25		
8			2,24	0,06	75	0,40	120	0,50	100	—	—	0,12	25	0,06	25	0,40	25	—	—	—	—	—	—	0,10	25	0,50	100		
9	MOUNTAIN VIEW																												
10			9,84	0,18	100	0,34	75	0,96	25	0,38	100	8,14	150	0,96	25	0,46	25	—	—	—	—	—	—	—	—	0,20	75		
11			3,78	0,16	100	0,28	75	0,06	25	0,34	75	—	—	—	—	2,38	50	0,08	25	—	—	—	—	0,02	25	0,16	50		
12			2,94	0,14	50	0,04	25	0,14	25	—	—	—	—	0,18	25	—	—	2,25	50	—	—	—	—	—	—	0,18	50		
13			3,24	0,02	25	0,18	25	—	—	0,04	25	0,88	25	—	—	—	—	0,28	25	0,06	25	—	—	—	—	1,56	150		
14			2,50	0,20	100	0,16	25	—	0,16	0,70	120	—	—	0,08	25	1,02	25	0,06	25	—	—	0,02	25	—	—	0,18	100		
15			2,00	0,14	100	0,52	150	0,22	50	0,12	25	—	—	0,10	25	0,48	25	0,02	25	—	—	—	—	0,06	25	0,02	50		
16																													
17	INFORMAL																												
18			6,98	0,66	100	0,36	120	0,12	25	0,80	100	2,18	50	0,08	25	2,30	25	0,95	25	—	—	—	—	0,30	25	0,46	75		
19			4,70	0,06	75	0,62	150	0,04	25	0,06	25	2,84	50	0,08	25	0,52	25	0,04	25	—	—	—	—	0,10	25	0,16	75		
20																													
21	KOP		4,16	0,02	25	0,64	75	0,06	25	0,22	75	—	—	—	—	0,12	25	—	—	0,32	25	0,56	50			1,24	50		
22			2,80	—	—	0,08	25	0,02	25	0,28	50	0,42	25	0,10	25	1,24	25	0,00	25	—	—	—	—	—	—	0,08	25		
23			1,04	0,10	50	0,16	25	0,14	25	0,4	25	—	—	—	—	0,42	25	—	—	—	—	—	—	—	—	0,20	50		
24			1,28	0,04	25	0,08	25	0,06	25	0,06	25	—	—	—	—	0,86	25	0,02	25	—	—	—	—	0,02	25	0,20	25		
25			3,96	0,08	100	—	—	1,04	50	0,08	25	0,32	25	—	—	1,14	25	0,18	25	—	—	—	—	—	—	0,60	100		
26			5,44	0,10	25	0,26	50	0,32	25	0,20	25	0,80	25			2,70	150				0,06		25	0,10	25				
27																		—	—	—	—	—	—	—	—	—	—		
28			6,36	0,12	25	2,48	100	—	—	0,16	25	0,64	25	0,06	25	2,40	25	—	—	—	—	—	—	—	—	0,52	50		
29			3,38	0,16	50	0,08	25	0,08	25	0,16	25	—	—	0,06	25	2,52	25	—	—	—	—	0,14	25	—	—	0,28	50		
30			5,62	0,16	50	0,28	50			0,30	25					4,58	50	0,02	25			0,10	25			0,10	25		
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ROBERTSON

Date: 25-10 | Collected - | Sorted - | Data Capturer: ROSIE

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1	NQUBELA		4,32	0,32	100	0,74	150	0,08	25	0,40	100	0,30	25	0,02	25	1,82	100	—	—	—	—	0,16	25	—	—	0,42	100		
2			10,12	0,12	50	0,38	50	—	—	0,08	50	—	—	0,02	25	4,52	100	0,08	25	—	—	0,04	25	4,72	70	0,16	50		
3			4,64	0,08	25	0,14	25	0,20	25	0,12	25	—	—	0,08	25	2,84	100	0,02	25	—	—	—	—	0,80	25	0,68	20		
4			3,44	0,32	75	0,44	75	0,46	75	0,42	75	—	—	—	—	1,50	75	0,08	25	—	—	—	—	—	—	0,16	25		
5			2,12	—	—	—	—	—	—	—	—	—	—	—	—	2,12	200	—	—	—	—	—	—	—	—	—	—		
6			1,84	0,36	100	0,14	25	0,10	50	0,24	50	—	—	0,08	25	0,20	25	—	—	—	—	—	—	—	—	0,26	100		
7			4,32	0,10	25	0,12	50	0,06	25	0,06	25	—	—	—	—	—	—	0,20	25	—	—	—	—	3,60	100	0,08	25		
8			2,10	0,10	100	0,62	100	0,14	50	0,40	100	0,30	25	0,02	25	0,42	100	—	—	—	—	—	—	—	—	0,42	75		
9			3,14	0,12	75	0,26	75	0,06	25	0,30	75	1,28	25	0,28	25	0,52	25	—	—	—	—	—	—	0,84	25	0,20	75		
10			2,10	0,26	50	0,20	50	0,06	25	0,24	50	0,16	25	0,02	25	0,60	25	0,04	25	—	—	0,14	25	—	—	0,18	50		
11			3,28	—	—	—	—	—	—	—	—	—	—	—	—	3,28	—	—	—	—	—	—	—	—	—	—	—		
12			8,32	0,10	50	0,20	25	0,02	25	0,68	25	—	—	0,06	25	0,68	75	—	—	—	—	—	—	7,14	75	0,12	25		
13			9,14	0,24	75	0,88	75	0,20	25	0,48	100	—	—	—	—	8,32	75	—	—	—	—	—	—	—	—	0,20	50		
14			10,86	0,40	75	0,52	75	0,60	100	0,22	75	0,54	25	0,16	25	1,24	75	0,06	25	—	—	—	—	4,88	75	2,20	100		
15			10,28	0,18	75	0,54	100	0,06	25	0,02	25	0,72	25	—	—	1,36	75	0,04	25	—	—	—	—	6,84	100	1,52	75		
16			26,62	0,58	100	0,92	120	0,58	100	0,22	75			0,30	25	0,46	25					0,04	25	11,92	100	1,34	100		
17																										0,14	100		
18	DROËHEUWEL																75	0,02											
19			2,02	0,10	25	0,14	25	0,10	25	0,22	25	0,40	25	—	—	0,74	75	25	25	—	—	—	—	0,04	25	—	—		
20			2,54	0,10	25	0,06	25	—	—	0,12	25	—	—	—	—	1,56	75	—	—	—	—	—	—	—	—	0,70	100		
21			3,96	0,02	25	0,16	25	—	—	0,10	25	—	—	0,10	25	1,58	50	—	—	—	—	—	—	1,40	25	0,30	25		
22			3,84	0,58	50	0,32	25	0,32	25	0,32	50	0,44	25	0,28	25	0,70	25	—	—	0,60	25	0,04	25	—	—	0,04	25		
23																													
24																													
25	ROBERTSON CBD																												
26			1,24	—	—	0,80	25	0,00	25	0,00	25	—	—	0,74	25	0,82	25	—	—	—	—	—	—	—	—	0,86	25		
27			1,44	0,06	25	—	—	—	—	—	—	0,88	25	0,02	25	0,92	25	—	—	—	—	—	—	—	—	—	—		
28			2,44	0,78	50	0,94	50	—	—	0,80	25	0,94	25	0,88	25	1,54	25	0,76	25	—	—	0,82	25	—	—	0,70	25		
29			4,48	0,74	25	0,70	25	0,70	25	0,92	75	—	—	0,72	25	3,58	50	—	—	—	—	—	—	—	—	1,10	25		
30			2,64	0,16	25	0,12	25	0,08	25	0,42	75	0,48	25	0,22	50	1,02	50	—	—	—	—	—	—	—	—	0,14	25		
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ZOLANI 27/10/2016

Date: | Collected - | Sorted - | Data Capturer:

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1	1		19,60	0,60	120	0,26	25	0,04	10	0,00	2			0,16	10	4,06	75	0,00	2					5,72	65				
2																													
3				CONRADIE DORP																									
4																													
5																													
6																													
7	2		2,06	0,10	25	0,20	25	0,20	20	0,20	25					1,14	75	0,16	10			0,02	5			0,04	10		
8	3		6,78	0,18	30	0,64	30	0,64	50	0,38	30			0,14	10	3,90	50	0,22	30							0,12	30		
9	4		6,08	0,16	20	0,08	10	0,62	30	0,26	20	0,88	20	0,10	15	3,62	50	0,02	5			0,00	2			0,16	50		
10	5		8,86	0,38	75	0,42	50	0,40	30	0,22	25	0,30	2	0,14	10	4,54	75	0,18	25	0,10	FO	0,00	2	0,68	30	0,46	55		
11	6		4,16	0,12	50	0,44	30	0,66	70	0,40	75	0,58	10	0,06	10	1,40	50	0,14	20			0,00	2			0,22	60		
12	7		3,44	0,12	25	0,54	50	0,42	25	0,18	30	0,12	5	0,00	2	1,34	50	0,32	50			0,00	2	0,20	5	0,12	20		
13	8		5,22	0,06	20	0,04	5	0,08	20	0,08	5	0,58	20	0,04	10	4,14	75	0,02	2			0,00	1			0,08	20		
14	9		4,84	0,20	60	0,48	70	0,38	20	0,26	50	1,34	75	0,10	10	0,82	60	0,02	5							0,12	20		
15	10		2,52	0,18	65	0,10	20	0,16	25	0,12	75	0,44	10	0,06	10	0,52	50					0,02	2			0,28	20		
16	11		2,40	0,04	50	0,30	65	0,20	30	0,16	25	0,16	5	0,06	5	0,70	75			0,00	5	0,06	5			0,56	75		
17	12		5,70	0,36	75	0,54	120	0,60	25	0,40	70	0,04	10	0,020	25	3,30	30	0,06	5							0,08	20		
18																													
19				KOGMANS KLOOF																									
20																													
21																													
22	13		3,32	0,68	50	0,88	65	0,68	30	0,14	25	0,16	5	0,06	5	0,70	75			0,00	5	0,06	5			0,56	75		
23	14		2,24	0,26	15	0,36	75	0,18	25	0,08	20	0,10	5	0,06	5	1,26	70					0,00	2			0,06	20		
24	15		4,86	0.44	120	0,40	70	0,56	75	0.12	25			0.58	50	2,20	[illegible]	0,04	5			0,04	5	0,12	15				
25	16		5,94	0,32	120	0,16	20	0,98	120	0,34	65			0,28	25	1,96	50					0,02	5	1,36	20	0,30	120		
26	17		7,06	0,16	75	0,18	20	0,36	120	0,74	100			1,32	70	2,16	60	0,06	10			0,02	2	1,24	20	0,30	120		
27	18		12,20	0,16	30	0,18	25	3,20	25	0,88	25	0,14	10	0,24	25	10,60	50	0,10	20			0,02	2	0,12	20	0,06	20		
28	19		5,54	0,30	30	0,10	20	1,44	120	0,12	20	0,14	10	0,08	10	3,68	50					0,00	5			0,08	25		
29	20		5,58	0,54	75	0,08	10	1,00	100	0,48	75	~~0,16~~	~~5~~	0,18	10	2,44	60							0,00	2	0,58	75		
30																													
31				MCGREGOR																									
32																													
33																													
34	21		3,62	0,08	10	0,04	5	0,44	20	0,36	25			0,02	2	2,00	75	0,16	25		~~0,02 2~~			0,22	5	0,14	25		
35	22		3,14	0,08	25	0,18	20	0,16	10	0,14	10			0,06	5	0,84	10	0,12	10			0,02	1	0,12	5	1,26	50		
36	23		1,54	0,04	20	0,14	25	0,06	10									0,10	10			0,00	5	1,10	25	0,12	20		
37	24		16,90	0,32	50	0,40	30	0,44	30	0,16	20	0,24	10	0,04	5	3,88	75	0,08	20					4,72	120	0,46	20		
38	25		4,20	0,08	25	0,18	10	0,04	5	0,08	10	0,30	5	0,10	10	1,32	25									0,04	15		
39																													
40																													

ZOLANI

PHUMLA MAKHUTHA

Date: 27-10-16 | Collected - | Sorted - | Data Capturer:

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1			1.52	0.06	25	0.18	50	0.08	25	0.20	50	0.20		0.06	20			0.32	55									0.40	75		
2			1.10	0.08	50	0.20	25	0.04	20					0.10	25	0.38	30											0.26	50		
3			3.46	0.20	75	0.14	25	0.20	50	0.38	70					0.12	50									2.18	50	0.18	70		
4			~~4.58~~																												
5												CONRADIE DORP																				
6																															
7																															
8			4.58	0.10	50			0.04	20	0.36	55	0.76	25	0.08	20	1.92	50							0.70	40			0.40	50		
9			2.54			0.32	50	0.10	25	0.04	10	1.20	25	0.04	20	0.70	70											0.16	75		
10			2.96	0.10	60	0.32	55	0.30	50	0.34	50					1.72	50							0.04	10			0.16	50		
11			4.72	0.06	20	0.20		0.48	50	0.52	75	0.90		0.04	20	2.16	50											0.22	40		
12			6.28					0.30	25							5.90	80														
13			13.64	0.32	20	0.04	5	1.82	75	1.42	70			0.04	10	9.28	100											0.68	70		
14			4.14	0.10	40	0.50	70	0.52	0.44	0.24	30			0.10	25	2.20	60											0.38	75		
15			~~8.60~~																												
16										KOMMANSKLOOF																					
17																										20					
18			8.60	0.12	50	0.04	10	0.92	75	0.42	50	0.08	10			5.44	70							0.02	10	0.20	20	1.44	75		
19			6.60	0.10	40	0.14	25																		0.36	20		2.42	78		
20																															
21																															
22			~~0.66~~ 10																												
23			6.60	0.10	40	0.16	25	0.34	40	0.16	25			0.06	10	2.84	70							0.02	10			2.42	70		
24			4.24	0.32	25	2.06	20	0.66	20	1.04		0.98	25			2.04	50							0.74	10	0.80	25	0.90	70		
25			4.58	0.18	50	1.18	75	1.00		1.54	75	0.80	25	0.78	20	2.02	50			1.08	25	0.68	10	0.76	20	1.38	60				
26			4.74	1.16	75	0.74	20	0.52	50	1.26	70	0.80	20	0.78	10	2.40	65			0.68	10	0.68	20			1.88	75				
27			6.12	0.12	50	0.10	25	2.82	70	0.70	70			0.10	10	0.10				0.98	40					1.10	70				
28			11.66	0.04	20	0.22	30	0.52	25	0.66	75	0.36	20	0.06	20	1.68	40					0.04	10	0.06	10	0.96	75				
29			8.32	0.18	30	0.08	10			0.56	70	0.10	10	0.04	25							0.40	20	1.38	40	0.52	70				
30			~~1.68~~		~~0.06~~	~~0.06~~	~~10~~			0.56	70					5.10	70					~~0.44~~	~~20~~								
31												MC GREGOR Y.																			
32																															
33																															
34			1.68	0.04	10			0.30	20	0.04	10					1.08	50											0.26	50		
35			2.70			0.10	20	0.06	10	0.34	10	2.10	10															0.14	40		
36			1.96	0.05	10	0.06	10			0.18	50			0.02	10	0.84	50					0.01	10								
37			1.98													1.98	100											1.34	50		
38			2.32	0.10	10											1.08	100											1.10	75		
39			2.88							1.01	50																				
40			1.54	0.00	00	0.6	10	1.10	75	0.20	50			0.10	25													0.14	50		

McGREGOR

Date: 27.10 | Collected: | Sorted: | Data Capturer: Rose

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)		
1			1.42	004	25	004	25	032	25	020	25	022	25	—	—	048	25	—	—	—	—	008	25	—	—	008	25		
2			2.52	—	—	—	—	—	—	—	—	—	—	—	—	252	110	—	—	—	—	—	—	—	—	—	—		
3			10.32	010	25	034	50	154	50	010	25	—	—	026	25	798	110	008	25	—	—	00	25	—	—	—	—		
4			3.94	006	25	046	100	008	25	013	25	054	25	006	25	186	50	—	—	—	—	—	—	—	—	046	50		
5			3.90	022	50	054	50	014	25	018	25	—	—	020	25	224	50	018	25	—	—	—	—	—	—	038	25		
6			2.78	008	25	004	25	014	25	016	25	080	25	018	25	106	25	—	—	026	25	—	—	—	—	—	—		
7			5.30	008	25	022	25	022	25	010	25	050	25	014	25	312	50	034	25	002	25	—	—	032	25	006	25		
8			10.36	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	10.36	150	—	—		
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ASHTON

Date: 27.10 | Collected - | Sorted - | Data Capturer: Rose

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
1	ZOLANI		210	026	50	018	50	006	25	006	25	—	—	006	25	050	25	—	—	—	—	006	25	—	—	094	100		
2			218	010	25	002	25	010	25	120	150	—	—	002	25	050	25	—	—	026	25	—	—	—	—	00	00		
3			412	034	100	094	100	028	50	026	75	088	25	018	50	032	25	002	25	—	—	—	—	—	—	1.00	50		
4			232	002	25	012	25	002	25	020	75	—	—	008	25	—	—	090	50	—	—	—	—	016	25	086	50		
5																													
6																													
7																													
8	CONRADIE DORP		342	002	25	—	—	022	50	—	—	—	—	—	—	226	50	—	—	006	25	—	—	094	50	—	—		
9			480	—	—	—	—	046	100	—	—	—	—	—	—	094	25	—	—	—	—	—	—	432	100	—	—		
10			252	020	50	012	50	024	50	050	75	048	25	—	—	072	25	014	25	—	—	—	—	—	—	014	25		
11			630	008	25	012	25	026	50	018	50	—	—	—	—	516	75	008	25	—	—	002	25	—	—	006	25		
12			326	016	75	014	25	006	25	034	50	014	25	034	25	166	50	008	25	—	—	006	25	—	—	032	100		
13			252	010	25	046	25	012	25	024	50	—	—	—	—	128	50	008	25	004	25	—	—	—	—	004	25		
14			1814	010	25	0.50	100	042	50	018	25	—	—	014	25	234	50	—	—	—	—	—	—	—	—	008	25		
15			292	010	50	012	100	006	25	004	25	—	—	006	25	168	25	—	—	—	—	—	—	—	—	008	25		
16			508	002	25	076	100	042	50	030	75	684	25	008	25	256	25	—	—	—	—	—	—	—	—	012	25		
17			944	—	—	—	—	508	110	026	50	—	—	007	25	—	—	—	—	—	—	—	—	—	—	384	125		
18			280	008	25	026	75	018	110	—	—	—	—	004	25	—	—	162	100	—	—	004	25	—	—	—	—		
19			678	008	25	014	50	026	25	028	25	038	25	038	25	494	75	006	25	008	25	—	—	—	—	022	100		
20			498	016	50	014	25	018	25	004	25	—	—	—	—	422	120	004	25	—	—	006	25	—	—	014	75		
21			458	002	25	018	25	008	25	050	75	—	—	018	25	258	75	—	—	—	—	00	25	072	25	006	50		
22																													
23																													
24	KOGMANS KLOOF																												
25			798	022	75	010	25	038	50	040	100	322	50	—	—	290	50	032	25	—	—	—	—	042	25	010	75		
26			528	016	75	038	100	046	75	036	100	084	25	012	25	282	75	—	—	—	—	—	—	—	—	018	75		
27			304	022	75	014	25	038	75	024	25	—	—	014	25	148	25	—	—	—	—	—	—	—	—	014	75		
28			580	016	75	048	50	026	50	002	25	—	—	038	50	446	75	—	—	—	—	—	—	—	—	008	25		
29			556	006	25	016	25	004	25	014	25	—	—	014	25	498	75	—	—	—	—	004	25	—	—	004	25		
30			286	006	25	—	—	008	25	018	50	—	—	—	—	216	75	004	25	032	25	—	—	—	—	002	25		
31			394	004	25	006	50	002	25	006	25	—	—	004	25	—	—	—	—	—	—	—	—	—	—	376	150		
32			7.10	010	25	010	25	016	25	010	25	014	25	006	25	5.51	150	—	—	—	—	—	—	—	—	—	—		
33			490	026	50	038	50	036	50	026	25	—	—	024	25	296	100	—	—	—	—	002	25	—	—	032	25		
34			690	006	25	014	25	010	25	004	25	008	25	—	—	—	—	004	25	006	25	—	—	630	100	030	25		
35			346	002	75	012	25	014	25	022	75	038	25	026	25	148	50	046	100	—	—	00	25	—	—	024	25		
36			472	010	25	026	25	025	25	022	75	058	50	046	25	232	50	026	100	—	—	—	—	00	25	014	25		
37			532	020	25	034	75	008	25	034	75	158	50	066	25	158	50	00	25	—	—	016	25	004	25	014	50		
38			392	028	100	026	75	016	25	038	75	010	25	—	—	—	—	004	25	054	25	004	25	—	—	186	110		
39			10.20	—	—	—	—	—	—	—	—	—	—	—	—	798	120	—	—	—	—	—	—	—	—	220	100		
40																													

33

Zaiani

Mertul

Date: Collected - Sorted - Data Capturer:

Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft) Mass (Kg)	Plastic (soft) Vol (%)	Plastic (dense) Mass (Kg)	Plastic (dense) Vol (%)	Paper Mass (Kg)	Paper Vol (%)	Cardboard Mass (Kg)	Cardboard Vol (%)	Glass Mass (Kg)	Glass Vol (%)	Metals Mass (Kg)	Metals Vol (%)	Organics (food & green waste) Mass (Kg)	Organics (food & green waste) Vol (%)	Composite packaging/ Tetrapak Mass (Kg)	Composite packaging/ Tetrapak Vol (%)	e-waste (computers, electrical appliances, batteries, globes) Mass (Kg)	e-waste Vol (%)	Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc) Mass (Kg)	Household Hazardous waste Vol (%)	Nappies, sanitary towels & condoms Mass (Kg)	Nappies Vol (%)	Other (wrappers, chips packets, foil, cling wrap, faeces, sand, stone) Mass (Kg)	Other Vol (%)	Total Mass (Kg)	Total Vol (%)
1.			5.64	0,30	75	0,14	25	0,30	75	—		0,26	10	—		2,38	75	0,10	15	0,42	18	—		—		0,46	20		
2			2.42	0,28	75	0,58	100	0,18	25	0,20	25	—		—		1,06	50	0,08	25	—		—		—		—			
3			2,44	0,22	100	0,22	25	0,24	75	—		—		0,90	25	0,56	10	0,04	10					0,12	15	0,02	15		
4			1,90	0,28	100	0,20	15	—		0,34	75	—		0,06	15						0,96	25				0,06	15		
~~5~~			~~3,40~~																										
										Conradie dorp																			
5.			3,40	0,06	15	0,20	25	0,06	10	0,04	10	0,60	15.	0,08	15	1,90	25	0,24	15	—		—		—					
6			7,46	0,22	25					0,08	25	0,04	10	0,14	15.	5,08	25.	0,16	75.					0,44	15	0,02	25		
7			5,22	0,24	25.	0,28	75.	0,30	25.	0,58	110.	0,08	18	0,28	25	2,36	75.	—		—		—		0,08	25.	0,02	10		
8			8,48	0,12	100	0,78	75.	0,04	10	0,48	25	1,16	15.	0,20	15.	5,38	25.	—		—		—				0,06	0		
9.			2,30	0,12	25	0,58	150.			0,68	110	0,40	10	0,14	15.	~~[illegible]~~		0,20	25	1,60	15.	0,08	15.	—		0,12	16		
10			6,25	0,24	100	0,16	25	0,10	15.	0,44	75.	1,80	50	0,22	25.	3,16	100	—		—		—		—		0,66	18		
11			10,24	0,26	100	0,18	25.	—		0,18	100	3,16	25	0,36	18	2,92	75.	0,04	10.					1,64	75	0,02	10.		
12			4,54	0,44	75.	0,24	25.	—		0,44	110.	0,24	16.	0,12	18	2,18	110.	0,08	10	0,16	20.	—		0,52	100	0,22	100		
13			2,30	0,28	100	0,14	25.	0,14	18	0,44	150.			0,20	10	0,86	50.	0,18	25	—		—		—		0,08	25.		
14			3,32	0,24	100	0,02	10	0,16	20.	0,76	110.	1,14	25.	0,04	10.	0,74	110.	—		—		—		—		0,04	25.		
											Koomanskloof.																		
15.			1.16.	0,20	75	0,30	110	0,12	10	0,12	18.	—		0,24	18	0,98	100.	—		—		—		—		0,20	10		
16.			9,34	0,30	150.	0,18	100	—		0,76	100	—		0,56	75	2,12	25.	0,04	10	—		—		3,44	20	0,02	25		
17.			6,94	0,26	110	0,14	100	0,74	100	0,32	25.	0,02	10	0,06	10	5,46	100	—		—		—		1,52	25.	0,06	75		
18			13,30	0,04	18	0,16	25.	—		0,28	75.	2,34	25.	0,06	10.	10,24	150.	—		—		—		—		0,04	25.		
19.			7,70	0,24	110	0,34	75	1,14	100	0,28	100	0,96	25.	0,20	10	2,20	110.	—		—		—		1,80	25.	—			
20			5,44	0,30	160	0,20	110	0,16	15.	0,34	110	—		0,14	18	3,80	160	0,06	10	—		—		—		0,12	100		
21			2,80	0,22	110	0,08	10.	0,12	100	0,42	75	0,88	25.	0,12	10	~~4~~		0,06	10	—		0,04	5	—		0,08	110.		
22			6,62	0,16	25	0,16	25	—		0,44	20	—		—		4,70	50	—		—		—		—		0,06	25.		
23			4,30	0,10	50	0,16	25.	0,14	25.	0,72	160	—		—		1,16	50.	0,16	100	—		—		—		0,02	50.		
24			2,80	0,16	25.	0,14	18.	0,06	25.	0,04	50.	0,52	25.	0,02	10.	1,03	10.	0,08	18.	—		—		—		0,04	50		
25			2,52	0,08	20.	0,24	18.	0,04	18.	0,10	20.	0,40	20.	—		1,16	20.	—		—		—		—					
~~26~~			~~2,26~~																										
									Mcgregor																				
26			2,26	0,08	110	0,14	18	—		0,62	25	—		—		0,40	25	0,18	50.	—		—		0,10	20	0,02	10.		
27			5,32	0,08	25	0,06	15.	0,14	15.	0,08	20	—		—		2,46	100	0,04	10.	—		—		—		—			
28			2,86	0,12	15.	0,36	~~0,24~~	~~100~~		0,30	25.	—		0,18	20.	—		—		—		—		—		0,02	15.		

100 0,4 20.

Date:		Collected -		Sorted -																Data Capturer:									
Bag no.	Address of origin	Description (Black/ Clear/ Blue)	unopened mass (kg)	Plastic (soft)		Plastic (dense)		Paper		Cardboard		Glass		Metals		Organics (food & green waste)		Composite packaging/ Tetrapak		e-waste (computers, electrical appliances, batteries, globes)		Household Hazardous waste (Needles, medicine, tablets, paints, cleaning products etc)		Nappies, sanitary towels & condoms		Other(wrappers, chips packets, foil, cling wrap, faeces, sand, stone)		Total	
				Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)	Mass (Kg)	Vol (%)
29			2,14	0,04	50.	—				0,06	50.	0,30	10.	—		1,78	100	0,04	10.	—		—		—		0,02	10		
30			4,92	0,14	50.	0,36	50.	0,12	100	0,38	75	—		—		3,38	50.	0,52	50.	—		—		—		0,42	15.		
31			1,36	—		—		3,82	110.	—		—		0,00	0	2,98	110	—		—		—		0,08	15.	—			
32			7,24	0,12	50	0,18	25.	0,14	25	0,42	50	1,90	50	0,16	25.	4,22	110	0,04	25.	—		—		—		1,04	25.		
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