

**CAPRICORN DISTRICT MUNICIPALITY
INTEGRATED WASTE MANAGEMENT PLAN**

DRAFT No.1

**LEPELLE NKUMPI LOCAL MUNICIPALITY
INTEGRATED WASTE MANAGEMENT PLAN –
FEASIBILITY REPORT**

Report No : 6950/6610/3/E

FEBRUARY 2005

DISTRIBUTION:

3 Copies - BVI Consulting
1 Copy - Project File 6950
1 Copy - Library

EXECUTIVE SUMMARY

TABLE OF CONTENTS

SECTION	PAGE
1 INTRODUCTION.....	6
1.1 Background.....	6
1.2 Project Objectives.....	6
1.3 Approach and methodology	6
2 LITERATURE REVIEW	9
2.1 Regulatory Framework for waste management.....	9
2.1.1 The Constitution of South Africa	9
2.1.2 National Environmental Management Principles	10
2.1.3 Integrated Pollution and Waste Management for SA	12
2.1.4 National Water Act 1998	16
2.1.5 Development Facilitation Act.....	17
2.1.6 The EIA Regulations	17
2.1.7 The White Paper on Municipal Services Partnerships (MSPs).....	18
2.1.8 Minimum Requirements for Waste Disposal by Landfill – DWAF: Second Edition 1998	20
2.2 Industry examples	21
2.2.1 Resuscitating waste management services in Lusaka, Zambia, through a public private partnership – 2001/2002.....	21
2.2.2 Sustainable approach to the design, implementation and management of community based/SMME type Solid Waste Service Provision in the City of Cape Town: 2002	22
2.2.3 Establishment of an Integrated Waste Management System in Rural Umkhanyakude, Kwazulu-Natal: The Jozini recycling centre: 2001/2004.....	26
2.2.4 240l bin health care risk waste system	28
3 SUMMARY OF THE STATUS QUO INVESTIGATIONS	28
4 GAP ANALYSIS.....	32
4.1 Benchmarking as an Improvement Tool	32
5 NEEDS ASSESSMENT AND PRIORITISATION.....	32
5.1 Improving existing waste management services	34
The strategic objectives/alternatives to facilitate improving of these services are detailed below as follows:.....	34
5.1.1 Waste Management Organisation Structure.....	34
5.1.2 Refuse collection and transportation.....	41
5.1.3 Refuse disposal and landfill operation	42
5.1.4 Revenue collection and tariffs	43
5.1.5 Medical waste treatment and handling	48
5.2 Implementing waste management services in L-NLM.....	51
5.2.1 Current waste Quantities.....	52
5.2.2 Future waste quantities	72
5.2.3 Refuse disposal and landfill operations	77
5.2.4 Refuse storage, collection and transportation	84
5.3 Employment creation, public information and awareness creation	95
5.3.1 Waste Management, minimisation and prevention strategy	96

	5.3.2	Establishment of Municipal Services Partnerships (MSPs).....	96
	5.3.3	Establishment of Public Private Partnerships (PPP)	97
6		FINANCIAL REQUIREMENTS	97
	6.1	Cost Comparison.....	97
	6.1.1	Scenario 1	97
	6.1.2	Scenario 2	98
	6.1.3	Scenario 3	99
	6.2	Summary of cost comparison.....	100
7		RECOMMENDATIONS.....	101
8		CONCLUSIONS.....	101
9		REFERENCES	101

LIST OF TABLES

Table 1: Summary of gap in status quo investigations: Lepelle Nkumpi Local Municipality	29
Table 2 : Summary of Needs Prioritisation	33
Table 3 : Minimum Requirements for GSB Landfill Operation	42
Table 4 : Potential revenue for waste management services in L-NLM	45
Table 5 : Medical or health care waste generators in L-NLM	48
Table 6 : Guidelines for Estimating Domestic Waste Generation Rates	53
Table 7 : Guidelines for Conversion Between Masses and Volumes	53
Table 8 : Estimated amount of waste generated by households in L-NLM	53
Table 9 : Guidelines for estimating waste generated by schools in L-NLM	58
Table 10 : Guidelines for estimating waste generated by crèches in L-NLM	58
Table 11 : Estimated amount of waste generated by schools and crèches in L-NLM	58
Table 12 : Guidelines for estimating waste generated by hospitals and clinics in L-NLM.....	65
Table 13 : Estimated amount of waste generated by Hospitals and Clinics in L-NLM.....	65
Table 14 : Estimated amount of waste generated by Police Stations and Prisons in L-NLM	66
Table 15 : Estimated amount of waste generated by businesses in L-NLM.....	67
Table 16 : Summary of estimated amount of general waste generated in L-NLM	71
Table 17 : Summary of current estimated amount of general waste generated in L-NLM.....	72
Table 18 : Estimated population growth rates in L-NLM	75
Table 19 : Estimated future waste quantities in L-NLM.....	76
Table 20 : Minimum Requirements Landfill size classes	77
Table 21 : Composite structure for L-NLM waste generation Clusters/Zones.....	80
Table 22 : Minimum Requirements for Permitting Small and Medium Landfill Sites.....	81
Table 23 : Advantages and disadvantages for various waste storage systems.....	87
Table 24 : Advantages and disadvantages for various waste collection and transportation systems ...	91

Table 25 : Waste collection and transportation routes	93
Table 26 : Scenario 1 cost estimation	98
Table 27 : Scenario 2 cost estimation	99
Table 28 : Scenario 3 cost estimation	100
Table 29 : Summary of cost estimation.....	100
Table 30 : Advantages and disadvantages for various MLM waste management services scenarios ..	100

LIST OF FIGURES

Figure 1 : L-NLM Waste Management Services Needs and Prioritisation Hierarchy	33
Figure 2 : Full responsibility and management by L-NLM	35
Figure 3 : MSP involvement.....	36
Figure 4 : MSP and PPP involvement.....	37
Figure 5 : Landfill Process.....	44
Figure 6 : L-NLM Medical and Health Care Waste Management Responsibility Chain	49
Figure 7 : Waste collection and Transportation capacity calculation model	92

LIST OF MAPS

Map 1 : Capricorn District Municipality.....	7
Map 2 : Lepelle Nkumpi Local Municipality	8
Map 3 : Schools and Crèches in L-NLM	57
Map 4 : Hospitals in L-NLM	63
Map 5 : Clinics in L-NLM.....	64
Map 6 : Clusters/Zones	83
Map 7 : Waste management facilities	84
Map 8 : Waste collection routes within L-NLM	94

LIST OF APPENDICES

Appendix A	The National Environmental Management Act (Act No. 107, 1998)
Appendix B	White Paper on Integrated Pollution and Waste Management of South Africa
Appendix C	White Paper on Municipal Services Partnership (MSPs)
Appendix D	Cost estimates of alternative

1 INTRODUCTION

1.1 Background

In March 2003, Capricorn District Municipality (CDM) requested a proposal for consulting services to investigate Solid Waste Management, as required by the Municipal Systems Act (MSA), Act 32 of 2000.

BVI Consulting Engineers (BVI) were appointed by the CDM for the completion of the study, as well as the development of an Integrated Waste Management Plan (IWMP) for each of the four local municipalities - Aganang, Blouberg, Lepelle Nkumpi and Molemole - which fall within the Capricorn District (refer Map 1). As part of the appointment, an IWMP for the entire Capricorn District (including the local municipality of Polokwane) was also to be developed. This would form a District Master IWMP. Detailed investigations would not be required for Polokwane, as these have been completed under a separate previous study (**Ref. 1**).

At the start of the project in February 2004, a Project Steering Committee (PSC) was established for the management of the project. The PSC comprises of members of the Local and District Municipalities, the Limpopo Department of Health and Welfare, the Limpopo Department of Finance, Economic Affairs, Tourism and Environmental Affairs (DFEATE), and BVI Consulting Engineers.

This report contains the outcome of the feasibility study for the Lepelle Nkumpi Local Municipality (L-NLM) (refer Map 2). In undertaking the study, a phased approach has been adopted, and ten phases have been identified. To date, the Lepelle Nkumpi Local Municipality Status Quo Report has been produced and this report should be read in conjunction with the Status Quo Report.

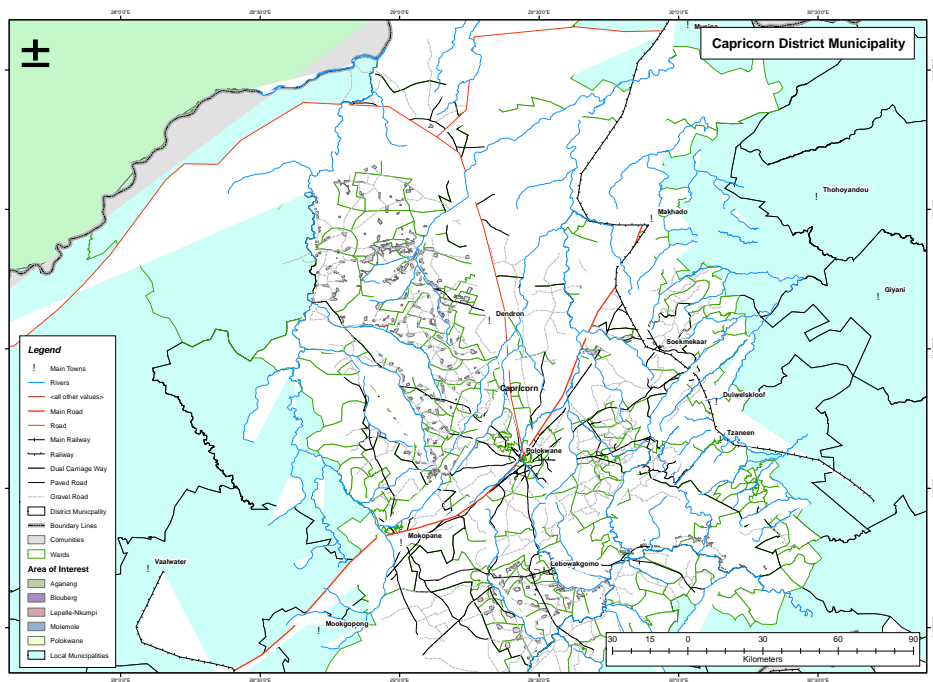
1.2 Project Objectives

The main focus and objectives of this assignment are defined by the major stages of the environmental planning process, which are incorporated in the IWMP process. These stages are detailed in the L-NLM Status Quo Report. The L-NLM strategic objectives are detailed in **Section 3** of this document.

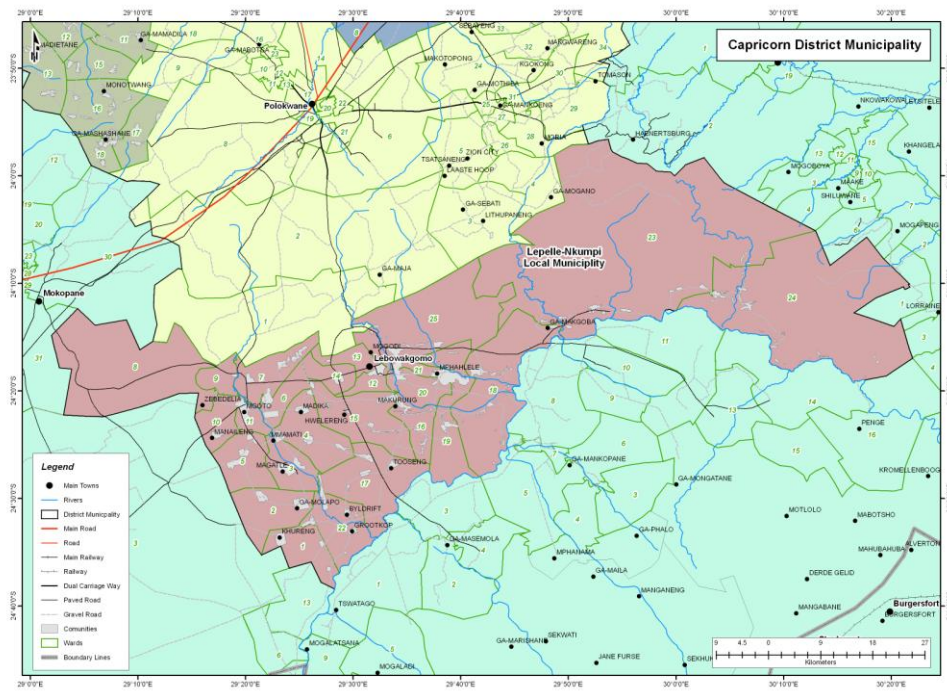
1.3 Approach and methodology

The development of the IWMP for the Lepelle Nkumpi Local Municipality is envisaged to consist of ten phases. To date the following phases have been completed:

- Phase I: Inception
- Phase II: Data collection, field work
- Phase III: Data collation and analysis
- Phase IV: Writing the Status Quo Report



Map 1 : Capricorn District Municipality



Map 2 : Lepelle Nkumpi Local Municipality

This report covers the following phases:

- Phase V: Gap analysis
- Phase VI: Needs assessment and Prioritisation
- Phase VII: Consideration of alternatives and strategies for meeting requirements
- Phase VIII: Costing and financial procurement strategies

In order to cover all the required aspects and address the Lepelle Nkumpi Local Municipality waste management services, a literature review as well as constant interaction with Lepelle Nkumpi Local Municipalities relevant officials are envisaged. This approach ensures that best practices are identified and incorporated into the L-NLM IWMP. It also ensures participation by the relevant L-NLM officials and encourages informed decision-making.

2 LITERATURE REVIEW

2.1 Regulatory Framework for waste management

2.1.1 The Constitution of South Africa

The Constitution of the Republic of South Africa is designed to ensure the fundamental rights of the citizens of South Africa. A number of sections of the constitution have a direct bearing on the development of waste facilities and the protection of the environment.

Section 24: Environment

Section 24 of the Constitution has caused a paradigm shift towards a new environmental policy for South Africa. An important element of the Constitution, namely to protect the human rights, is related to the need for a sustainable use of the country's scarce natural resources, the promotion of conservation and the prevention of pollution and economic degradation as contained in Section 24.

Section 24 (a) provides everyone the right to an environment that is not harmful to their health or wellbeing.

Section 24 (b) provides everyone the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures.

Section 32: Access to information

Section 32 (a) of the Constitution entitles every person access to any information held by the State. Sub-section (b) also entitles every person to information that is held by another person and that is required for the exercise or protection of any rights.

Formatted: Bullets and Numbering

Section 33: Just administration action

This right entails that:

- Everyone has the right to administrative action that is lawful, reasonable, and procedurally fair and
- Everyone whose rights have been adversely affected by administrative action has the right to be given written reasons.

Section 38: Right to involvement

Provides the “right to get involved” to any member of public. This means that a member of public has the right to take appropriate action to prevent environmental damage. This may include taking action against the responsible authority for failing to perform its duties in preventing environmental damage.

Section 41: Co-operative governance and intergovernmental relations

These principles are, inter alia, repeated in two other acts, the National Environmental Management Act 1998 and the National Water Act 1998. These acts, particularly the NEMA, enshrine the same principles, especially the guarantee of a healthy environment and the right to information and comment of the general public.

Hence, the principles behind the aforementioned sections of the Constitution must be acknowledged and complied with upon consideration of a waste site authorisation

2.4.12.1.2 National Environmental Management Principles

Formatted: Bullets and Numbering

The National Environmental Management Principles, stated in the National Environmental Management Act (NEMA), No. 107.1998, which are applicable to this study and include the following:

- 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.
- Sustainable development requires the consideration of all relevant factors, including the following:
 - That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
 - That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
 - That waste is avoided, or, where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;

- That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
 - That the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resources;
 - That the development, use and exploitation of renewable resources and the ecosystems they are part of, do not exceed the level beyond which their integrity is jeopardised;
 - That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
 - That negative impacts on the environment and the people's environmental rights be anticipated and prevented, and where they cannot be altogether be prevented, are minimised and remedied.
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental options.
 - Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, Particularly vulnerable and disadvantaged persons.
 - Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access for categories of people who are disadvantaged by unfair discrimination.
 - Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
 - The participation of all interested and affected parties in environmental governance must be promoted and people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation. Participation by vulnerable and disadvantaged persons must be ensured.
 - Decisions must take into account the interest, needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge, including traditional and ordinary knowledge.
 - Community well being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and through other appropriate means.
 - The social, economic and environmental impacts of activities, including disadvantages and benefits must be considered, assessed and evaluated and decisions must be appropriate in the light of such consideration and assessments.
 - The right of workers to be informed of dangers and to refuse work that is harmful to human health or the environment must be respected and protected.

- Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.
- There must be inter-governmental co-ordination and harmonisation of policies, legislation and actions relating to environment.
- Actual or potential conflicts of interest between organs of the state should be resolved through conflict resolution procedures.
- Global and international responsibilities relating to the environment must be discharged in national interest.
- The environment is held in public trust for the people. The beneficial use of environmental resources must serve the public interest and the environment must be protected as people's common heritage.

The National Environmental Management Act, No. 107 of 1998) is included in **Appendix A** of this document.

2.4.22.1.3 Integrated Pollution and Waste Management for SA

Formatted: Bullets and Numbering

The White paper on Integration Pollution and Waste Management outlines government new thinking in relation to pollution and waste management. The White paper on Integration Pollution and Waste Management for South Africa serves the following two purposes:

- To inform the public of government strategic goals and supporting objectives, and how the government intends to achieve them.
- To inform government agencies and state organs of these strategic goals and supporting objectives and their roles in achieving them.

The seven strategic goals and supporting objectives of the policy area follows:

- **Goal 1:** Effective Institutional Framework and Legislation

“To create, develop, implement, maintain and continuously improve an effective, adequately resourced and harmonised institutional framework and integrated legislative system and to build institutional capacity.”

Objectives

- To establish mechanisms to give effect of the institutional arrangements for all spheres of government
- To conduct an audit and review of existing skills, capacities, functions and the deployment of resources in the national Departments of Environmental Affairs and Tourism and of the Water Affairs and Forestry, and realign them towards implementing IP&WM policy.
- **Goal 2:** Pollution Prevention, Waste Minimisation, Impact Management and Remediation

“To promote holistic and integrated pollution and waste management through pollution prevention, minimisation at source, impact management and remediation.”

Objectives

- To manage, prevent, reduce and control soil pollution problems arising from a range of other sources, for example waste treatment and disposal, and the metal and mining industries
- Pollution and waste avoidance, prevention and minimisation to be achieved by:
 - Adhering to mechanisms to ensure appropriate design parameters, optimising operating procedures and good housekeeping for all waste generating processes.
 - Identifying mechanism such as risk assessment, for forecasting potential situation in which accidents and spills can cause unscheduled waste emissions, whether be it at facility or during transportation
- Resource recovery, recycling and reuse mechanisms
 - Reduction in the waste stream by ensuring an economic environment which favours recycled materials
 - Extraction and utilisation of landfill gas.
- Waste collection, treatment and processing mechanisms
 - Ensuring that waste are appropriately treated and processed prior to their disposal in accordance with the relevant regulations, standards, laws and guidelines.
 - Rendering harmless any pollutants, which may be released during waste treatment process.
 - Ensuring that all South Africans have adequate and sufficient waste and refuse collection services.
- Final waste disposal mechanisms
 - Timely identification, investigation and development of environmentally and socially acceptable waste disposal facilities, in a manner, which promotes the regionalisation or sharing of waste disposal sites to reduce their number and costs.
 - Developing, operating and/or closing all other waste disposal facilities including tailings dams, metallurgical slag dumps, whether proposed, existing or closed, in terms of appropriate guidelines and pollution control legislation.
 - Phasing out salvaging on landfills completely.
- Pollution remediation mechanisms
 - It will be required that where the environment has been impaired by accidental, insidious or intentional pollution or unacceptable waste management practices, it must be remedied by the accountable party and returned as close as possible to its original state.
- **Goal 3:** Holistic and integrated planning

“To develop mechanisms to ensure that integrated pollution and waste management considerations are effectively integrated into the development of government policies, strategies and programmed, all spatial and economic development planning processes, and all economic activities.”

Objectives

- To incorporate integrated, environmental management principles and methodologies in spatial development planning, as it affects integrated pollution and waste management.
- To make timely and appropriate provision for adequate waste disposal facilities.
- To develop management instruments and mechanisms for integrating pollution and waste management concerns in development planning and land allocation.
- To develop agreed, appropriate indicators to measure performance for inclusion in EIPs and EMPs as provided for in the NEMA.
- **Goal 4:** Participation and partnerships in integrated pollution and waste management governance

“To establish mechanisms and processes to ensure effective public participation in integrated pollution and waste management governance.”

Objectives

- To ensure that communication strategies in all spheres of government address public participation needs.
- To allocate government resources (financial and human) to build institutional capacity in national, provincial and local government spheres for effective management of public participation in integrated pollution and waste management governance.
- To encourage strategic alliance between government and interested and affected parties to ensure integrated pollution and waste management and achieve sustainable development.
- **Goal 5:** Empowerment and education in integrated pollution and waste management

“To promote the education and empowerment of South Africa’s people to increase their awareness of and concern for pollution and waste issues, and assist in developing the knowledge, skills, values and commitment necessary to achieve integrated pollution and waste management”.

Objectives

- To integrate pollution and waste management education in all education programmed, at all levels, in all curricula and disciplines of formal and non-formal education in the national qualification framework.
- To ensure that integrated pollution and waste management education programmed and projects foster a clear understanding of the interrelationships between pollution and waste, and of the economic, social, cultural, environmental and political issues in local, regional, national and global spheres.
- To develop a culture of discouraging pollution and waste generation among all South Africans.

- To assist Small, Micro and Medium-Enterprises (SMME) in developing appropriate integrated pollution and waste management procedures.
- To encourage and support the involvement of women, youth, workers, the unemployed, the disabled, traditional healers, the elderly and other special interest groups in the design, planning, and implementation of integrated pollution and waste management education and capacity-building programmed and projects.
- To initiate awareness campaigns for integrated waste management planning, together with the provincial environmental departments. The campaigns will be implemented by local government for general waste, and the provincial environmental departments for hazardous and industrial waste.
- **Goal 6:** Information management

“To develop and maintain databases and information management systems to provide accessible information to interested and affected parties that will support effective integrated pollution and waste management.”

Objectives

- To establish effective and efficient information system, including the development of appropriate pollution indicators to ensure informed decision-making, measure progress in policy implementation and enable public participation in the governance of integrated pollution and waste management.
- To strengthen and build capacity of government to collect, analyse, and use relevant information and knowledge for integrated pollution and waste management from all sources.
- To develop a register of pollution and waste releases and transfers from point and diffuse sources.
- To develop a register for all waste handlers.
- **Goal 7:** International cooperation

“To develop mechanisms to deal effectively and in the national interest with international issues affecting pollution and waste.”

Objectives

- To cooperate internationally on common pollution and waste management concerns, giving priority to the Southern African region.

A National Waste Management Strategy (NWMS), which forms the basis for translating the goals and objectives of the policy into practice, has been developed, together with short-term (five-year) priority Action Plans for the following key elements of the strategy:

- Integrated Waste Management Planning
- Waste information systems
- General waste collection

- Waste recycling and minimisation
- Waste treatment and disposal
- Capacity Building, Education, Awareness and Communication

While the Department of Environmental Affairs and Tourism (DEAT) is the lead agent for the environment, the Department of Water Affairs and Forestry is the lead agent for water, responsible for managing water quality and quantity. The Department of Environmental Affairs and Tourism will provide leadership and guidance to enable other national departments, provincial environmental departments and municipalities to meet their executive obligation in respect of environment, including integrated pollution and waste management.

The responsibilities of the local government (Municipalities) are to provide waste management services and management of waste disposal facilities. Specific functions to be carried out by municipalities include:

- Compiling and implementing general waste management plans, with assistance from provincial government.
- Implementing public awareness campaigns
- Collecting data for the Waste Information Systems
- Providing general waste collection services and managing waste disposal facilities within their area of jurisdiction
- Implementing and enforcing appropriate waste minimisation and recycling initiatives, such as promoting the development of voluntary partnership with industry, including the introduction of waste minimisation clubs.
- Where possible, regional planning, establishment and management of landfill sites, especially for regionally based general waste landfills.

The Department of Environmental Affairs and Tourism White Paper on Integrated Pollution and Waste Management for South Africa is included in **Appendix B** of this document.

2.1.4 National Water Act 1998

The National Water Act 1998 or NWA (Act No. 36 of 1998) was put in place to regulate the use of water resources. The NWA is a companion act to NEMA and dovetails with the principles contained within NEMA. As with NEMA, the NWA gives effect to Section 24 and 27 of the Constitution, which guarantees the right to all people of healthy and safe environment, but with particular emphasis on water usage and protection.

Furthermore, the NWA identifies 11 consumptive and non-consumptive water uses, which must be authorised under a tiered authorisation system, which include Scheduled uses, General Authorisation, or Licences. Non –consumptive uses include waste disposal.

In particular, Section 21(g) of the Act requires licensing where waste is disposed “ in a manner which may detrimentally impact on water resources”. A disposal site requires permitting in terms of Section 20 of the ECA, or licensing in terms of Section 21 of the NWA. Currently, the Department of Water Affairs and Forestry administer both authorisations.

2.1.5 Development Facilitation Act

The Development Facilitation Act (DFA) was passed to achieve three key objectives:

- To provide a coherent policy framework for land development, land registration and land planning in South Africa according to certain general principles, which formed the framework on which the act was based.
- To expedite and facilitate approval of land development applications, and
- To overhaul the existing planning and land development framework in South Africa.

The DFA provides for the formulation of “ land development objectives” for all local authority structure throughout South Africa with a view to integrated planning at local government level, setting goals and priorities in respect of service delivery and development projects, realigning resources (both human and financial) to adequately deal with such priorities and develop a spatial framework to illustrate the policies and project guidelines of the local authority for future.

The DFA creates the framework within which a registered owner of land may approach the provincial authorities for permission to use land for a pre-identified development purpose, generally in line with the Land Development Objectives set for the relevant area. In general, the DFA provides that no authority may approve an application for land development that is deemed to be inconsistent with the provisions of the statutory Land Development Objectives applicable to such area.

2.1.6 The EIA Regulations

One of the objectives of the ECA is to control activities that are likely to have a detrimental affect on the environment. In order to provide for thorough and uniform control of the environmental impact of development projects, legislation for compulsory Environmental Impact Assessment (EIA) was published in terms of section 21, 22, and 26 of the Environment Conservation Act (the EIA Regulations).

The EIA regulations have, *inter alia*, the following objectives:

- To ensure that the environmental effects of activities are taken into consideration before decision in this regards are taken.
- To promote sustainable development, thereby achieving and maintaining an environment that is not harmful to people’s health or well-being.
- To ensure that social and economic interests are taken into account before an activity is authorised.

- To regulate the process and reports required to enable the Minister or the designated competent authority to make informed decision on the activities.

Any waste disposal site to be permitted under section 20 of the ECA is identified in Government Notice No. 1182 as requiring an environmental impact assessment. The responsibility for administration of requirements for EIA is delegated to provincial departments.

2.1.32.1.7 The White Paper on Municipal Services Partnerships (MSPs)

Formatted: Bullets and Numbering

According to the Constitution, the executive and legislative authority of a municipality is vested in its municipal council. The Constitution gives municipal councils the obligation to ensure that municipal services are delivered to its municipality in a sustainable way. This is a daunting challenge, as the demand for basic services continues to outpace available government finances.

The White Paper on Local Government recommends that municipalities look for innovative ways of providing and accelerating the delivery of municipal services. The Municipal Services Partnership (MSP) Policy aims to provide clear framework within which to leverage and marshal the resources of public institutions, CBOs, NGOs and the private sector towards meeting the country's overall development objectives. The MSP Policy has been derived from the principles of *Batho Pele* (People First). It actively promotes an ethos of participation by consumers and other stakeholders throughout the process of determining and implementing service delivery options. The MSP Policy also endorses universal access to basic services, the progressive improvement in service standards, and openness and transparency in the processes used for selecting service providers.

Objectives of the MSP Policy

- The objective of the MSP Policy is to ensure that MSPs are applied in a manner that supports the Constitutional obligation of the municipalities and the Constitutional rights of communities.
- The MSP Policy creates a more conducive environment for MSPs arrangements by addressing the gaps and constrains that presently limit the use of MSPs. This will make MSPs viable and functional services delivery options and will thereby help municipalities to plan, finance and accelerate the delivery of municipal services.
- Municipalities will also be assisted in establishing systems to monitor the performance of service providers to ensure that they perform according to expectations and report on this to their communities.
- The MSP Policy supports and encourages better information flows, value for money, avenues for citizen's redress and, importantly, courtesy in service delivery.

Typical MSP arrangements

- *Service contract:* The service provider receives a fee from the council to manage a particular aspect of a municipal service. Service contracts are usually short-term (one to three years). Examples include repair and maintenance or billing and collection functions. Evidence suggests that this type of arrangement is a starting point for involving CBOs and NGOs in municipal

services provision with the other arrangements being considered as capacity and experience are developed over time.

- *Management contract*: The service provider is responsible for the overall management of all aspects of a municipal service, but without the responsibility to finance the operating, maintenance, repair, or capital costs of the service. Management contracts are typically for three to five years. Management contracts typically specify the payment of a fixed fee plus a variable component *n*, the latter being payable when the contractor meets or exceeds specified performance targets. The service provider normally does not assume the risk for collecting tariffs from residents; however, high collection rates could be a trigger for incentive payments to the service provider.
- *Lease*: The service provider is responsible for the overall management of all aspects of a municipal service, and the council's operating assets are leased to the contractor. The service provider is responsible for operating, maintenance and repairing of those assets. In some cases, the service provider may be responsible for collecting tariffs from resident and assume the related collection risk. The service provider pays the council rent for the facilities, which may include a component that varies with revenues. Generally, the service provider is not responsible for new capital investments or for replacement of leased assets. Leases are typically eight to fifteen years.
- *Build/Operate/Transfer (BOT)*: The service provider undertakes to design, build, manage, operate, maintain and repair, at its own expense, a facility to be used for delivery of a municipal service. The council becomes the owner of the facility at the end of the contract. BOTs may be used to develop new facilities, or expand existing ones. A BOT typically requires the council to pay the service provider a fee (which may include performance incentive) for the services provided, leaving responsibility for tariff collection with the council.
- *Concession*: The service provider undertakes the management, operating, repair, maintenance, emplacement, design, construction, and financing of a municipal service facility or system. The service provider often assumes responsibility for managing, operating, repairing and maintenance of related existing facilities. The contractor collects and retains all service tariffs, assumes the collection risk, and pays the council a concession fee (sometimes includes a component that varies with revenue). The municipality still remains the owner of any existing facility operated by the concessionaire, and the ownership of any new facility constructed by the concessionaire is transferred to the municipality at the end of the concession period.

Why use Municipal Service Partnerships

- If they are well structured and properly implemented, MSP arrangements can lead to significant improvements in the efficiency of service delivery i.e. significantly more services can be delivered while still remaining within the council's overall budget limits.
- MSPs permit municipal councils to reduce their expenses for equipment rentals, lease costs, initial purchase costs and technology licensing arrangements.
- Over time, municipalities can save on the capital costs of infrastructure expansion and technology upgrades.

- By linking the provision of municipal services to a definitive contractual arrangement, municipal councils are also able to know their cost in advance and therefore are in a better position to prepare their budgets and plans.
- By requiring a number of potential service providers to bid for the provision of municipal services, municipal councils can gain from the benefits of competition.

The White Paper on Municipal Services Partnerships (MSPs) is included in **Appendix C** of this document.

2.1.42.1.8 Minimum Requirements for Waste Disposal by Landfill – DWAF: Second Edition 1998

Formatted: Bullets and Numbering

The *Minimum Requirements for Waste Disposal by Landfill* forms part of the Department of Water Affairs and Forestry's Waste Management Series. This series establishes a reference framework of standards for waste management in South Africa. It also facilitates the enforcement of landfill permitting system provided for in terms of Section 20 (1) of the Environment Conservation Act, 1989 (Act 73 of 1989), and the subsequent amendments.

The objective of setting Minimum Requirements is to take pro-active steps to prevent the degradation of water quality and environment, *and to improve the standard of waste disposal in South Africa*. To ensure practical and affordable environmental protection, graded requirements are applied to different classes of landfill. The landfill class is determined from the waste type, size of operation, and potential for leachate generation.

There is an important relationship between all aspects of the landfill development process. Good landfill site selection provides for simple cost-effective design, which, provided the site preparation is correctly carried out, provides for good landfill operation. This in turn ensures the environmental acceptability of the landfill. Environmental acceptability, in its turn, often relates directly to public acceptability. Minimum Requirements are therefore set for all technical aspects of landfill development, operations and closure. They also set for involving Interested and Affected Parties (IAPs) in determining site feasibility and end use requirements.

The Permit Holder is primarily and ultimately accountable for the landfill and any effects it may have on the receiving environment. However, the Permit Holder may appoint a Responsible Person, for example, a consultant or operator, to ensure that the appropriate Minimum Requirements are applied throughout the development, operation and closure of the landfill.

Throughout the landfill development, operation and closure process, a close liaison must be maintained with the Department of Water Affairs and Forestry. At certain critical points, written consent must be obtained, before certain steps may be taken. In this way, the Department will use Minimum Requirements to enforce waste disposal site permitting. A close liaison must also be maintained with IAPs throughout the process, to ensure public acceptance.

2.2 Industry examples

This sections details industry examples, which are relevant to this study, and may be adopted and implemented at Lepelle Nkumpi Local Municipality to address the waste management services requirements.

2.2.1 Resuscitating waste management services in Lusaka, Zambia, through a public private partnership – 2001/2002

In Lusaka, the capital of Zambia, the delivery status of waste management services by the Lusaka City Council deteriorated to a very low level mainly due to financial reasons. The situation became unacceptable to the residents of Lusaka and a solution had to be found to resuscitate the service delivery. A study was commissioned by the USAID to investigate implemental and sustainable solutions to the problem.

A workshop was held with stakeholders, and consisted of representative from the following sectors; Lusaka City Council (LCC), government, residents, donor organisation, ILO (UN) institutions, initiatives, NGOs and others. An Action Plan and Programme was compiled and a working group was formed at this workshop.

At the workshop it was decided that a waste management service provision model should be developed based on all inputs and suggestions received as well as past experience and evaluation of the problem and possible solutions.

The main problems to implement a proper waste collection and disposal services were found to be as follows:

- Lack of capacity of the LCC.
- Lack of funds at the LCC to implement any improved service delivery options.
- No commitment from residents to improve their environment by paying for an improved service.
- The average resident has a limited income and any service to be provided will have to be as cost efficient as possible and affordable.
- Lack of proper revenue collection systems.

On the positive side, the following aspects were identified:

- The LCC was committed to improving the waste management situation as well as the living conditions of its residents.
- The residents also needed an improved waste management service and a healthy environment.

The following were identified as major constraints to the successful implementation of possible solutions:

- Institutional ability and willingness to implement the proposed solutions. The LCC will need professional assistance to finally develop and implement the system.
- Reluctance of the residence to adopt the new system. I.e. resident who take the standpoint that “Government” must provide.
- Lack of finance to implement the system.
- General low income of residents.
- Very poor section of the residents who will not be able to pay for any services, irrespective of the costs.

The study found that it would take a considerable time before the LCC would be able to render waste services as a municipal service to the residents. The model developed was thus based on extensive participation by private sector partners in a Public Private Partnership (PPP) with the local authority. The LCC thus remains in control of the process but private partners provide the service and they also do revenue collection under concession agreement. It was also necessary to divide Lusaka into a number of service zones.

The suggested service model, was thus as follows:

- The zones consisted of high and medium income areas together with low-income areas in the ratio of 3:1 low to high income (based on population in the areas).
- A concession was advertised and awarded to a private contractor.
- The contractor operates his own revenue collection system.
- The contractor disposes waste at a disposal site for free, with a possibility of payment of disposal services at a latter stage.
- The LCC and the contractor will propagate the services. The LCC must also undertake to start applying the by laws and Government regulations pertaining to illegal methods of waste disposal such as backyard burning or burying.
- A pilot project is developed as a first step, to ensure that expected teething problems could be rectified in the process.

The adopted model proved to be a very attractive solution to solve Lusaka waste management services problems.

2.2.2 Sustainable approach to the design, implementation and management of community based/SMME type Solid Waste Service Provision in the City of Cape Town: 2002

The provision of Solid Waste Management Services in developed communities is characterised by increasing use of sophisticated technology and equipments with more emphasis on waste minimisation and recycling. Historical data shows that waste from higher income residential and commercial areas

contains a higher content of recyclables, including organic materials, than low income (developing) areas.

In the City of Cape Town various formats of the provision of community based refuse removal services have been in use for many years where recognition was given that, *methods and technology used in prosperous developed communities does not apply in developing communities.*

The different systems in use at different areas are discussed below.

Khayelitsha

Before Khayelitsha became the responsibility of the City of Tygerberg during the restructuring of local authorities in 1997, this area was under the control of the Lingeletu West City Council and serviced by a communal skip system. This service method was not successful and not acceptable to the community.

With the focus on facilitating “true empowerment” and creating employment, the five year tender to provide a total cleaning service was awarded to The Entrepreneurial Development Corporation (Pty) Ltd (Tedcor)

Instead of the normal agreement between the council and the contractor, a tripartite agreement was signed between the council, Tedcor and each of the 9 entrepreneurs. Each sub-contractor services between 4 500 to 6 200 dwellings on a weekly basis dependent on the number of formal and informal dwellings within the area. (A total of 48 000 service points are being serviced by the 9 entrepreneurs).

Each sub-contractor employed 12 workers from the community and their cleaning activities include door-to-door collections. Street sweeping, litter picking, street bins waste removal and illegally dumped waste. One of the main criteria used to employ workers and entrepreneurs were that they should reside in the area and be unemployed.

Tedcor’s role includes, amongst others, the following: ensure service delivery, including back-up in cases of vehicle breakdowns, facilitates the setting up of businesses, monthly reporting, training, education and skills development in managing a business. A separate financial management company was employed to ensure financial sustainability.

The penalty clause for non-performance was used with success to motivate contractors to provide a higher level of service delivery after an initial time was allowed for business to understand what is expected from them. The total cleaning service is provided at the price of R 15, 55 per service point, which includes disposal fees which are payable by council. The service is seen as a very cost effective service with the added benefit of providing a mentoring business opportunity.

The major constraints experienced is the tripartite agreement structure. It does not facilitate flexibility in rapidly changing circumstances, complicates control and cannot be seen as an improvement on the

traditional council/contractor agreement as generally used, but generally the project can be seen as successful.

Philippi/Weltevreden Valley Areas

The Integrated Service Land Projects (ISLP) was one initiative of the Cape Town Administration to alleviate the symptoms of urbanisation by providing sites with basic services on otherwise undeveloped properties. What made this area unique to other similar situations was the option of delivering waste collection services by means of the 240l wheel bin system (political interpretation of the equity principle).

Due to the fact that the 240l wheeled bin system had to be serviced requiring technology compatible with the containers, this contract had to be aimed at an organisation with the capital needed to purchase the expensive equipments. A requirement was however built into the tender that the contractor had to use the contract as an empowerment opportunity.

Tedcor was appointed as the main contractor for three-year contract period. In turn, they appointed two entrepreneurs from the community and undertook the task of providing training and development of these entrepreneurs. A total of 10 000 service points needed to be serviced on a weekly basis. An improvement on the Khayelitsha contract format was made by council in that a direct contract with Tedcor was insisted on. This ensures a single body is held responsible to ensure acceptable service delivery.

Initially, problems were experienced with the appointment of workers from the community. The contractor's responsibilities included supply of a total cleaning service on a once per week basis. Two vehicles with unique mechanised side bin lifting equipment are used to facilitate cleaning operations.

Services are provided at a rate of R24,44 per service point per month, which includes transport and disposal costs, and is seen as reasonably cost effective.

Masicoco project (Let's clean up)

The areas serviced by this contract covers \pm 40 000 informal homes where council-owned land was invaded. Areas where this project is being implemented includes, amongst others, New Rest, Kanana, Barcelona, Boys Town, KTC, Joe Slovo, Brown's farm, etc. Previously, these areas were serviced by the so-called One Person Contractors (OPCs) employed from the community and taking responsibility of \pm 400 dwellings. This situation was difficult to manage by council therefore a tender was advertised for interested bodies to take over this management function. Council therefore manages these main contractors.

The initial contract was more labour intensive, and it was decided to advertise a separate tender for the bulk refuse removal and disposal operation of collected waste. This scenario facilitated empowerment on the labour contract while providing opportunities to more established waste companies with the capital available to provide the transport contract.

Numerous lockable bulk containers were distributed around the collection areas to facilitate containerisation of collected waste. From these points removal and disposal is done according to set down service requirements. All areas are required to be thoroughly cleaned once a week. An independent contractor was appointed to supervise and manage all operations of the Masicoce Project, and some of the tasks include, amongst others, the following:

- Ensure service standards are met.
- Liaison with council, RDP forums.
- Monthly reporting.
- Verification of invoices.

The service is generally up to standard and services are provided at a cost effective rate of R14,24 per service point per month (R9,86 for collection, R2,78 for bulk removal and disposal and R1,60 for black bags). Constant monitoring and control of contractors is essential.

Dunoon/Joe Slovo

These areas are low-income formal areas in the Blaauwberg Administration. They were initially serviced by Blaauwberg Cleansing Department but due to resources been stretched extensively, the outsourcing option was considered. A tender process was initiated and facilitated in a way and at a level accessible to members of that community to establish a community based collection system. A separate tender was also initiated for the bulk removal and disposal.

A lot of time, money and energy was spent to facilitate pretender clinics, providing a 24 hour enquiry telephone line and assisting the entrepreneur in setting up its business. One main contractor was appointed for the collection and general cleaning, and the other for the bulk removal and disposal service. Services are delivered to a total of 3 916 service points.

A cleaning plan was drafted with help from a specialised consultant, which in turn made monitoring and controlling the contractor far easier. The services are provided at a total cost of ± R19,00 per service point per month (R13,00 for collection and R6,00 for disposal).

Lessons learnt

- The areas target by this means of service delivery is achieving good results in general and areas are far cleaner than previous.
- Close monitoring and management of service providers is essential.
- The biggest benefit to council is the fact that a reliable service can be obtained with all the added benefits of empowerment, employment, etc. at cost effective rates.
- Service provision by outsourcing to SMMEs is a workable option, which not only provides effective and reliable service but also falls in line with the National Government policies.

Provision and management of drop-off facilities/Transfer stations

Drop-offs (small transfer facilities) are provided throughout the City of Cape Town to facilitate the disposal of all waste other than that collected by means of the weekly residential removal system.

Due to the fact that up to 80% of waste disposed at these facilities are organic greens this stream is chipped and transported to organic composting facilities with great success. The system indicates that a savings of 75% on the transportation and disposal fees is applicable, and an average saving of R15 000.00/month is obtained by extracting all recyclables from the waste stream.

The running of drop-off facilities which includes the gate control function, separation of waste into different waste streams, chipping of greens and compost making process with all its related activities is not seen as the council core business, hence management of this facilities is ideal for purposes of entering into Public Private Partnerships (PPPs)

Funding Mechanisms

Council approached the Municipal Infrastructure Investment Unit (MIU), who funds planning and feasibility studies that lead to the establishment of PPPs.

2.2.3 Establishment of an Integrated Waste Management System in Rural Umkhanyakude, Kwazulu-Natal: The Jozini recycling centre: 2001/2004

Jozini is a small rural town situated in northern Kwazulu-Natal in the Umkhanyakude District Municipality. Like many rural towns in South Africa, it is characterized by high levels of unemployment and poverty and experiences deficiencies in its municipal waste management systems. For instance, Jozini has an unpermitted waste disposal site where waste is burnt and cattle graze and there is an enormous litter problem in the town centre. As waste management competes with other pressing social and economic needs for a share of municipal resources, the establishment of an appropriate rural integrated waste management system that leads both to an improvement in environmental quality and the creation of sustainable livelihoods represents a major challenge.

In 2001, the Umkhanyakude District Municipality was pronounced as one of four nodes in the province that would be focus for the implementation of the Integrated Sustainable Rural Development Strategy. In June the of the same year the then MEC for Agriculture and Environmental Affairs (DAEA), Mr Narend Singh, launched an anti-litter campaign in Jozini in a bid to highlight the need for sustainable waste management practices in rural areas.

In 2001, the Public Waste Agency of Flanders (OVAM) approached DAEA and the Independent Development Trust (IDT) to submit proposals for the establishment of an Integrated Waste Management System in Jozini. With counter-funding being provided from its own budget, DAEA proposed the establishment of a recycling /buy-back centre in Jozini. It was envisaged that community members would be encouraged to collect recyclables and deliver them to the buy-back centre. At the buy-back centre, a team of sorters would sort the waste and some of the waste would be used to make

crafts such as handbags, mats, clocks or ornaments which could then be sold to passing tourists travelling through to the Maputaland region. Organic waste would be used to make compost, which could then be used in market gardening.

A site belonging to DAEA was identified for the establishment of the centre. Twenty people from the community were selected to undergo training for Sustainable Development, which is run by Ecosystems cc. The individuals were trained in waste sorting, craft making using waste materials, composting and business skills.

The waste management system that has been established in Jozini operates in the following way:

- OPC's collect waste from wards 5 and 7 in Jozini.
- The waste is then transported to the recycling centre by municipal truck.
- At the recycling centre, the waste is deposited inside a shed and a team of sorters sort the waste into recyclables and non-recyclables.
- Non-recyclable waste is transported and disposed off to the existing illegal landfill site.
- Organic waste is converted to compost in the composting area. The compost is of poor quality but it is envisaged that once poultry unit is operational, chicken manure will be added to the compost to improve its quality.

The project has initiated a public awareness campaign in Jozini to make the community aware of waste management and recycling. This has included radio spots on Maputaland Community Radio and Ukhozi FM as well as capacity-building workshops for community members and councillors. A number of waste bins have also been placed in Jozini Town to encourage the community not to litter. The primary schools in Jozini have also been approached to assist with the collection of recyclables.

The project has encountered many challenges since its inception, and the following are noted:

- The project long-term sustainability.
- Whether the centre can generate enough income to sustain the number of community members that work there.
- Medical waste found in the waste being brought to the centre.
- Maintenance of the property.
- Occupational health and safety compliance.

In addressing the issue of an appropriate institutional set-up to manage the project once the donor-funded portion of the project is terminated, it was resolved that a Trust be formed to take over the management of the centre. The Board of Trustees will comprise of representative from DAEA, the municipality, business people from Jozini and community members.

2.2.52.2.4 240l bin health care risk waste system

Formatted: Bullets and Numbering

On 1 June 2003 Pikitup commenced with the provision of a 240l bin system at a large private clinic. The new system utilizing 240l bins incorporates a closed loop system. A full tracking system is utilized to monitor the whole process from the time of filling and weighing the full container to the collection, transportation and incineration of the Health Care Risk Waste.

Close Loop System

- **Transport:** Medical waste trucks fetching bins from hospital.
- **Storage** of empty bins at designated areas at hospitals.
- **Ward:** Transporting waste from wards to bins.
- **Internal storage** of bins – Sluice room.
- **Storage** of full sealed bins to be picked up by medical waste trucks.
- **Weighing** of full bins on portable scale on trucks.
- **Transport** to incinerator.
- **Weighing** again of full bins at incinerator as part of security check.
- **Incineration** of contents of bins.
- **Washing** and disinfection of bins.

Benefits of the waste generators: The generator of the waste can access information and query the frequency of waste collection, the type of waste generated and the actual total tonnages on a daily, weekly or monthly basis.

Benefits of the waste transporters: The transporters of the waste can query the movements of the vehicle as well as the deployment of each and every container.

Benefits to the Health Authorities: The health authorities can query the decontamination of the containers as well as the actual tonnages generated per area. The authorities can also access the information to ensure the operators do comply with the health regulations.

Benefits to Pikitup: Pikitup can ensure that the waste is incinerated properly and timeously, as well as automate its billing process.

3 SUMMARY OF THE STATUS QUO INVESTIGATIONS

Table 1 summarises the findings of the status quo investigations at Lepelle-Nkumpi Municipality

Table 1: Summary of gap in status quo investigations: Lepelle Nkumpi Local Municipality

Item No.	Issue	Findings
1.	Policy and legislation	
1.1		A five-year Integrated Development Plan has been developed for L-NLM, (Ref. 2). Although waste management was identified as one of the priority issues, there is no Waste Management Plan for L-NLM.
1.2		The only documents regarding policies and /or legislation that is available in the Lepelle Nkumpi local municipality is the Integrated Development Plan (IDP).
2	Demographics	The estimated total population in L-NLM is 419 258 with approximately 71 % of the population is under the age of 35.
2.1		Approximately 5.5 % of the population suffers from some form of disability.
2.2		Population distribution: Low Income (LI), High Density (HD) or informal settlement.
2.3		>50% of households larger than 2 person households with 40% of households being larger than 4 person households. As much as 30% of households are single person households.
2.4		Extremely low level of employment with only 16 % of persons above legally employable age being employed. Main employment areas: Community, social or personal work 38%; Wholesale/retail 11%; Private households 9%.
2.5		Low income levels, more than 68 % with no income (2001 census data).
2.6		Low level of education, approximately 50 % of persons over 20 years old have no schooling or have not completed primary school.
2.7		Up to 89 % of housing in can be considered formal.
2.8		Effectively, only 14 % of the community receives waste management services, with the study indicating urgent need to 75 % of the community.
2.9		Mode of transport to schools and work is mainly by foot, and this results in litter along the routes.
3	Waste Quantities and Characteristics	Waste generated in L-NLM consists of: Domestic and commercial waste, Medical/Health care waste, Water and Waste-water treatment waste and small quantities of Agricultural waste from small scale rural farmers.
3.1		No definitive information regarding waste quantities collected, recycled, treated or disposed.
3.2		Domestic waste in clinics and hospitals consisting of plastics and papers is dumped into pits and burned.
		These pits are unguarded and unfenced.
		Nobody accepts responsibility for these pits.
		Old bandages, swabs etc. are also treated as general waste by the clinics and this is a major concern, as such material can still cary infectious matter.
		Left-over food is stored in drums at hospitals and was collected weekly by a contractor to feed domestic animals such as dogs and pigs. The left-over food collector has stopped collecting due to the sharps and bottles found in the food.
3.3		Medical waste is often mixed with domestic waste (food left-overs).
		Separation of waste is not being followed; therefore, waste cannot be re-used (recycled).
		There are two incinerators at Groothoek hospitals, one at Lebowakgomo hospital and one at Mafete clinic. These incinerators are not licenced and do not have temperature regulators/ adjustments.
	The incinerator at the clinic is not functional.	

Item No.	Issue	Findings
		The incinerators do not give full combustion, and often there are items such as needles in the ash that have not been properly burnt.
		Incinerator operators are not adequately trained.
		Incinerator operators have no protective clothing.
		Incinerator operators sell bug bins instead of incinerating them.
		Bug bins of 10-20 litres from clinics are collected by the officers delivering medicines and treated at the hospital's incinerators.
		The same vehicles used to transport medications is used to transport bug bins.
		Nobody accepts responsibility for the transportation of the medical waste.
3.4		No removal service for the incinerator ash exists.
3.5		Sharps are visible in the incinerator ash.
3.6		No funding is available for the transportation of medical waste.
3.7		There is no education of staff or monitoring of medical waste.
3.8		Human tissue is disposed of in placenta pits at all the clinics and hospitals but problems are experienced with these pits being full.
3.9		Pit latrines have reached capacity at some clinics.
3.10		No specific budget for waste management at clinics and hospital.
		Due to lack of records, probably as a result of understaffing, hospital and clinic management and staff are not able to establish the actual costs of waste management at their institutions.
3.11		None of the medical health care facilities have any specific strategies, policies or educational programmes relating to waste management.
3.12		No actual records for Hazardous Waste. However, Hazardous waste generation rates for the Limpopo province are very low and this waste should therefore be managed on a regional or provincial level.
3.13		No actual records for agricultural waste.
		Medical Waste is not treated properly.
3.14		Currently, the only domestic / general waste collection services that exist in the Lepelle Nkumpi municipal area are in place in Lebowaikgomo. The services are, however, extremely basic, and need improvement and better management systems for proper control.
		The majority of households in Lepelle Nkumpi have no waste management services at all. Waste is disposed of in the veldt, with an associated negative impact on the environment.
3.15		The municipal waste collectors, where these exist, were not able to provide information regarding waste collection and transportation routes.
3.16		With the exception of the transportation of medical waste from the various clinics and hospitals, there is minimal transportation of waste in Lepelle Nkumpi.
3.17		There is currently no waste management equipment, such as compactors etc, being used in Lepelle-Nkumpi. The only waste collection vehicles that are used are being used in Lebowaikgomo.
		There are no waste transfer facilities in the Lepelle Nkumpi municipal area.
		There are no waste recycling facilities in the Lepelle Nkumpi municipal area. Most of the recycling facilities in the Capricorn District are located within Polokwane. The use of these facilities, and the future development of any new waste recycling facilities, should be managed for regional (district use).
3.18		The only waste treatment facilities in Lepelle Nkumpi are the two waste incinerators at the Groothoek hospital, one at Lebowaikgomo hospital and one at Mafeke clinic, as discussed above.
		There are currently two main waste disposal sites in Lepelle Nkumpi, namely, the Lebowaikgomo A and Lebowaikgomo B waste disposal sites. Both these sites are classified as GSB sites.
		None of these disposal sites are permitted.

Item No.	Issue	Findings
		Both of these disposal sites are not operated or managed within Minimum Requirements. The sites are not operated at all: there is no compaction of the waste, sites are not operated in cells, waste is not covered with fill, there is no control over what waste is being dumped at the site, etc. There is also no sorting of waste done at the landfill sites. Waste is also frequently dumped just outside the site itself.
		Landfill sites are not fenced or guarded
4	Economics and Financing of Waste Management	The budget for 2002 indicates R 16 250 000 for waste collection and R 500 000 for rehabilitation of dumping site in Lebowakgomo.
4.1		No funding for transportation of medical waste.
4.2		Levies of R 40.05 / month for refuse collection are charged in Lebowakgomo. It is estimated that an annual income of some R 1 393 259, for some 2 899 households is generated per year. It is not known whether businesses in Lebowakgomo are charged a different rate to households.
		Some 15% of households are willing to pay for waste collection services (R2.00 to R30.00 per month).
		Some 20% of households did not feel that they could afford to pay for services.
		Some 65% of households did not indicate whether they would be willing or able to pay for waste collection services.
		Considering the community's perceived ability to pay for services, it is estimated that some R 2 239 000 could be collected annually from levies for waste collection. However, this figure would have to be adjusted if equal levies are to be charged throughout Lepelle Nkumpi.
		No information on schools, pre-schools and crèches ability to pay.
		92% of responding schools would be willing to participate in waste recycling programmes, while 97% would be willing to participate in composting programmes.
		96% of the responding pre-schools and crèches would be willing to participate in waste recycling programmes, while 82% would be willing to participate in composting programmes.
5	Organizational Structure	R 100 000 budget is focussed for finalising the organogram of municipality. Lack of capacity in the Municipality – Lepelle Nkumpi Local Municipality relies mainly on the staff of the former Lebowakgomo Township.
		No MSPs exist within the Lepelle Nkumpi Local Municipality.
6	Public awareness and public information	The public is relatively aware of the problems associated with lack of waste management, but generally do not know how to deal with the waste generated in their communities.
		There are no public information programmes about waste management in Lepelle Nkumpi.
		Little attention is paid to waste management issues in schools. Of the responding schools, only 53% teach about waste and waste management issues, while 24% have special programmes in the schools to make learners aware of waste and problems associated with waste and litter.
		Although there is a significant number of Community Based Organisations, there are no community self-help programmes identified in Lepelle Nkumpi that deal with waste. CBOs offer potential forums for access to community members for developing public awareness and educating the community with respect to waste management issues.

Lepelle-Nkumpi Local Municipality states the following:

Vision: “*To be financially viable municipality council, geared towards the improvement of the quality of the life of people by providing sustainable services*”.

Mission: “*To effectively provide basic services and thus make significant contribution to social and economic development of the community*”.

24 GAP ANALYSIS

Formatted: Bullets and Numbering

The objective of the *gap analysis* is to identify the issues, concerns, gaps and needs which need to be addressed by the IWMP, based on the information from the ALM *status quo review*. In assessing the gaps within ALM waste management systems, the relevant waste management regulatory framework as well as industry examples are referred to. In doing so, the principles of *Best Practices* and the philosophy of *Bench Marking* are considered.

2.44.1 Benchmarking as an Improvement Tool

Formatted: Bullets and Numbering

The philosophy of benchmarking is very well expressed in the following statement:

“Benchmarking is the practice of being humble enough to admit that someone else is better at something, and being wise enough to learn how to match and even surpass them at it. Benchmarking is about finding out why there are differences in performance and about learning from others best practice.”

There is an array of definitions of benchmarking. Nearly all emphasise the importance of learning from others through a systematic method of identifying best practices for a particular process or activity. For the purpose of this report, the definition, which seems to be the most appropriate, is as follows:

“Benchmarking is a process for identifying and importing best practices to improve performance.”

Almost any process or activity of an organization is a candidate for benchmarking, such as: *work processes, products and services, support functions, organizational performance and strategies*. An important element of the definition of benchmarking is the *best practice*. Best practice, in the more traditional uses of benchmarking, is defined by Robert Camp as “*those practices that please the customer most*”.

35 NEEDS ASSESSMENT AND PRIORITISATION

Formatted: Bullets and Numbering

In order to address the gaps, waste impacts and problems identified in the L-NLM status quo baseline investigation and improve the waste management services in the L-NLM, strategic objectives should be developed. This approach ensures that waste management services needs and solutions are prioritised and funds are allocated accordingly. The L-NLM Waste Management Services Needs are grouped into four key categories listed below and presented in Figure 1 termed the Leppelle Nkumpi Local Municipality Waste Management Services Needs and Prioritisation Hierarchy (L-

NLMWMSN&P). Figure 1 also gives priority levels in addressing the waste management services needs within the L-NLM.

- Improving the existing waste management services.
- Implement new waste management services in un-serviced areas.
- Employment creation, public information and awareness creation.
- Feedback, adaptive management and continuous improvement.

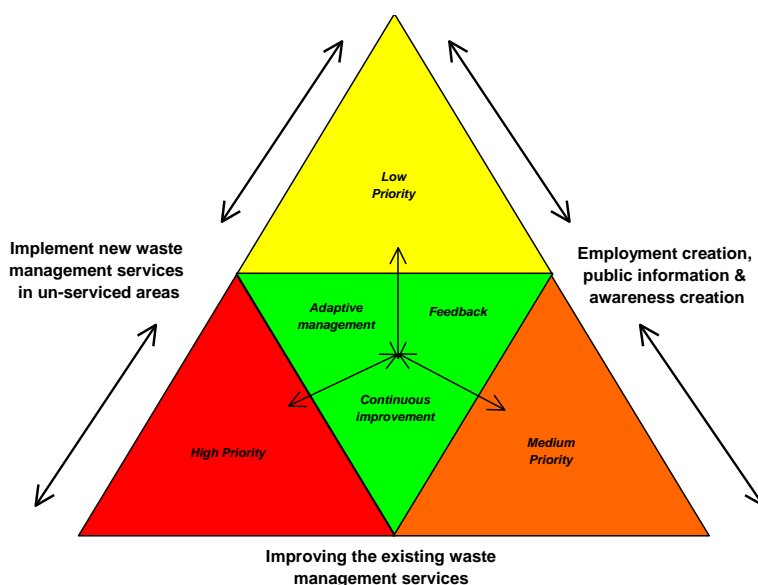


Figure 1 : L-NLM Waste Management Services Needs and Prioritisation Hierarchy

The L-NLM needs prioritisation are summarised in **Error! Reference source not found.**:

Table 2 : Summary of Needs Prioritisation

Item No.	Needs	Priority
1	Improving the existing waste management services	High - Medium
2	Implementing new waste management services in un-serviced areas	High - Low
3	Employment creation, public information and awareness creation	Medium - Low

The needs identified are described in detail below.

3.4.5.1 Improving existing waste management services

Formatted: Bullets and Numbering

The following waste management aspects/services and associated activities exist within the L-NLM:

- Refuse storage, collection and removal
- Refuse disposal and landfill operations.
- Health Care waste treatment and handling.
- Limited or no system for waste management services revenue collection and tariff structure.
- Waste management organizational structure and administration.

The strategic objectives/alternatives to facilitate improving of these services are detailed below as follows:

3.4.5.1.1 Waste Management Organisation Structure

Formatted: Bullets and Numbering

Goal 1- Effective Institutional Framework and Legislation - of the White paper on Integration Pollution and Waste Management states the following:

“To create, develop, implement, maintain and continuously improve an effective, adequately resourced and harmonised institutional framework and integrated legislative system and to build institutional capacity.”

This is key in ensuring that the Lepelle Nkumpi Local Municipality renders to its community an efficient, effective and sustainable waste management services as stated in the L-NLM vision statement. Waste and environmental aspects requires adequate resources and capacity to ensure feedback, continuous improvement and adaptive management. Currently the Technical Manager responsibilities include management/attending to waste management aspects. These presents a shortcoming as waste management services requires dedicated team. The current waste management situation in L-NLM is evidence of this incapacity.

Alternative Waste and Environmental Division Organisational Structures (W&ED) are proposed for the L-NLM. The proposed organisational structures ensure holistic approach for dealing with waste and environmental related aspects. : The proposed structures consider the following levels of responsibility and involvement either by L-NLM or external organisations.

- Services Management
- Crafting of strategy to deal with waste
- Legal compliance
- Revenue collection
- Waste collection and transportation
- Maintenance and repair and

- Disposal site operation

Three main organisation structures are proposed for L-NLM and are the following:

- L-NLM takes full responsibility for the entire waste management services
- Involvement of Municipal Services Partners (MSPs) and
- Involvement of Municipal Services Partners and Public Private Partnerships (PPPs)

The proposed organisational structures are illustrated below:

Organisational Structure – Alternative 1 (see Figure 2): Full responsibility and management by L-NLM

L-NLM utilises own resources to provide the waste management services without the involvement of MSP/PPP.

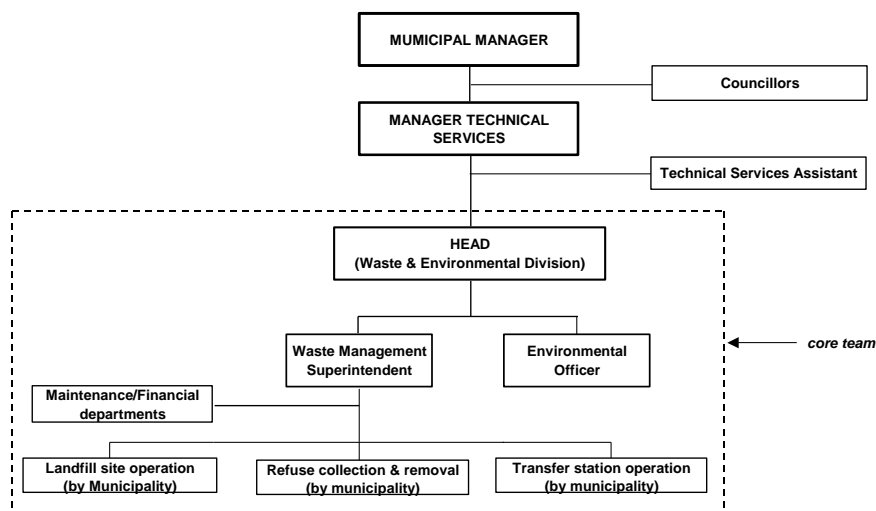


Figure 2 : Full responsibility and management by L-NLM

Organisational Structure – Alternative 2 (refer Figure 3): Partial responsibility and management by L-NLM with collection and transportation services by MSP.

L-NLM utilises own resources for management of part of the waste management services (i.e. operations of transfer stations and disposal sites), with collection and transportation services outsourced.

Organisational Structure – Alternative 3 (refer Figure 4): Partial responsibility and management by L-NLM with collection and transportation services by MSP and disposal sites and transfer stations by PPP.

L-NLM outsources the collection, transportation and management and operations of transfer stations and disposal sites.

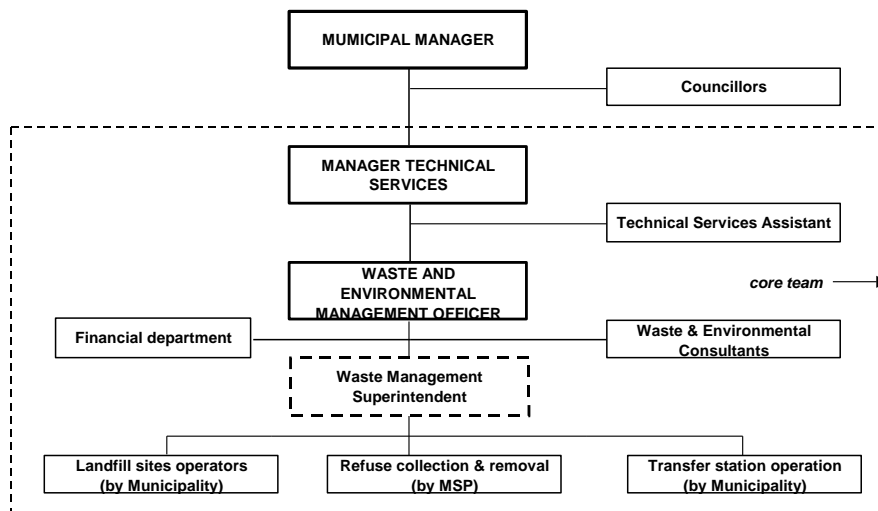


Figure 3 : MSP involvement

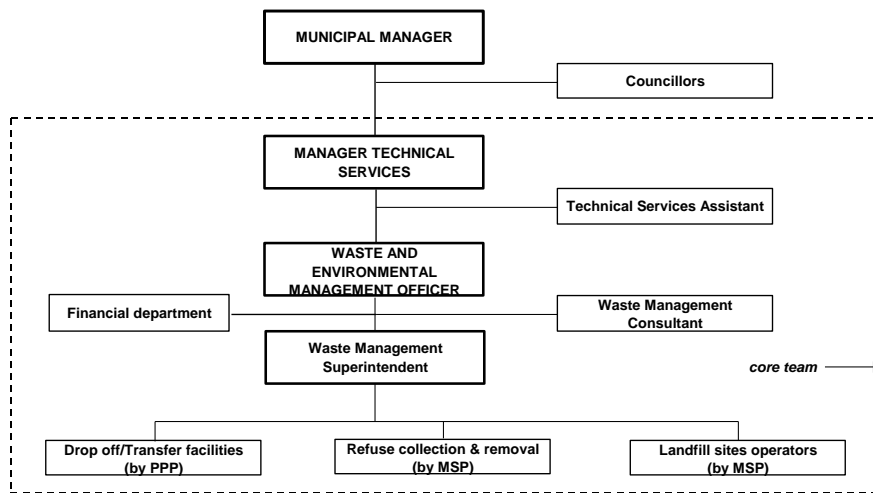


Figure 4 : MSP and PPP involvement

The various structures are assessed in section 6 and the optimal structure recommended.

Proposed Minimum Responsibilities and Duties

The following minimum responsibilities and duties by the relevant waste management services role players are envisaged:

Head: Waste and Environmental Division

- Development of divisional business plan for incorporation into the L-NLM IDP.
- Review of division strategic objectives update were necessary.
- Ensure divisions financial viability i.e. prepare budgets and apply for donor funds.
- Ensure L-NLM compliance to the relevant legislative requirements.
- Appoint appropriate personnel for the division.
- Liaise with the Manager Technical Service and Municipal Manager about divisional needs and objectives.
- Liaise with the relevant national, provincial departments and CDM responsible officials with regards to L-NLM waste and environmental matters.
- Review of by-laws and amend as required.
- Develop policies, mission statements, vision and targets for waste management services.
- Enforce penalties for non-compliance.

- Create platform for public information, training and awareness creation in relation to waste management, prevention or minimisation.

Waste Management Superintendent

- Manages and co-ordinates the waste collection and removal.
- Ensure compliance to Occupational Health and Safety Act.
- Ensure L-NLM waste quantities and types data capturing.
- Ensure proper operations of the landfill sites and refuse removal.
- Ensure availability of waste storage facilities.
- Facilitate the process of permitting, auditing, remedial measures etc of the landfill sites.
- Identifies new service points and review and update strategies.
- Report to the divisional head.
- Ensure provision of basic services at landfill sites i.e. water, electricity and sanitation.
- Prepare specifications and invite tenders/proposal when required.
- Facilitate system to prevent illegal dumping.
- Ensure proper handling and disposal of medical waste.
- Review of division strategic objectives update were necessary.

Environmental Officer

- Promotes the developments of EIA for new developments.
- Facilitate the EIA process and lease with the relevant provincial and national governments.
- Prepare specifications and invite tenders/proposals when required.
- Report to the divisional head.
- Promotes recycling initiatives.
- Facilitate training.
- Liaise with communities with regards waste and environmental matters.
- Liaise with various institutions on waste and environmental related matters to encourage continuous improvement in L-NLM

Refuse removal

- Provision of resources (i.e. manpower and equipments) for collection, treatment, transportation and disposal of waste.

- Picking up litter and clearing of illegal dumping.
- Ensure payments for disposal of waste (i.e. Where a private contractor uses the municipality disposal facilities).
- Ensure compliance to Occupational Health and Safety Act (i.e. Provision of Personal Protective Equipments).
- Ensure that equipments are fully operational at all times and in good working conditions.
- Preparation of a collections plan.
- Keep records of area serviced.
- Provision of refuse bags (i.e. Where a private contractor is utilized, it is the responsibility of the municipality to provide storage bins).

Maintenance Department

Where the municipality undertakes to perform all functions related to waste management, i.e. no use of private contractors, a properly structured and capacitated maintenance department to maintain municipality equipment (e.g. Compactors, collection vehicles) is required.

- Maintain all equipment to ensure operation at all times.
- Keep the maintenance infrastructure in good conditions.
- Ensure compliance to Occupational Health and Safety Act.
- Appointment of relevant personnel to perform required duties.
- Provide personnel with proper tools and equipments to perform functions.
- Maintain maintenance records of equipments.
- Maintain equipments daily checklist.
- Identify suppliers of, lubricants, tools and services part to facilitate good working relationship.
- Report to the Waste Management Superintendent.
- Send equipment lubricants for analysis at regular intervals to in order to prolong the equipments life span.
- Assess the municipality fleet requirements and advise when required.

Financial Department

- Ensure waste management services revenue collection.
- Ensure ease of access to pay points by all serviced areas.
- Develop a system, which will facilitate ease of payment and record keeping.

- Appoint and train revenue collectors.
- Liaise with the Head of W&ED regarding tariffs increases and penalties.
- Develop policies for payments collection.
- Assist the W &ED responsible person with the preparation of budgets.
- Ensure payments of creditors.
- Assist the W&ED responsible person with the development of financial plans.

Waste and Environmental Management Consultants

- Provide advise to the municipality/
- Prepare tender documents, contracts and specifications when required/
- Prepare design details when required/
- Develop waste management services plans when required/
- Undertake feasibility studies when required/
- Liaise with authorities with regards to permit conditions and applications/
- Provide training and awareness creation when required/
- Facilitate public meetings when required/
- Analysis of waste streams/
- Audit of landfill sites in accordance with the Minimum Requirements.

Disposal site operations

- Provision of sufficient and properly trained staff.
- Ensure that the landfill is operated in accordance with the prescribed standards.
- Ensure compliance to Occupational Health and Safety Act.
- Keep records of waste quantities and activities within the site.
- Provide equipments required for undertaking disposal activities.
- Report and repair defects when necessary.
- Ensure availability of daily cover material at all times.
- Facilitate disposal of waste.
- Co-ordinate the recycling activities and maintain structured disposal systems.
- Develop management protocols.

- Maintain access control.
- Prevent destruction of infrastructure.
- Prevent illegal dumping.
- Ensure revenue collection for disposal.
- Ensure good housekeeping of the site.

3.4.25.1.2 Refuse collection and transportation

Formatted: Bullets and Numbering

Currently the only domestic/general waste collection services that exist in Lepelle-Nkumpi Local Municipality takes place in Lebowakgomo. However, the service is extremely basic, and the municipal waste collectors are unable to provide necessary information regarding waste quantities, collection and transportation routes. The type and number of waste collection vehicle is also unknown.

Lebowakgomo is situated in ward 13 of Lepelle-Nkumpi and the 2004 survey information for this ward is not comprehensive. However, in order to improve the situation, the following generic aspects are proposed:

Maintenance of the tractor-trailer used for waste collection at Soekmekeer is important to ensure uninterrupted service. The current operations do not comply with the Occupational Health and Safety Act, and need to be improved. A service point data sheet need to be established and maintained to facilitate ease of waste collection and cash flow projections comprising of the following:

- Identification of service point i.e. school, clinic, shops, restaurant, taxi ranks, businesses, police stations and prisons
- Appointment of responsible person
- Review the existing contract between L-NLM and the current service provider
- Keep records of the collection and transportation vehicles including maintenance registers
- Ensure compliance to Occupational Health and Safety Standards
- Communicate and agree on service period.
- Identify service points provided with storage containers and assess conditions of the storage containers. If deteriorated L-NLM to replace.
- Review current tariff structure

All existing waste storage facilities need to be assessed and provided accordingly by the MLM. Once a service point is provided with storage facilities, the collection team should be informed and payments collection initiated.

5.1.3 Refuse disposal and landfill operation

There are currently two main waste disposal sites in the L-NLM, namely Lebowakgomo A and B. The sites are not operated and managed in accordance with the Minimum Requirements for Waste Disposal by Landfill, and poses risk to communities and environment. The sites are not permitted according to ECA s20 and the classification of the site is GSB⁺. Table 3 presents the Minimum Requirements for operating a GSB⁺ Landfill site.

Table 3 : Minimum Requirements for GSB⁺ Landfill Operation

Item No.	Minimum Requirements	Requirements (R – Required; N – Not Required; F - Flag)
		Small
1	Permit all unpermitted and concept permitted landfills	R
2	Consult and apply figures 1,2, & 8 in MR	R
3	Appoint Responsible Person	R
4	Confirm site classification	R
5	Landfill Permit	R
6	Deal with Department's Regional office	R
7	Deal with Department's Head Office	N/F
8	Permit Application form	R
9	Site demarcated on a map	R
10	Site visit by state departments	F
11	Full Permit application Report	R
12	Feasibility Study Report	R
13	Geohydrological Report	R
14	Geological Report	R
15	Environmental Impact Assessment	F/R
16	Landfill concept design	R
17	Landfill technical design	R/F
18	Approval of design by the department	R/F
19	Development plan	R
20	Operational and Maintenance Plan	R
21	Closure/Rehabilitation Plan	R
22	End-use plan	R
23	Water quality monitoring plan	F/R
24	Amend title deed to prevent building development on closed landfill	R
25	Report change in operation infrastructure	R
26	Report change of ownership	R
27	Site inspection prior to commissioning	N/R

The magnitude of the risk imposed onto the environment and human health by the site is un-quantified, hence the following are options are suggested.

- Option 1 - Apply for permit to continue land filling
- Option 2 – Apply for permit for closure and rehabilitation

The required regulatory processes for the suggested options are illustrated in Figure 5.

From Figure 5, it is clear that, if option 1 is considered, there is a possibility that the application for permit to continue operation may be un-favourable with the authorities and the municipality may be

advised to consider closure. Past experiences has shown that, in most cases, the authorities will advice municipality to apply for closure. It is therefore, suggested that, option 2 be considered and application for new landfill site/s initiated. Details are outlined in section 4.2.

3.1.45.1.4 Revenue collection and tariffs

Formatted: Bullets and Numbering

Currently, the only domestic / general waste collection services that exist in the Lepelle Nkumpi municipal area are in place in Lebowakgomo. Here, households are charged R 40.05 / month for waste collection services. It is estimated that some 2 899 households should be paying levies for waste collection, generating an annual income of some R 1 393 259. It is not known whether businesses in Lebowakgomo are charged a different rate to households. The actual cost of providing waste collection services in Lebowakgomo is also not known.

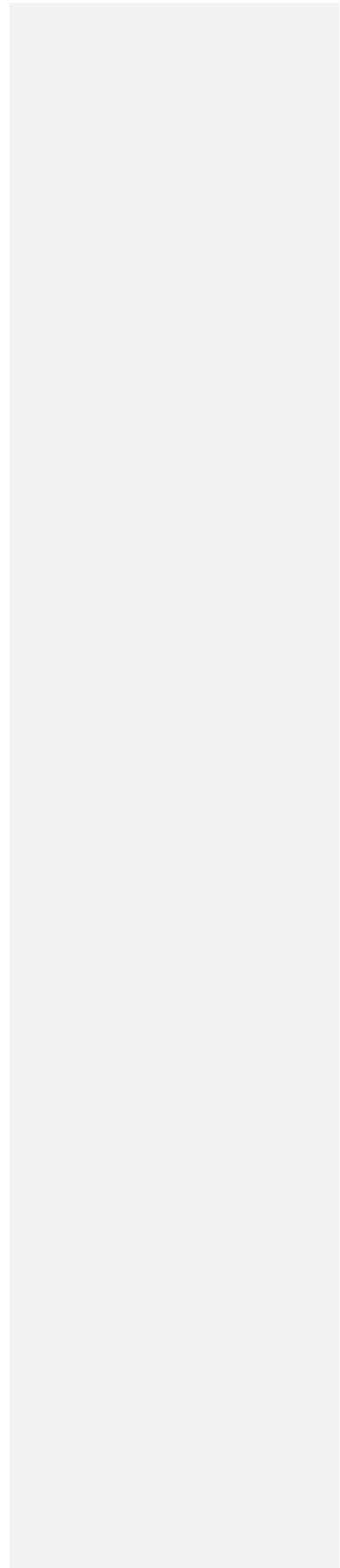
For the majority of the Lepelle Nkumpi municipal area, no waste collection services are provided and as such, no levies are charged for the provision of refuse removal services due to the fact that there are no refuse removal services.

As part of this study, communities, schools, crèches or nursery schools and police stations were requested to comment on their ability, and willingness, to pay for waste collection services. The response to the question as to what the various waste generators would be willing to pay for waste collection services are detailed below. Table 4 shows potential revenue for L-NLM if an adequate waste management service is implemented and the communities pays for the services. Rates used are for indicative purposes only and should be verified, through a more focused cost estimation and quotation process. To ensure sustainable waste management services, different waste management service levies for different service points (e.g. Formal and informal households, restaurants, schools, clinics, office blocks, industry, farming) need to be established.

Households:

In response to the survey, at village level, 65% of households did not indicate whether they would be willing or able to pay for waste collection services. Some 15% of households indicated that they would be willing to pay for waste collection services (R2.00 to R30.00 per month), while 20% of households indicated that they could not afford to pay for services. In Table 4, a levy of R15.00 per household per month is used throughout the Lepelle Nkumpi households to calculate the potential revenue collection from this particular waste generator.

Figure 5 : Landfill Process



Schools:

Some schools indicated that they would be willing to pay for waste removal services, while others either did not respond to the question or indicated that they would not afford to pay for services. For the purpose of Table 4, a levy of R22.00 per school per month applied throughout the schools in the Lepelle Nkumpi municipal area.

Pre-schools or crèches:

Some pre-school / crèches indicated that they would be willing to pay for waste removal services, while others either did not respond to the question or indicated that they would not afford to pay for services. In Table 4, a levy of R12.50 per pre-school or crèche per month is applied throughout the pre-schools and crèches in the Lepelle Nkumpi municipal area.

Businesses:

No information is available on the willingness of businesses to pay for waste collection services. For the purpose of Table 4, a levy of R38.00 per business per month is applied throughout the un-serviced Lepelle Nkumpi municipal area.

Police stations and Prisons:

No information is available on the willingness of police stations and prison to pay for waste collection services. For the purpose of Table 4, a levy of R35.00 per police station or prison per month is applied throughout the Lepelle Nkumpi municipal area.

Hospitals and clinics:

No information is available on the willingness of hospitals and clinics to pay for waste collection services. For the purpose of Table 4, a levy of R35.00 per hospital or clinic per month is applied throughout the Lepelle Nkumpi municipal area.

Table 4 : Potential revenue for waste management services in L-NLM

Ward No.	No. of Households	No. of Schools	No. of Pre-Schools & Crèches	No. of Businesses	No. of Police Stations & Prisons	No. of Clinics and Hospitals	Total (Month) Rands	Total (Annual) Rands
1	8172	0		0	0	0	R 122,580.00	R 1,470,960.00
Sub-Total	R 122,580.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00		
2	9828	0		0	0	0	R 147,420.00	R 1,769,040.00
Sub-Total	R 147,420.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00		
3	21074	6	4	56	1	1	R 318,490.00	R 3,821,880.00
Sub-Total	R 316,110.00	R 132.00	R 50.00	R 2,128.00	R 35.00	R 35.00		
4	0	0	0	0	0	0	R 0.00	R 0.00
Sub-Total	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00		
5	10997	5	2	76	0	0	R 167,978.00	R 2,015,736.00
Sub-Total	R 164,955.00	R 110.00	R 25.00	R 2,888.00	R 0.00	R 0.00		
6	17392	4	2	32	0	1	R 262,244.00	R 3,146,928.00

Ward No.	No. of Households	No. of Schools	No. of Pre-Schools & Crèches	No. of Businesses	No. of Police Stations & Prisons	No. of Clinics and Hospitals	Total (Month) Rands	Total (Annual) Rands
Sub-Total	R 260,880.00	R 88.00	R 25.00	R 1,216.00	R 0.00	R 35.00		
7	17743	7	4	44	1	2	R 268,126.00	R 3,217,512.00
Sub-Total	R 266,145.00	R 154.00	R 50.00	R 1,672.00	R 35.00	R 70.00		
8	50400	2	2	67	0	1	R 758,650.00	R 9,103,800.00
Sub-Total	R 756,000.00	R 44.00	R 25.00	R 2,546.00	R 0.00	R 35.00		
9	8340	2	2	13	1	1	R 125,733.00	R 1,508,796.00
Sub-Total	R 125,100.00	R 44.00	R 25.00	R 494.00	R 35.00	R 35.00		
10	12480	0	0	0	0	0	R 187,200.00	R 2,246,400.00
Sub-Total	R 187,200.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00		
11	15998	3	4	29	0	1	R 241,223.00	R 2,894,676.00
Sub-Total	R 239,970.00	R 66.00	R 50.00	R 1,102.00	R 0.00	R 35.00		
12	15708	0	0	0	0	2	R 235,690.00	R 2,828,280.00
Sub-Total	R 235,620.00	R 0.00	R 0.00	R 0.00	R 0.00	R 70.00		
13	123	0	0	0	0	1	R 1,880.00	R 22,560.00
Sub-Total	R 1,845.00	R 0.00	R 0.00	R 0.00	R 0.00	R 35.00		
14	0	0	0	0	0	0	R 0.00	R 0.00
Sub-Total	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00		
15	6129	4	3	19	0	0	R 92,782.50	R 1,113,390.00
Sub-Total	R 91,935.00	R 88.00	R 37.50	R 722.00	R 0.00	R 0.00		
16	26253	8	3	10	0	1	R 394,423.50	R 4,733,082.00
Sub-Total	R 393,795.00	R 176.00	R 37.50	R 380.00	R 0.00	R 35.00		
17	25766	4	4	3	0	1	R 386,777.00	R 4,641,324.00
Sub-Total	R 386,490.00	R 88.00	R 50.00	R 114.00	R 0.00	R 35.00		
18	9062	5	3	8	0	1	R 136,416.50	R 1,636,998.00
Sub-Total	R 135,930.00	R 110.00	R 37.50	R 304.00	R 0.00	R 35.00		
19	13197	8	7	52	0	2	R 200,264.50	R 2,403,174.00
Sub-Total	R 197,955.00	R 176.00	R 87.50	R 1,976.00	R 0.00	R 70.00		
20	1215	0	0	0	0	0	R 18,225.00	R 218,700.00
Sub-Total	R 18,225.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00		
21	3021	0	0	0	0	0	R 45,315.00	R 543,780.00
Sub-Total	R 45,315.00	R 0.00	R 0.00	R 0.00	R 0.00	R 0.00		
22	13213	8	4	16	0	2	R 199,099.00	R 2,389,188.00
Sub-Total	R 198,195.00	R 176.00	R 50.00	R 608.00	R 0.00	R 70.00		
23	17331	12	6	47	0	1	R 262,125.00	R 3,145,500.00
Sub-Total	R 259,965.00	R 264.00	R 75.00	R 1,786.00	R 0.00	R 35.00		
24	19601	13	8	74	1	2	R 297,318.00	R 3,567,816.00
Sub-Total	R 294,015.00	R 286.00	R 100.00	R 2,812.00	R 35.00	R 70.00		
25	30757	5	6	33	0	0	R 462,794.00	R 5,553,528.00
Sub-Total	R 461,355.00	R 110.00	R 75.00	R 1,254.00	R 0.00	R 0.00		
Cost/ Month	R 15.00	R 22.00	R 12.50	R 38.00	R 35.00	R 35.00	R 5,332,754.00	R 63,993,048.00
Total	R 5,307,000.00	R 2,112.00	R 800.00	R 22,002.00	R 140.00	R 700.00		

It is understood that high level of unemployment and low household income results in non-payment for waste management service, but the following should be noted:

- Inadequate or no waste management services poses a health risk to the community and an environmental risk to the environment, and this is in conflict with the South African National Constitution.
- As with any other service (e.g. electrical supply and water and sanitation), for Waste Management Services to be sustainable, communities must be made aware of the value of such services, and be encourage to pay for the services provided.

- Waste management services are equally important to the well being of the communities as any other basic service such as electrical supply, water and sanitation services.
- Waste management services provide long-term employment opportunities and do not require a highly skilled labour force.
- Waste Management services are directly linked to the population growth and infrastructure development (i.e. an increase in population results in increase in the amount of waste generated, and infrastructure development creates employment opportunities which results in short term or long term waste generation).
- Waste management tariffs are fixed monthly charges and are the most affordable/cheapest compared to other services.

The following aspects are key in ensuring payments for waste management services by communities in L-NLM.

- Getting value for money.
- Accessibility of pay points.
- Improved level of service i.e. waste collection, storage and disposal.
- Public information and awareness creation.
- Feedback and adaptive management.
- Creation of employment opportunities i.e. recycling at sources or disposal areas.
- Recruiting and appointment of appropriate personnel.
- Provision of basic services by L-NLM i.e. sweeping of streets, imposing penalties for illegal dumping, clearing of all existing illegal dumping areas, placing of storage facilities at public places (Schools, taxi ranks, clinics, police stations etc) e.g. 240 Litre mobile containers and providing households with storage facilities e.g. 60 Litre plastic bags, 85 Litre steel/rubberised bins.
- Creation of database for service points.

To ensure effectiveness of the revenue collection system a *policy* should be developed and communicated to all Interested and Affected Parties to ensure their participation. The following can also be initiated to ensure payments for waste management services:

- Incentives for regular payments.
- Cleaner ward competition within L-NLM.
- Keep L-NLM clean campaigns (e.g. Visits to public places, announcement on local radios etc).
- Establishment of a customer care facility (e.g. Call centre to address customer queries).

- Keep L-NLM clean day (A day whereby municipal officials together with the communities pick up litter around wards in L-NLM).

3.4.55.1.5 Medical waste treatment and handling

Formatted: Bullets and Numbering

There are 18 clinics, 4 hospitals and 4 private medical or health care practitioners in L-NLM. The clinics and hospitals in L-NLM are listed in Figure 5.

Table 5 : Medical or health care waste generators in L-NLM

Item No.	Hospitals	Clinics
1	Groothoek	
2	Lebowakgomo	
3	Thabamooopo	
4	Zebediela	
5		Byldrift
6		Boschplaats
7		Dithabaneng
8		Lebowakgomo Public Works Building
9		Ledwaba
10		Malemati
11		Mashite
12		Mphahlele
13		Moletlane
14		Mogoto
15		Lebowakgomo Parliament
16		Smugglers' Union
17		Rakgoatha
18		Slypsteen
19		Zebediela Estate
20		Lebowakgomo Unit R
21		Mafefe
22		mathabathe

The following waste collection and transportation systems exist in L-NLM:

- There are two incinerators at Groothoek hospital, one at Lebowakgomo hospital and one at Mafefe clinic. These incinerators are not licensed and do not have temperature regulators/ adjustments.
- Bug bins of 10-20 litres from all clinics are collected by the officers delivering medicines and treated at the hospital's incinerators. An estimated 3.5 kg of waste is treated at these incinerators per session and usually treatment of waste is done twice a day. The ash is then dumped at the waste pit within the hospital premises.

The system is not effective and the problems below are noted:

- None of the incinerators have permits.
- Incinerators at the clinics are not functional.
- Separation of waste is not being followed, therefore waste cannot be re-used (recycled).
- Leftover food collector has stopped doing so due to the sharps and bottles found in the food.

- There is no proper schedule or records for the collection of bug bins.
- Same vehicle used for transporting bug bins is used for transporting medication.
- No removal services for incinerator ash.
- Nobody accepts responsibility for the transportation of medical waste.
- Incinerator does not give full combustion, and this results in waste not being properly burnt.
- Incinerator operators are not adequately trained.
- Incinerator operators sell bug bins instead of incinerating them.
- Incinerator operators do not have protective clothing.
- There is no education of staff or monitoring of medical waste.
- It is not known how the private medical and health care practitioners handle their waste.

Although the Limpopo Province Department of Health has issued out a tender for the collection and treatment of medical waste, it is important for L-NLM to improve the current situation to ensure ease of incorporation to the regional medical/ health care waste management. With the increase in the spread of HIV/AIDS, it is important that L-NLM initiate and implement a system to handle medical/health care waste. Collaboration amongst L-NLM Waste and Environmental Management Division, clinics, hospitals, private medical/health care practitioners and the Local Health Department within L-NLM is vital to improve the handling of medical waste. A *Responsibility Chain* for the collaboration is illustrated in Figure 6.

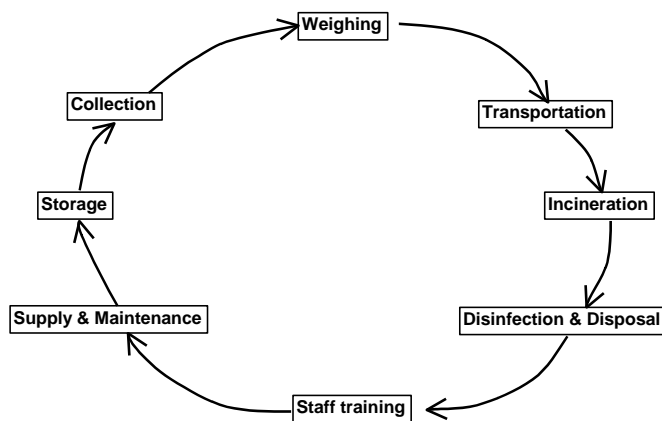


Figure 6 : L-NLM Medical and Health Care Waste Management Responsibility Chain

The responsibility chain will ensure accountability by all stakeholders. The allocation of responsibilities to various stakeholders is listed below.

Staff training

Medical/ Health Care workers at various public clinics and hospitals are employed by the Department of Health, hence it is the responsibility of the department to ensure their proper training and supply with the relevant Personal Protective Equipments.

Supply and Maintenance

Supply of bug bins and incinerators as well as maintenance of incinerators at public clinics and hospitals is the responsibility of the Department of Health. The Local Department of Health should interact regularly with the local clinics and hospitals, to ensure that facilities provided are adequate and functional, and defects are reported and attended to on time. The supply and maintenance of bug bins and incinerators can be outsourced to a private contractor by the department, or an internal department established for this purposes.

Collection

Collection of bug bins from wards to the temporary storage rooms at various clinics and hospitals is the responsibility of Local Department of Health with this responsibility allocated to the responsible trained person.

Storage

Temporary storage of bug bins at clinics or hospital before transportation or incineration is the responsibility of the Department of Health. The responsibility allocated to the Local Health Department and the various hospitals and clinics. A demarcated room for temporary storage of medical health care waste at clinics and hospitals should be identified and signposted. Only trained responsible person should have access to the storage room.

Weighing

Where medical/health care waste is not incinerated at source, the party responsible for transportation should weigh the waste with the responsible person at source being present. The party responsible for transportation prior to him/her leaving the source premises should issue a record slip to the responsible person. On arrival at the incineration facility, the transporting party, in the presence of the incinerator operator, should weigh the waste again. A record slip should be issues to the incinerator operator and he/she must confirm the waste quantities with the responsible at source. This is done to prevent illegal dumping during transportation.

Where the incinerator is at source, the incinerator operator should weigh the waste and keep the record slip and issue a copy to the responsible person.

Transportation

Where waste is transported from source to other areas for incineration, mode of transport, designed specifically for such purpose should be used. The Local Department of Health is responsible for transportation of medical waste from source to an incinerator, but may appoint a private contractor or enter into an agreement with L-NLM Waste and Environmental Management Division to perform the functions.

Incineration

It is the responsibility of the Department of Health to ensure that clinics and hospitals are provided with functional and sufficient incinerators.

Disposal

It is the responsibility of L-NLM Waste and Environmental Management Division to make facilities available for disposal of treated medical/health care waste. The treated medical waste should be clearly indicated, when collection of domestic/general waste is done by L-NLM, to ensure that it is disposed off appropriately.

Communication amongst the relevant stakeholders is also vital to ensure sustainability of the *Responsibility chain*.

3.25.2 Implementing waste management services in L-NLM

Formatted: Bullets and Numbering

Currently, the only domestic / general waste collection services that exist in the Lepelle Nkumpi municipal area are in place in Lebowakgomo. For the majority of the Lepelle Nkumpi municipal area, no waste collection services are provided.

The following waste management aspects/services and associated activities are therefore required:

- Estimation of current waste quantities.
- Estimation of future waste quantities.
- Provision of refuse collection, storage, and transportation.
- Provision of refuse disposal and landfill operations.
- Development and implementation of waste management, prevention and minimisation strategies (Illegal dumping).
- Establishment of Municipal Services Partnerships (MSPs).
- Establishment of Public Private Partnerships (PPPs).

5.2.1 Current waste Quantities

Estimations of current waste quantities in L-NLM are listed in tables below. Waste generated in L-NLM comprises mainly of General Waste.

General Waste is a classification used by the Department of Water Affairs and Forestry system to develop and permit a landfill sites. General Waste is broken down into different categories, namely:

- Municipal Solid Waste – comprising of domestic waste, garden cuttings, commercial waste, builders rubble and light industrial waste.
- Heavy/Bulk Industrial Waste – comprising of non hazardous waste from mining activities.

In order to estimate the waste quantities in L-NLM, survey information relating to waste generators, type of waste, type of dwellings and income levels, and population distribution is used.

The following waste generators are considered:

- Households
- Schools and crèches
- Hospitals and clinics
- Police stations and prisons
- Businesses
- Agricultural activities
- Heavy / Bulk Industries
- Hazardous waste generators

Waste Generator – Households

The estimated total population for L-NLM is 353,800 persons (*2004 survey*), with average total households of 84,383 and an average number of persons per household 4.19. The majority of the population in L-NLM falls either into the categories of low income, high density (LH) or informal settlement. (IS). The villages are characterised by informal settlements, while in the more urbanised areas, the tendency is a low income-high density exists.

Table 6 gives guidelines used to estimate the amount of domestic waste generated by each individual per annum and Table 7 presents typical mass-volume conversion factors.

Table 6 : Guidelines for Estimating Domestic Waste Generation Rates

Household Waste Produced per Person per Annum (Ref. DWAF (2001), Waste Generation in South Africa)			
Income Level	Disposable Income R / annum	Volume m ³	Mass ton
Low	0 to 5 000	0.24	0.08
Medium	5 000 to 10 000	0.75	0.17
High	10 000+	2.7	0.43
Household Waste Produced per Person per Annum (Based on findings of sampling of household waste)			
Molemole			0.412

Table 7 : Guidelines for Conversion Between Masses and Volumes

Equivalent Masses and Volumes of Waste (Ref. DWAF (2001), Waste Generation in South Africa)		
Compaction	Volume m ³	Mass ton
Loose	1	0.15
Compacted	1	0.45
Average	1	0.25

Table 8 gives the current estimated amount of waste generated by households in L-NLM assuming a unit generation rate of 0.412 t/person/annum (1.13 kg/person/day) and average compaction: density of 250 kg/m³ (0.25 t/ m³).

Table 8 : Estimated amount of waste generated by households in L-NLM

Area Description	Estimated population	Estimated Number of households	Estimated Number of person per household	Unit Generation (kg/person/day)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
WARD 1							
Klipheuwel	2270	500	4.54	1.13	2565	10.26	934
Kwaripe / Kwarip Ext	5902	1300	4.54	1.13	6669	26.68	2428
Sub-Total	8172	1800			9234	36.94	3361
WARD 2							
Droogte	3024	700	4.32	1.13	3417	13.67	1244
Ga-Molapo	3672	850	4.32	1.13	4149	16.60	1510
Khureng	3132	725	4.32	1.13	3539	14.16	1288
Sub-Total	9828	2275			11106	44.42	4042
WARD 3							
Madisa Di Toro	8240	2000	4.14	1.13	9311	37.24	3389
Madisaleole	6624	1600	4.14	1.13	7485	29.94	2725
Magatle	4140	1000	4.14	1.13	4678	18.71	1703
Mapatjakeng	2070	500	4.14	1.13	2339	9.36	851
Sub-Total	21074	5100			23814	95.25	8668
WARD 4							
Sub-Total							
WARD 5							
Bolahlakgomo	4192	955	4.39	1.13	4737	18.95	1724
Mmamogwase	3732	850	4.39	1.13	4217	16.87	1535
Sekgophokgophong	3073	700	4.39	1.13	3472	13.89	1264
Sub-Total	10997	2505			12427	49.71	4523
WARD 6							
Hwelereng	1980	500	3.96	1.13	2237	8.95	814

Area Description	Estimated population	Estimated Number of households	Estimated Number of person per household	Unit Generation (kg/person/day)	Waste generated per day (kg/day)	Waste generated per day (m³/day)	Waste generated per annum (t/annum)
Makuswaneng	479	121	3.96	1.13	541	2.17	197
Makweng	479	121	3.96	1.13	541	2.17	197
Mmakotse	1980	500	3.96	1.13	2237	8.95	814
Matantenjana	594	150	3.96	1.13	671	2.68	244
Rakgwatha	11880	3000	3.96	1.13	13424	53.70	4886
Sub-Total	17392	4392			19653	78.61	7154
WARD 7							
Ledwaba	4512	1200	3.76	1.13	5099	20.39	1856
Mathibela	5640	1500	3.76	1.13	6373	25.49	2320
Mathibela Low cost	5264	1400	3.76	1.13	5948	23.79	2165
Matome Village	2327	619	3.76	1.13	2630	10.52	957
Sub-Total	17743	4719			20050	80.20	7298
WARD 8							
Mogoto	50400	12000	4.20	1.13	56952	227.81	20731
Sub-Total	50400	12000			56952	227.81	20731
WARD 9							
Zebediela Estate	8340	2000	4.17	1.13	9424	37.70	3430
Sub-Total	8340	2000			9424	37.70	3430
WARD 10							
Rafiri	12480	3000	4.16	1.13	14102	56.41	5133
Sub-Total	12480	3000			14102	56.41	5133
WARD 11							
Mawaneng (Moletlane & Sekimeng)	9875	2500	3.95	1.13	11159	44.64	4062
Moletlane (Sekimeng & Mawaneng)	3358	850	3.95	1.13	3795	15.18	1381
Sekimeng (Moletlane & Mawaneng)	2765	700	3.95	1.13	3124	12.50	1137
Sub-Total	15998	4050			18078	72.31	6580
WARD 12							
Boomplaas	2741	955	2.87	1.13	3097	12.39	1127
Lebowakgomo	1435	500	2.87	1.13	1622	6.49	590
Lobowakgomo Business	1435	500	2.87	1.13	1622	6.49	590
Lebowakgomo Township (Zone B,F)	8320	2899	2.87	1.13	9402	37.61	3422
Matemang / Malemang	1777	619	2.87	1.13	2008	8.03	731
Sub-Total	15708	5473			17750	71.00	6461
WARD 13							
MEC Complex	123	55	2.23	1.13	139	0.56	51
Sub-Total	123	55			139	0.56	51
WARD 14							
Sub-Total							
WARD 15							
Lekhuswaneng	1915	500	3.83	1.13	2164	8.66	788
Morotse	3256	850	3.83	1.13	3679	14.72	1339
Rooibokbult	192	50	3.83	1.13	217	0.87	79
Thamagane	766	200	3.83	1.13	866	3.46	315
Sub-Total	6129	1600			6926	27.70	25.21
WARD 16							
Dithabaneng	3136	700	4.48	1.13	3544	14.17	1290
Kgaphamadi	8960	2000	4.48	1.13	10125	40.50	3685
Makurung	6272	1400	4.48	1.13	7087	28.35	2580
Malkapane	1344	300	4.48	1.13	1519	6.07	553
Maralaleng	493	110	4.48	1.13	557	2.23	203
Mobokotshwane	3808	850	4.48	1.13	4303	17.21	1566
Seswikaneng (Tjiane)	2240	500	4.48	1.13	2531	10.12	921
Sub-Total	26253	5860			29666	118.66	10798
WARD 17							

Area Description	Estimated population	Estimated Number of households	Estimated Number of person per household	Unit Generation (kg/person/day)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
Lenting	17800	4000	4.45	1.13	20114	80.46	7321
Marulaneng	1869	420	4.45	1.13	2112	8.45	769
Motsetsereng	3560	800	4.45	1.13	4023	16.09	1464
Rooibosbult	223	50	4.45	1.13	252	1.01	92
Tooseng	2225	500	4.45	1.13	2514	10.06	915
Veeplaas	89	20	4.45	1.13	101	0.40	37
Sub-Total	25766	5790			29116	116.46	10598
WARD 18							
Lehlokwane / Tsoging	2165	500	4.33	1.13	2446	9.79	891
Lesetse	2165	500	4.33	1.13	2446	9.79	891
Matinkane	2680	619	4.33	1.13	3028	12.11	1102
Phosiri	866	200	4.33	1.13	979	3.91	356
Rapotela	217	50	4.33	1.13	245	0.98	89
Sampye	17	4	4.33	1.13	19	0.08	7
Sotalale	476	110	4.33	1.13	538	2.15	196
Tswaing	476	110	4.33	1.13	538	2.15	196
Sub-Total	9062	2093			10240	40.96	3727
WARD 19							
Lekureng (Ext)	3720	800	4.65	1.13	4204	16.81	1530
Lekureng / Malemati	3720	800	4.65	1.13	4204	16.81	1530
Maijane	851	183	4.65	1.13	962	3.85	350
Mosetamong	488	105	4.65	1.13	551	2.21	201
Patoge	1395	300	4.65	1.13	1576	6.31	574
Seleteng	2325	500	4.65	1.13	2627	10.51	956
Zaaiikloof	698	150	4.65	1.13	789	3.15	287
Sub-Total	13197	2838			14913	59.65	5428
WARD 20							
Masite	1215	250	4.86	1.13	1373	5.49	500
Sub-Total	1215	250			1373	5.49	500
WARD 21							
Middlekop	3021	661	4.57	1.13	3414	13.65	1243
Sub-Total	3021	661			3414	13.65	1243
WARD 22							
Byldrift (Ext)	4212	955	4.41	1.13	4760	19.04	1732
Makgopong	807	183	4.41	1.13	912	3.65	332
Malatane	1971	447	4.41	1.13	2227	8.91	811
Mehlareng	2915	661	4.41	1.13	3294	13.18	1199
Phaswana	3308	750	4.41	1.13	3738	14.95	1361
Sub-Total	13213	2996			14931	59.72	5435
WARD 23							
Bodutlulo	0	0	4.98	1.13	0	0.00	0
Ga-Makgoba	2241	450	4.98	1.13	2532	10.13	922
Ga-Mathabatha (Lekgwareng)	1046	210	4.98	1.13	1182	4.73	430
Grootfontein	433	87	4.98	1.13	489	1.96	178
Madikelang	9960	2000	4.98	1.13	11255	45.02	4097
Mahlaokeng	100	20	4.98	1.13	113	0.45	41
Makapeng	911	183	4.98	1.13	1029	4.12	375
Maseseleng	1046	210	4.98	1.13	1182	4.73	430
Mashadi	1046	210	4.98	1.13	1182	4.73	430
Success	548	110	4.98	1.13	619	2.48	225
Sub-Total	17331	3480			19584	78.34	7129
WARD 24							
Ditabogong	120	31	3.88	1.13	136	0.54	49
Dublin / Sealane	2716	700	3.88	1.13	3069	12.28	1117
Ga-Maila	124	32	3.88	1.13	140	0.56	51
Ga-Mampa	93	24	3.88	1.13	105	0.42	38
Kappa	1940	500	3.88	1.13	2192	8.77	798
Mafeke	6208	1600	3.88	1.13	7015	28.06	2553

Area Description	Estimated population	Estimated Number of households	Estimated Number of person per household	Unit Generation (kg/person/day)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
Magope	58	15	3.88	1.13	66	0.26	24
Mahlatjane	710	183	3.88	1.13	802	3.21	292
Malakabaneng	291	75	3.88	1.13	329	1.32	120
Manhlane	1164	300	3.88	1.13	1315	5.26	479
Mankole	1164	300	3.88	1.13	1315	5.26	479
Maredi	140	36	3.88	1.13	158	0.63	58
Mataung	2402	619	3.88	1.13	2714	10.86	988
Matsoong	213	55	3.88	1.13	241	0.96	88
Mosola	407	105	3.88	1.13	460	1.84	167
Motsane	229	59	3.88	1.13	259	1.04	94
Motsane X1	132	34	3.88	1.13	149	0.60	54
Motsane X2	132	34	3.88	1.13	149	0.60	54
Mphape	136	35	3.88	1.13	154	0.61	56
Ngwaname	136	35	3.88	1.13	154	0.61	56
Pitsaneng	776	200	3.88	1.13	877	3.51	319
Ramonwane	310	80	3.88	1.13	350	1.40	128
Sub-Total	19601	5052			22149	88.60	8062
WARD 25							
Bolatjane	4594	955	4.81	1.13	5191	20.76	1890
Bolopa	4594	955	4.81	1.13	5191	20.76	1890
Hlahla	914	190	4.81	1.13	1033	4.13	376
Hwelesaneng	2405	500	4.81	1.13	2718	10.87	989
Makopeng	880	183	4.81	1.13	994	3.98	362
Mang le mang	1443	300	4.81	1.13	1631	6.52	594
Mogodi	4170	867	4.81	1.13	4712	18.85	1715
Molapo Matebele	4089	850	4.81	1.13	4621	18.48	1682
Mooiplaas	4089	850	4.81	1.13	4621	18.48	1682
Naauppoort (A,B,Ext)/(Phalakwane)	1174	244	4.81	1.13	1327	5.31	483
Serobaneng	2405	500	4.81	1.13	2718	10.87	989
Sub-Total	30757	6394			34755	139.02	12651
Total	353800	84383			399794	1599.18	145525

Table 8 indicates that ward 8 has the highest population, as compared to other wards and generates more waste.

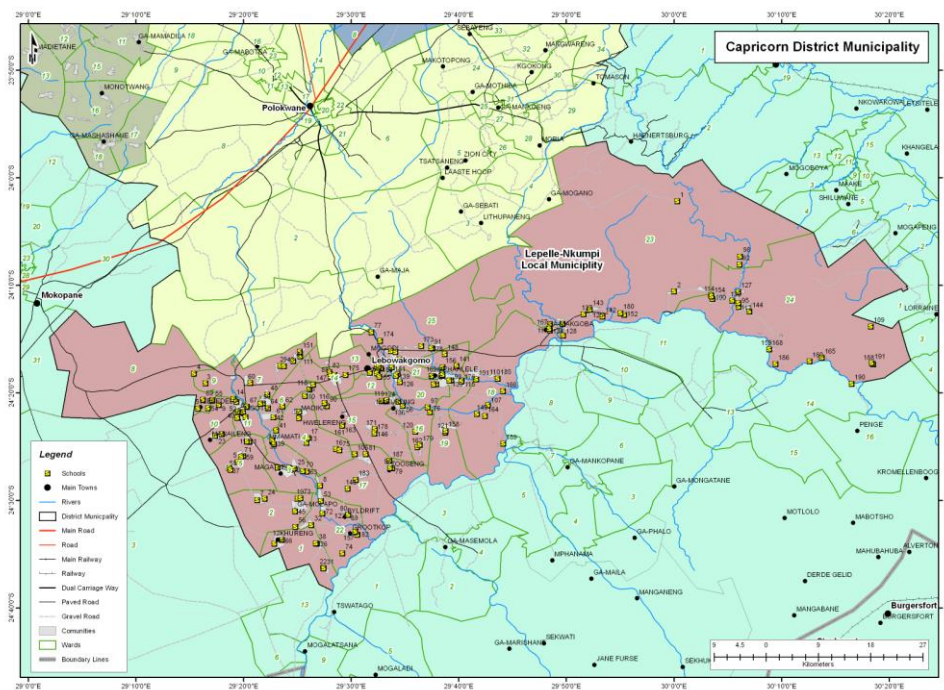
It should be noted that the unit generation rate used in Table 8 is that derived from the sampling of household waste conducted in this study and it is the second highest rate in Table 6. Use of other unit generation rates given in Table 6 give annual waste quantities of 28 304 tonnes, 60 146 tonnes and 152 134 tonnes compared to 145 525 tonnes given in Table 8. It is likely that the minimum and maximum estimates for total general waste generated could be indicative of the two extreme conditions in economic growth in the area viz. minimum waste generation can be expected if there is no economic growth in the area and household incomes remain low. The maximum total waste generation could be representative of potential conditions should there be sound economic growth in the area, with the average household income rising above R 5 000 / household per annum.

L-NLM is responsible for providing waste management services to its communities at an affordable fee. Free Basic Waste Management Services should also be provided by L-NLM.

Waste Generator – Schools and Crèches

Map 3 shows the locations of schools in L-NLM. As part of the waste survey, schools, pre-schools and crèches in L-NLM were identified and information relating to number of learners, availability of waste management services, awareness relating to waste management and environmental protection and willingness to pay for waste management services were obtained.

Waste generated by schools comprises mainly of soft drink tins and bottles, paper, cardboard boxes and glass bottles. There is no proper information relating to handling of wastes by schools, as no services are provided by L-NLM.



Map 3 : Schools and Crèches in L-NLM

Table 9 and Table 10 give guidelines used to estimate the amount of waste generated by schools and crèches in L-NLM.

Table 9 : Guidelines for estimating waste generated by schools in L-NLM

Item No.	Mass range	Unit Generation (kg/person/week)
1	1 kg < 5 kg	0.02
2	5 kg < 10 kg	0.02
3	10 kg < 15 kg	0.02
4	15 kg < 15 kg	0.05
5	25 kg < 50 kg	0.19
8	90 kg < 125 kg	0.49
6	600 kg	0.49

Table 10 : Guidelines for estimating waste generated by crèches in L-NLM

Item No.	Mass range	Unit Generation (kg/person/week)
1	2 kg < 5 kg	0.10
2	5 kg < 20 kg	0.60
3	20 kg < 30 kg	0.73
4	50 kg < 80 kg	1.01
5	80 kg	3.20

The estimated amount of waste generated by schools and crèches in L-NLM is presented in Table 11, in which average masses of waste produced per person per week of 0.22kg and 1.04kg were used for schools and crèches, respectively. The equivalent mass per volume of waste is taken to be 250 kg/m³.

Table 11 : Estimated amount of waste generated by schools and crèches in L-NLM

Area Description	Schools	Number of pupils plus teachers	Unit Generation (kg/person/week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
WARD 3						
Madisa Di Toro	Mmammati Primary School	QNC	0.22	14.65	0.06	2.86
	Moropa High School	582	0.22	25.61	0.10	4.99
	Mosebjadi Creche	QNC	1.04	18.57	0.07	6.76
	Setlogolo Sabathokoa	QNC	1.04	18.57	0.07	6.76
Magatle	Shopeng Primary School	239	0.22	10.52	0.04	2.05
	Mokhohloa Makopo	224	0.22	9.86	0.04	1.92
	Koko Khutsa	QNC	1.04	18.57	0.07	6.76
	Mmagofa Creche	QNC	1.04	18.57	0.07	6.76
Mapatjakeng	Mapatjakeng Primary School	QNC	0.22	14.65	0.06	2.86
	Tubake High School	907	0.22	39.91	0.16	7.78
Sub-Total	10	3118		189.48	0.76	49.50
WARD 5						
Bolahlakgomo	Bolahlakgomo	QNC	0.22	14.65	0.06	2.86
	Mathekgana	215	0.22	9.46	0.04	1.84
Mmamogwase	Mmamogwase	447	0.22	19.67	0.08	3.84
Sekgophokgophong	Madibo High School	500	0.22	22.00	0.09	4.29
	Mathekgana, Maponyane, Seloana	405	0.22	17.82	0.07	3.47
	Elias Motswaledi	39	1.04	5.79	0.02	2.11
	Kolopo Nthlana	QNC	1.04	18.57	0.07	6.76
Sub-Total	7	2064		107.97	0.43	25.17
WARD 6						
Makweng	Sello Primary School	QNC	0.22	14.65	0.06	2.86
	Sethwethwa High School	QNC	0.22	14.17	0.06	2.76
	Pheladi Community Creche	QNC	1.04	18.57	0.07	6.76
Rakgwatha	Rakgwatha Primary School	20	0.22	0.88	0.00	0.17

Area Description	Schools	Number of pupils plus teachers	Unit Generation (kg/person/week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
	Maroba High School	QNC	0.22	14.17	0.06	2.76
	Setckone	QNC	1.04	18.57	0.07	6.76
Sub-Total	6	1247		81.01	0.32	22.07
WARD 7						
Ledwaba	Ndlovu Primary School	316	0.22	13.90	0.06	2.71
	Maditsi High School	278	0.22	12.23	0.05	2.39
	Tihabake Primary School	24	0.22	1.06	0.00	0.21
Mañhibela	Sekutudi	741	0.22	32.60	0.13	6.36
	Mmabolepu	160	0.22	7.04	0.03	1.37
	Lesedi	54	1.04	8.02	0.03	2.92
	Moon-Light	34	1.04	5.05	0.02	1.84
Mañome Village	Phalalong	306	0.22	13.46	0.05	2.63
	NgwanaBahlalerwa Secondary	8	0.22	0.35	0.00	0.07
	Xhevonda	33	1.04	4.90	0.02	1.78
	Mosetile	QNC	1.04	18.57	0.07	6.76
Sub-Total	11	2079		117.20	0.47	29.03
WARD 8						
Mogoto	Tintela	518	0.22	22.79	0.09	4.44
	Reholegile	1027	0.22	45.19	0.18	8.81
	E Segabutla	21	1.04	3.12	0.01	1.14
	Maranatha	32	1.04	4.75	0.02	1.73
Sub-Total	4	1598		75.85	0.30	16.12
WARD 9						
Zebediela Estate	Mashigoana Primary	33	0.22	1.45	0.01	0.28
	Lahlasedi Combined School	465	0.22	20.46	0.08	3.99
	Mmatjie Creche	38	1.04	5.65	0.02	2.06
	Zebediela Creche	35	1.04	5.20	0.02	1.89
Sub-Total	4	571		32.76	0.13	8.22
WARD 11						
Mawaneng (Moetlane & Sekimeng)	Moshodo	382	0.22	16.81	0.07	3.28
	Praise Centre Edu-Care	71	1.04	10.55	0.04	3.84
	Sethele Community Creche	35	1.04	5.20	0.02	1.89
	Matshumu Primary School	940	0.22	41.36	0.17	8.07
Moetlane (Sekimeng & Mawaneng)	Tshita Secondary School	736	0.22	32.38	0.13	6.31
	Itireleng Creche	QNC	1.04	18.57	0.07	6.76
	Matshela Pre-School	QNC	1.04	18.57	0.07	6.76
Sub-Total	7	2414		143.44	0.57	36.91
WARD 15						
Morotse	Morotse Primary School	374	0.22	16.46	0.07	3.21
	Sekate Senior Secondary School	340	0.22	14.96	0.06	2.92
	Mahlako Pre-School	QNC	1.04	18.57	0.07	6.76
Thamagane	Thmagane Primary School	319	0.22	14.04	0.06	2.74
	Sekate Secondary School	340	0.22	14.96	0.06	2.92
	Madipadi Pre-School	27	1.04	4.01	0.02	1.46
	Itireleng Community Educare Centre	57	1.04	8.47	0.03	3.08
Sub-Total	8	1582		91.46	0.37	23.08
WARD 16						
Dithabaneng	Dithabaneng Primary School	1017	0.22	44.75	0.18	8.73
	Tagaetala	QNC	0.22	14.65	0.06	2.86
	Ramolwetji	413	0.22	18.17	0.07	3.54
Malkapane	Malekapane Primary School	77	0.22	3.39	0.01	0.66
	Rekhutjite	22	1.04	3.27	0.01	1.19
Maralaleng	Maraleng Primary School	QNC	0.22	14.65	0.06	2.86
	Lehlaga Secondary School	QNC	0.22	14.17	0.06	2.76
Seswikaneng (Tjiane)	Tjiane Primary School	360	0.22	15.84	0.06	3.09
	Phutlo Senior Secondary School	1048	0.22	46.11	0.18	8.99
	Kgotlelelang Creche	23	1.04	3.42	0.01	1.24
	Grootkop Creche	QNC	1.04	18.57	0.07	6.76
Sub-Total	11	4073		196.99	0.79	42.68

Area Description	Schools	Number of pupils plus teachers	Unit Generation (kg/person/week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
WARD 17						
Marulaneng	Hlagatse Primary School	605	0.22	26.62	0.11	5.19
	Rekhutjite Secondary School	249	0.22	10.96	0.04	2.14
	Mohlasedi Creche	56	1.04	8.32	0.03	3.03
	Mosebjadi Creche	QNC	1.04	18.57	0.07	6.76
Tooseng	Boschplaats Primary School	646	0.22	28.42	0.11	5.54
	Kgwadiamoleke Secondary School	429	0.22	18.88	0.08	3.68
	Matlale Pre-School	18	1.04	2.67	0.01	0.97
	Motlakaro Creche & Pre-School	64	1.04	9.51	0.04	3.46
Sub-Total	8	2192		123.95	0.50	30.77
WARD 18						
Lehlokwane/Tsoging	Sampse	157	0.22	6.91	0.03	1.35
	Phaahia Creche	16	1.04	2.38	0.01	0.87
Lesetse	Lesetse Primary School	265	0.22	11.66	0.05	2.27
	Sekgololo Creche	45	1.04	6.69	0.03	2.43
Matinkane	Gwaragwara Primary School	192	0.22	8.45	0.03	1.65
	Ithuteng Creche	17	1.04	2.53	0.01	0.92
Phosiri	Mokgapaneng Primary School	131	0.22	5.76	0.02	1.12
	Ramalawane High School	237	0.22	10.43	0.04	2.03
Sub-Total	8	1060		54.80	0.22	12.64
WARD 19						
Lekureng (Ext)	Thakadu	14	1.04	2.08	0.01	0.76
Lekureng / Malemati	Malemati Primary School	891	0.22	39.20	0.16	7.64
	Phauwe Secondary School	468	0.22	20.59	0.08	4.02
	Thakamangana	118	1.04	17.53	0.07	6.38
	Magakabjeng Day Care Centre	19	1.04	2.82	0.01	1.03
Maijane	Maijane Primary School	917	0.22	40.35	0.16	7.87
	Tauphuti High School	704	0.22	30.98	0.12	6.04
	Ramoshweu Pre-School	106	1.04	15.57	0.06	5.73
Patoge	Patoga Primary School	8	0.22	0.35	0.00	0.07
	Mokgorotlwane	109	0.22	4.80	0.02	0.94
	Ratanang Creche	79	1.04	11.74	0.05	4.27
Seleteng	Maijane Primary School	620	0.22	27.28	0.11	5.32
	Tauphuthi Secondary School	4019	0.22	176.84	0.71	34.48
	Ramoshoeu Pre-School	50	1.04	7.43	0.03	2.70
	Nthwethi Pre-School	QNC	1.04	18.57	0.07	6.76
Sub-Total	15	8247		416.30	1.67	94.01
WARD 22						
Byldrift (Ext)	Byldrift Primary School	685	0.22	30.14	0.12	5.88
	Mamagogo High School	908	0.22	39.95	0.16	7.79
	Bolopang Bana	202	1.04	30.01	0.12	10.92
	Madisa Pre-School	304	1.04	45.17	0.18	16.44
Makgopong	Ramasodi	533	0.22	23.45	0.09	4.57
	Mpotla High School	740	0.22	32.56	0.13	6.35
Malatane	Baselwane Primary School	QNC	0.22	14.65	0.06	2.86
	Phaswane High School	694	0.22	30.54	0.12	5.95
	Moshiane Pheladi	203	1.04	30.16	0.12	10.98
Mehlareng	Mogololo Primary School	434	0.22	19.10	0.08	3.72
	Sebitse High School	688	0.22	30.27	0.12	5.90
	Ngoako Ramahlodi Creche	254	1.04	37.74	0.15	13.74
Sub-Total	12	5978		363.73	1.45	95.11
WARD 23						
Bodutlulo	Bodutlulo Primary School	53	0.22	2.33	0.01	0.45
	Legobole Primary & Makadimane Secondary	291	0.22	12.80	0.05	2.50
Ga-Makgoba	Scheiding Primary School	589	0.22	25.92	0.10	5.05
	Matimela High School	246	0.22	10.82	0.04	2.11
	Itsoshe Tlala Moshito Creche	59	1.04	8.77	0.04	3.19

Area Description	Schools	Number of pupils plus teachers	Unit Generation (kg/person/week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
Ga-Mathabatha (Lekgwareng)	Moleke Primary School	239	0.22	10.52	0.04	2.05
	Modaputsi Secondary School	501	0.22	22.04	0.09	4.30
	Selemagae Creche	29	1.04	4.31	0.02	1.57
	Kgolamorthi Creche	36	1.04	5.35	0.02	1.95
Grootfontein	Ngwamorei Primary School	117	0.22	5.15	0.02	1.00
	Tlouatiba Secondary School	271	0.22	11.92	0.05	2.33
	Ramadimetsa Creche	QNC	1.04	18.57	0.07	6.76
Madikeleng	Moshabe English Medium School	37	0.22	1.63	0.01	0.32
	Raisibe Creche	71	1.04	10.55	0.04	3.84
Mashadi	Dikgeu Primary School	581	0.22	25.56	0.10	4.98
	Mashianyane	826	0.22	36.34	0.15	7.09
	Moshiane Pre-School	69	1.04	10.25	0.04	3.73
Success	Mokolobane	164	0.22	7.22	0.03	1.41
Sub-Total	18	4304		230.05	0.92	54.63
WARD 24						
Dublin / Sealane	Sealane Primary School	181	0.22	7.96	0.03	1.55
	Phophedi High School	93	0.22	4.09	0.02	0.80
Ga-Mampa	Komane Primary School	455	0.22	20.02	0.08	3.90
	Kgadimo Secondary School	382	0.22	16.81	0.07	3.28
	Moshalane Creche	37	1.04	5.50	0.02	2.00
Kappa	Mashabashab & Mafefe	256	0.22	11.26	0.05	2.20
	Mafefe	208	0.22	9.15	0.04	1.78
	Tlatiru	26	1.04	3.86	0.02	1.41
Mahlatjane	Mahlajane	566	0.22	24.90	0.10	4.86
	Noko-Tlou	465	0.22	20.46	0.08	3.99
	Makgobelele Pre-School	QNC	1.04	18.57	0.07	6.76
	Matsane Creche	QNC	1.04	18.57	0.07	6.76
Motsane	Maletsai Primary School	13	0.22	0.57	0.00	0.11
	Phosani Secondary School	205	0.22	9.02	0.04	1.76
	Matsane Creche	QNC	1.04	18.57	0.07	6.76
Ngwaname	Molotwadi Primary School	372	0.22	16.37	0.07	3.19
	Kgalema	624	0.22	27.46	0.11	5.35
	Mafefe Central Creche	53	1.04	7.87	0.03	2.87
Ramonwane	Mamongao primary School	223	0.22	9.81	0.04	1.91
	Maphai	31	1.04	4.61	0.02	1.68
	Kwanang Creche	27	1.04	4.01	0.02	1.46
Sub-Total	21	4592		259.46	1.04	64.38
WARD 25						
Mang le mang	Serokolo Senyane	119	0.22	5.24	0.02	1.02
	Morishane	18	1.04	2.67	0.01	0.97
Molapo Matebele	Molapo Matebele Primary School	369	0.22	16.24	0.06	3.17
	Boikhutsong Senior Secondary	230	0.22	10.12	0.04	1.97
	Bapuleng Day Care	59	1.04	8.77	0.04	3.19
Mooiplaas	Mokopu	QNC	1.04	18.57	0.07	6.76
Naauwpoort (A, B, Ext) / (Phalakwane)	Moupo	161	0.22	7.08	0.03	1.38
	Lehlabile Mareme	29	1.04	4.31	0.02	1.57
	Makeme	12	1.04	1.78	0.01	0.65
Serobaneng	Serobaneng	330	0.22	14.52	0.06	2.83
	Serogole Day Care	54	1.04	8.02	0.03	2.92
Sub-Total	11	1506		97.32	0.39	26.43
Total	161	46625		2581.78	10.33	630.77

Many of the schools and crèches in L-NLM did not complete the questionnaire as requested by the project team. In order to estimate the quantity of waste generated by those schools and crèches, the following estimations are made:

- Avg. number of pupils and teachers at Secondary Schools: 322
- Avg. number of pupils and teachers at Primary School: 333
- Avg. number children and teachers at crèches/pre-schools: 125
- Unit generation for schools: 0.22 kg/person/week
- Unit generation for crèches/pre-schools: 1.04 kg/person/week
- Equivalent mass per volume of waste (kg/m^3): 250.

The Department of Education is the authority responsible for the governance of schools, which includes providing schools with relevant resources and facilities. It is, therefore, the responsibility of this department to ensure that the learning environment does not pose risk to teachers and learners. School committees and communities should also collaborate with L-NLM and various school principals to improve and implement waste management services at schools. The various schools will be responsible for payment of services, if services are provided.

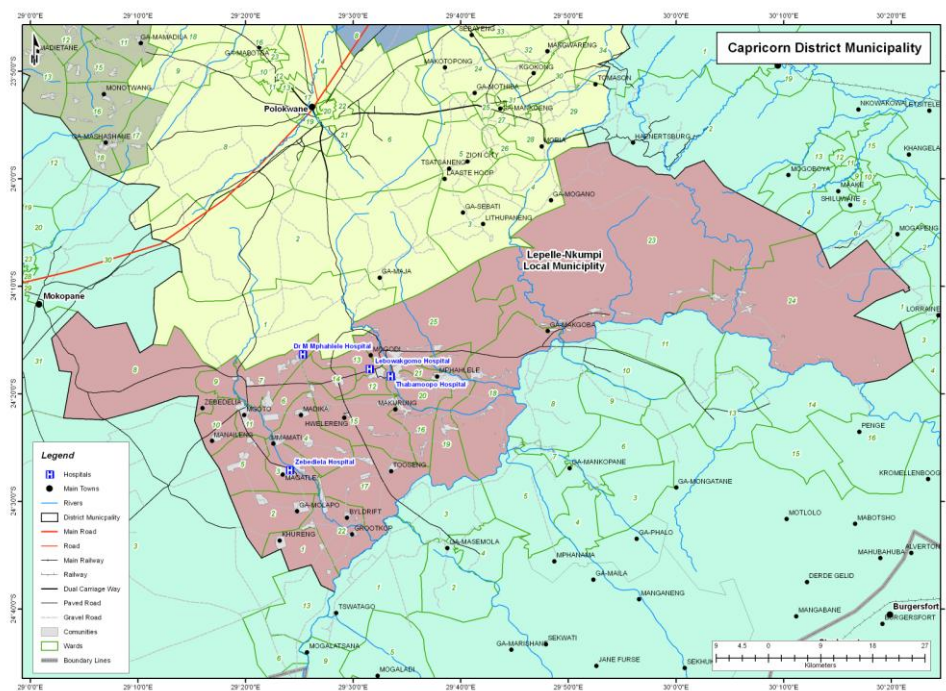
Waste Generator – Hospitals and Clinics

There are eighteen clinics, four hospitals and four private medical or health care practitioners in L-NLM. The various medical or health care waste generators in L-NLM are listed in Table 5. The location of the hospitals and clinics in L-NLM are indicated on Map 4 & Map 5.

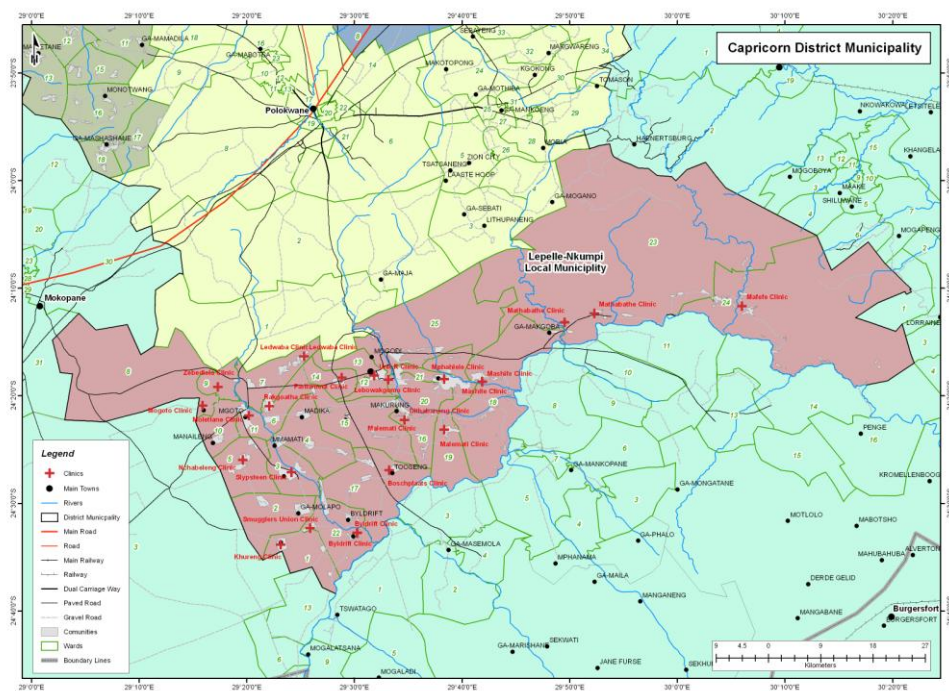
General waste (without medical or health care waste) that is generated at these points comprise mainly of food leftovers, disposable nappies, papers, cardboard boxes, aluminium cans, plastic and glass bottles.

The survey identified the following issues:

- All clinics in L-NLM have waste pits where domestic waste is dumped and burnt.
- These waste pits are not fenced or guarded.
- Nobody accepts responsibility for the waste pits.
- Medical waste is often mixed with domestic waste (food leftovers).
- Leftover food is stored in drums at hospitals and a contractor collects it weekly to feed domestic animals such as dogs and pigs.
- Old bandages, swabs etc. are treated as general waste by the clinics in L-NLM. This is a major concern, as such material can still carry infectious matter.



Map 4 : Hospitals in L-NLM



Map 5 : Clinics in L-NLM

Table 12 indicates guidelines used to estimate the amount of waste generated by hospitals and clinics in L-NLM.

Table 12 : Guidelines for estimating waste generated by hospitals and clinics in L-NLM

Item No.	Number of black bags	Unit Generation (kg/bed/week)
1	3-8 bags per day	91.9
2	8-15 bags per day	180.0
3	15-16 bags per day	207.1
4	30-40 bags per day	397.9

The estimated amount of general waste generated by hospitals and clinics in L-NLM is presented in Table 13. The unit generation rate of 122.5 kg/bed/week used in **Table 13** was derived from survey information in the Status Quo Report.

Table 13 : Estimated amount of waste generated by Hospitals and Clinics in L-NLM

Ward No.	Health Care Centre	Number of beds	Unit Generation (kg/bed/week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
CLINICS						
3	Slypsteen Clinic	QNC	122.5	70.0	0.28	25.48
6	Rakgwatha Clinic	QNC	122.5	70.0	0.28	25.48
7	Ledwaba Clinic	QNC	122.5	70.0	0.28	25.48
7	Groothoek Hospital	336	122.5	5880.0	23.52	2140.32
8	Mogoto Clinic	QNC	122.5	70.0	0.28	25.48
9	Zebediela Clinic	QNC	122.5	70.0	0.28	25.48
11	Moetlane Clinic	QNC	122.5	70.0	0.28	25.48
12	Lebowakgomo Hospital and Clinic	13	122.5	227.5	0.91	82.81
12	Unit R Clinic	7	122.5	122.5	0.49	44.59
13	Parliament Clinic	QNC	122.5	70.0	0.28	25.48
16	Dithabaneng Clinic	QNC	122.5	70.0	0.28	25.48
17	Boschplaats Clinic	QNC	122.5	70.0	0.28	25.48
18	Masite Clinic	QNC	122.5	70.0	0.28	25.48
19	Malemati Clinic	QNC	122.5	70.0	0.28	25.48
19	Mphahlele Clinic	7	122.5	122.5	0.49	44.59
22	Byldrift Clinic	2	122.5	35.0	0.14	12.74
22	Smacklaas Clinic	QNC	122.5	70.0	0.28	25.48
23	Mathabatha Clinic	QNC	122.5	70.0	0.28	25.48
24	Mafefe Clinic	4	122.5	70.0	0.28	25.48
24	Department of Health	QNC	122.5	70.0	0.28	25.48
Total		425		7437.5	29.75	2707.25

Data obtained from hospitals and clinics in L-NLM is not complete, hence the following assumptions have been made:

- Avg. number of beds at clinics: 4
- Avg. number beds at hospitals: 25
- Unit generation in clinics: 122.5 kg/bed/week

- Unit generation in hospitals: 122.5 kg/bed/week
- Equivalent mass per volume of waste (kg/m³): 250.

The Department of Health is the authority responsible for governance of hospitals and clinics, which includes providing hospitals and clinics with relevant resources and facilities. The L-NLM Waste and Environmental Management Division is responsible for making disposal facilities available. Collection of waste can either undertaken by private contractors contracted by the various clinics and hospitals or can be done by the municipality. Irrespective of which party collects the waste, the Department of Health (Clinics and Hospitals) are responsible for payments for provision of such services.

Waste Generator – Police Stations and Prisons

Four police station with holding cells exist within L-NLM. They are situated in wards 3, 7, 9 and 24. Waste that is generated at this points comprise mainly of food leftover, papers, cardboard boxes, aluminium cans, plastic and glass bottles. Table 14 presents the estimated amount of waste generated by police stations and prisons in L-NLM. A unit generation rate similar to household, i.e. 0.412 t/person/annum (1.13 kg/person/day) and average compaction: density of 250 kg/m³ (0.25 t/ m³) is used for determining the waste generated.

Table 14 : Estimated amount of waste generated by Police Stations and Prisons in L-NLM

Ward No.	Police Station	Number of people	Unit Generation (kg/person/day)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
3	Magatle Area Police Station	104	1.13	118	0.47	43
7	Township Police Station	10	1.13	11	0.05	4
9	Zebediela Police Station	46	1.13	52	0.21	19
24	Malipsdrift Police Station	52	1.13	59	0.24	21
Total		212		240	0.96	87

The Department of Safety and Security and the Department of Correctional Services are the authorities responsible for the governance of Police Stations and Prisons, which includes providing police stations and prisons with relevant resources and facilities. The L-NLM Waste and Environmental Management Division is responsible for making disposal facilities available. Collection of waste can either be undertaken by private contractors contracted by the various polices stations and prisons or can be done by the municipality. Irrespective of which party collects the waste, both departments (Safety and Security & Correctional Services) will be responsible for payments for provision of waste collection services, if these are provided.

Waste Generator – Businesses

Businesses in L-NLM comprises of hawkers, grocery shops, bakeries, liquor stores, restaurants, Butcheries, shebeens, taverns, furniture stores, banks, clothing stores, petrol stations, post offices, spare parts dealers, panel beaters, car washers, appliances stores, dry cleaners, hotels, bed and

breakfasts, agriculture, hairdressers, building material stores, mining, tombstones suppliers and scrap yards.

The following guidelines are considered for determining the amount of waste generated by businesses in L-NLM:

- Waste production rate of 6.2 bags/business/week.
- Effective volume of black bag (m³): 0.063.
- Equivalent mass per volume of waste (kg/m³): 150.

The estimated amount of general waste generated by businesses in ALM is presented in Table 15.

Table 15 : Estimated amount of waste generated by businesses in L-NLM

Area Description	Number of business	Avg. no of bags (bags/business/week)	Total no. of bags produced (bags/week)	Volume generated per week (m ³ /week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
WARD 1							
Klipheuwel	N/A						
Kwaripe/ Kwaripe Ext	N/A						
Sub-Total	0		0	0	0	0	0
WARD 2							
Droogte	N/A						
Ga-Molapo	N/A						
Khureng	N/A						
Sub-Total	0		0	0	0	0	0
WARD 3							
Madisa Di Toro	24	6.2	148.8	9.37	201	1.34	73.12
Madisaleole	N/A						
Magatle	23	6.2	142.6	8.98	193	1.28	70.07
Mapatjakeng	9	6.2	55.8	3.52	75	0.50	27.42
Sub-Total	56		347.2	21.87	469	3.12	170.61
WARD 4							
Sub-Total							
WARD 5							
Bolahlagomo	38	6.2	235.6	14.84	318	2.12	115.77
Mmamogwase	N/A						
Sekgophokgophong	38	6.2	235.6	14.84	318	2.12	115.77
Sub-Total	76		471.2	29.69	636	4.24	231.55
WARD 6							
Hwelereng	N/A						
Makuswaneng	N/A						
Makweng	16	6.2	99.2	6.25	134	0.89	48.75
Mmakotse	11	6.2	68.2	4.30	92	0.61	33.51
Motantenanya	N/A						
Rakgwatha	5	6.2	31.0	1.95	42	0.28	15.23
Sub-Total	32		198.4	12.50	268	1.79	97.49
WARD 7							
Ledwaba	10	6.2	62.0	3.91	84	0.56	30.47
Matibela	32	6.2	198.4	12.50	268	1.79	97.49
Matibela Low cost	N/A						

Area Description	Number of business	Avg. no of bags (bags/business/week)	Total no. of bags produced (bags/week)	Volume generated per week (m ³ /week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
Matome Village	2	6.2	12.4	0.78	17	0.11	6.09
Sub-Total	44		272.8	17.19	368	2.46	134.05
WARD 8							
Mogoto	67	6.2	415.4	26.17	561	3.74	204.13
Sub-Total	67		415.4	26.17	561	3.74	204.13
WARD 9							
Zebediela Estate	13	6.2	80.6	5.08	109	0.73	39.61
Sub-Total	13		80.6	5.08	109	0.73	39.61
WARD 10							
Rafiri	N/A						
Sub-Total	0		0	0	0	0	0
WARD 11							
Mawaneng (Moletlane & Sekimeng)	11	6.2	68.2	4.30	92	0.61	33.51
Moletlane (Sekimeng & Mawaneng)	17	6.2	105.4	6.64	142	0.95	51.79
Sekimeng (Moletlane & Mawaneng)	1	6.2	6.2	0.39	8	0.06	3.05
Sub-Total	29		179.8	11.33	243	1.62	88.35
WARD 12							
Boomplaas	N/A						
Lebowakgomo	N/A						
Lebowakgomo Business	N/A						
Lebowakgomo Township (Zone B,F)	N/A						
Matemang / Malemang	N/A						
Sub-Total	0		0	0	0	0	0
WARD 13							
MEC Complex	N/A						
Sub-Total	0		0	0	0	0	0
WARD 14							
Sub-Total							
WARD 15							
Lekhuswaneng	N/A						
Morotse	10	6.2	62.0	3.91	84	0.56	30.47
Rooibokbult	N/A						
Thamagane	9	6.2	55.8	3.52	75	0.50	27.42
Sub-Total	19		117.8	7.42	159	1.06	57.89
WARD 16							
Dithabaneng	4	6.2	24.8	1.56	33	0.22	12.19
Kgaphamadi	N/A						
Makurung	N/A						
Malkapane	1	6.2	6.2	0.39	8	0.06	3.05
Maralaleng	2	6.2	12.4	0.78	17	0.11	6.09
Mobokotshwane	N/A						
Seswikaneng (Tjiane)	3	6.2	18.6	1.17	25	0.17	9.14
Sub-Total	10		62.0	3.91	84	0.56	30.47
WARD 17							
Lenting	N/A						

Area Description	Number of business	Avg. no of bags (bags/business/week)	Total no. of bags produced (bags/week)	Volume generated per week (m ³ /week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
Marulaneng	2	6.2	12.4	0.78	17	0.11	6.09
Motsetsereng	N/A						
Rooibokbult	N/A						
Tooseng	1	6.2	6.2	0.39	8	0.06	3.05
Veeplaas	N/A						
Sub-Total	3		18.6	1.17	25	0.17	9.14
WARD 18							
Lehlokwane / Tsoging	1	6.2	6.2	0.39	8	0.06	3.05
Lesetse	6	6.2	37.2	2.34	50	0.33	18.28
Matinkane	1	6.2	6.2	0.39	8	0.06	3.05
Phosiri	N/A						
Rapotela	N/A						
Sampye	N/A						
Sotalale	N/A						
Tswaiing	N/A						
Sub-Total	8		49.6	3.12	67	0.45	24.37
WARD 19							
Lekureng (Ext)	2	6.2	12.4	0.78	17	0.11	6.09
Lekureng / Malemati	9	6.2	55.8	3.52	75	0.50	27.42
Maijane	19	6.2	117.8	7.42	159	1.06	57.89
Mosetamong	N/A						
Patoge	8	6.2	49.6	3.12	67	0.45	24.37
Seleteng	14	6.2	86.8	5.47	117	0.78	42.65
Zaakloof	N/A						
Sub-Total	52		322.4	20.31	435	2.90	158.43
WARD 20							
Masite	N/A						
Sub-Total	0		0	0	0	0	0
WARD 21							
Midlekop	N/A						
Sub-Total	0		0	0	0	0	0
WARD 22							
Byldrift (Ext)	6	6.2	37.2	2.34	50	0.33	18.28
Makgopong	4	6.2	24.8	1.56	33	0.22	12.19
Malatane	1	6.2	6.2	0.39	8	0.06	3.05
Mehlareng	5	6.2	31.0	1.95	42	0.28	15.23
Phaswana	N/A						
Sub-Total	16		99.2	6.25	134	0.89	48.75
WARD 23							
Bodutlulo	N/A						
Ga - Makgoba	10	6.2	62.0	3.91	84	0.56	30.47
Ga – Mathabatha (Lekgwareng)	14	6.2	86.8	5.47	117	0.78	42.65
Grootfontein	6	6.2	37.2	2.34	50	0.33	18.28
Madikeleng	10	6.2	62.0	3.91	84	0.56	30.47
Mahlaokeng	N/A						
Makapeng	N/A						
Maseseleng	N/A						
Mashadi	1	6.2	6.2	0.39	8	0.06	3.05
Success	6	6.2	37.2	2.34	50	0.33	18.28
Sub-Total	47		291.4	18.36	393	2.62	143.19
WARD 24							
Ditabogong	N/A						

Area Description	Number of business	Avg. no of bags (bags/business/week)	Total no. of bags produced (bags/week)	Volume generated per week (m ³ /week)	Waste generated per day (kg/day)	Waste generated per day (m ³ /day)	Waste generated per annum (t/annum)
Dublin / Sealane	4	6.2	24.8	1.56	33	0.22	12.19
Ga - Maila	N/A						
Ga - Mampa	7	6.2	43.4	2.73	59	0.39	21.33
Kappa	11	6.2	68.2	4.30	92	0.61	33.51
Mafeke	N/A						
Magope	6	6.2	37.2	2.34	50	0.33	18.28
Mahlajane	14	6.2	86.8	5.47	117	0.78	42.65
Malakabaneng	N/A						
Manhlane	6	6.2	37.2	2.34	50	0.33	18.28
Mankele	N/A						
Marede	14	6.2	86.8	5.47	117	0.78	42.65
Mataung	N/A						
Matsoong	N/A						
Mosola	N/A						
Motsane	2	6.2	12.4	0.78	17	0.11	6.09
Motsane X1	N/A						
Motsane X2	N/A						
Mphape	N/A						
Ngwaname	6	6.2	37.2	2.34	50	0.33	18.28
Pitsaneng	N/A						
Ramonwane	4	6.2	24.8	1.56	33	0.22	12.19
Sub-Total	74		458.8	28.90	619	4.13	225.45
WARD 25							
Bolatjane	N/A						
Bolopa	N/A						
Hlahla	N/A						
Hwelesaneng	N/A						
Makopeng	N/A						
Mang le mang	3	6.2	18.6	1.17	25	0.17	9.14
Mogodi	N/A						
Molapo	9	6.2	55.8	3.52	75	0.50	27.42
Matebele							
Mooiplaas	10	6.2	62.0	3.91	84	0.56	30.47
Naauwpoort (A, B, Ext) / (Phalakwane)	3	6.2	18.6	1.17	25	0.17	9.14
Serobaneng	8	6.2	49.6	3.12	67	0.45	24.37
Sub-Total	33		204.6	12.89	276	1.84	100.54
Total	579		3589.8	226.16	4846	32.31	1764.03

Table 15 indicates that businesses in ward 5 generate more waste. A total of 226.16 m³/week needs to be disposed.

L-NLM is responsible for providing the waste removal services to all businesses within its jurisdiction, and the respective businesses are responsible for payments for such services.

Waste Generator - Agricultural

The main agricultural waste generators in L-NLM are small-scale rural farmers. The domestic waste generated by this waste generator is included under businesses.

Waste Generator – Heavy/Bulk Industrial Waste

Large quantities of General Waste are produced by industrial and mining activities. These mining companies and industries need to submit regular Environmental Impact Assessment (EIA) reports to the relevant government control departments (e.g. Department of Environment and Tourism, Department of Minerals and Energy, Department of Water Affairs and Forestry). In these reports, the type of waste that is generated, and how is handled and treated has to be addressed. This type of waste generator does not exist in L-NLM.

Summary – Current general waste quantities in L-NLM

The summary of the current estimated waste quantities, in terms of volume, in L-NLM un-serviced areas are presented in Table 16.

Table 16 : Summary of estimated amount of general waste generated in L-NLM

Ward No.	Population	Households (m ³ /day)	Schools & Crèches (m ³ /day)	Hospitals & Clinics (m ³ /day)	Police Stations & Prisons (m ³ /day)	Businesses (m ³ /day)	Total waste generated per day (m ³ /day)	Total waste generated per week (m ³ /week)
1	8172	36.94	N/A	N/A	N/A	N/A	36.94	258.58
2	9828	44.42	N/A	N/A	N/A	N/A	44.42	310.94
3	21074	95.25	0.76	0.28	0.47	3.12	99.88	698.22
4								
5	10997	49.71	0.43	N/A	N/A	4.24	54.38	380.00
6	17392	78.61	0.32	0.28	N/A	1.79	81.00	566.68
7	17743	80.20	0.47	23.80	0.05	2.46	106.98	748.21
8	50400	227.81	0.30	0.28	N/A	3.74	232.13	1624.39
9	8340	37.70	0.13	0.28	0.21	0.73	39.05	273.18
10	12480	56.41	N/A	N/A	N/A	N/A	56.41	394.87
11	15998	72.31	0.57	0.28	N/A	1.62	74.78	522.76
12	15708	71.00	N/A	1.40	N/A	N/A	72.40	506.80
13	123	0.56	N/A	0.28	N/A	N/A	0.84	5.88
14								
15	6129	27.70	0.37	N/A	N/A	1.06	29.13	203.40
16	26253	118.66	0.79	0.28	N/A	0.56	120.29	840.64
17	25766	116.46	0.50	0.28	N/A	0.17	117.41	821.16
18	9062	40.96	0.22	0.28	N/A	0.45	41.91	293.02
19	13197	59.65	1.67	0.77	N/A	2.90	64.99	452.17
20	1215	5.49	N/A	N/A	N/A	N/A	5.49	38.43
21	3021	13.65	N/A	N/A	N/A	N/A	13.65	95.55
22	13213	59.72	1.45	0.42	N/A	0.89	62.48	435.63
23	17331	78.34	0.92	0.28	N/A	2.62	82.16	573.74
24	19601	88.60	1.04	0.56	0.24	4.13	94.57	660.55
25	30757	139.02	0.39	N/A	N/A	1.84	141.25	988.32
Total	353800	1599.18	10.33	29.75	0.96	32.31	1672.54	11693.13

Table 16 indicates that some 11693.13 m³/week of waste in L-NLM needs to be stored, collected and transported to landfill sites. More waste is generated in ward 8. Except for the waste removal services that exist in Lebowaqomo, which are extremely basic, no waste removal services exist in L-NLM. Various alternatives for implementing waste storage, collection and transportation services in L-NLM are detailed in **Section 4** of this document.

Hazardous Waste

Hazardous waste is waste, which can, even in low concentration, have a significant adverse effect on public health and/or the environment. This would be because of its inherent chemical and physical characteristics, such as toxic, ignitable, corrosive, carcinogenic or other properties.

Potential hazardous waste generators, other than medical and health care waste, in L-NLM, include petrol stations, mechanics, engine repairs, exhaust repairs, agricultural suppliers, electrical suppliers, alternators, wiring, dry cleaners, panel beaters and mines.

These potential hazardous waste generators are not concentrated on a specific area, but are spread around L-NLM. There are no fixed guidelines that can be used to determine the amount and type of Hazardous Waste being produced by any specific industry. The total hazardous waste generated in the Limpopo Province, as determined as part of the DWAF baseline study, is given in the Status Quo Report. From this information, it can be seen that hazardous waste generation rates in the province are very low (5 813.5 m³/annum in 2001). Hazardous waste should therefore be managed on a more regional or provincial level, as it would not be economically viable to manage it on a local level.

3.2.15.2.2 Future waste quantities

Formatted: Bullets and Numbering

To estimate future waste generation rate to be disposed of, the estimated current waste generation rate (i.e. Initial Rate of Disposal (IRD)) is determined, and it is escalated based on the projected population increase and increase in wealth growth rate. The estimated future waste generation rate is called Maximum Rate of Disposal (MRD). The MRD is determined as follows:

$$MRD = (IRD)(1+D)^t$$

Where:

IRD = Initial rate of disposal determined from current waste quantities;

D = expected annual growth in waste generation;

t = Time, in years, since deposition started at a rate IRD.

The current estimated waste quantities in L-NLM, in terms of mass, are summarised in Table 17 below.

Table 17 : Summary of current estimated amount of general waste generated in L-NLM

Ward No.	Population	Households (t/day)	Schools & Crèches (t/day)	Hospitals & Clinics (t/day)	Police Stations & Prisons (t/day)	Businesses (t/day)	Total waste generated per day (t/day)
1	8172	9.23					9.23
2	9828	11.11					11.11
3	21074	23.81	0.19		0.12	0.47	24.59
4				0.07			0.07

Ward No.	Population	Households (t/day)	Schools & Crèches (t/day)	Hospitals & Clinics (t/day)	Police Stations & Prisons (t/day)	Businesses (t/day)	Total waste generated per day (t/day)
5	10997	12.43	0.11			0.64	13.17
6	17392	19.65	0.08			0.27	20.00
7	17743	20.05	0.12	0.07	0.01	0.37	20.62
8	50400	56.95	0.08	5.95		0.56	63.54
9	8340	9.42	0.03	0.07	0.05	0.11	9.69
10	12480	14.10		0.07			14.17
11	15998	18.08	0.14			0.24	18.46
12	15708	17.75		0.07			17.82
13	123	0.14		0.35			0.49
14	0			0.07			0.07
15	6129	6.93	0.09			0.16	7.18
16	26253	29.67	0.20			0.08	29.95
17	25766	29.12	0.12	0.07		0.03	29.33
18	9062	10.24	0.05	0.07		0.07	10.43
19	13197	14.91	0.42	0.07		0.44	15.83
20	1215	1.37		0.19			1.57
21	3021	3.41					3.41
22	13213	14.93	0.36			0.13	15.43
23	17331	19.58	0.23	0.11		0.39	20.31
24	19601	22.15	0.26	0.07	0.06	0.62	23.16
25	30757	34.76	0.10	0.14		0.28	35.27
Total	353800	399.79	2.58	7.44	0.24	4.85	414.90

In order to identify future potential waste generators, planned projects within L-NLM were identified. These could either be potential waste generators during the development phase of the project and/or during the operating phase of the project. Projects that are planned for Lepelle Nkumpi, as identified from the DFEAT EIA register, are the following:

Dams and Weirs

- Olifant Sand River transfer scheme.

This project will result in waste generation during construction phase, but may also result in long term waste generation as a result of people relocating to areas where water is easily accessible.

Bulk Water Supply

- Semaneng bulk water
- New Messina Mine bulk water
- Chuene Maja bulk water
- Mathabatha water supply
- Lekurung bulk water
- Mafefe water supply
- Zebediela bulk water

- Sealane bulk water
- Bolatjane bulk water
- Krantzplaats water supply
- Motsane bulk water supply

These projects will result in waste generation during construction phase, but may also result in long-term waste generation as a result of people relocating to areas where water is easily accessible.

Sewerage

- Lebowakgomo waste treatment works

This project will result in waste generation during construction stage and during operating phase.

Roads

- Upgrading of rural roads- Seleteng cluster
- Construction of Matime bridge across the Hlakaro river on the road D4068- Seleteng

These projects will result in waste generation during construction phase, but may also result in long-term waste generation as a result of increased traffic (i.e. litter along road created by motorists).

Canals

- Bulk water supply pipelines- Sand Olifants scheme
- Mahlatjane water project
- Mphahlele Phase II bulk water- Lebowakgomo

These projects will result in waste generation during construction phase, but may also result in long-term waste generation as a result of people relocating to areas where water is easily accessible.

Resorts

- Mafefe camp
- Lebowakgomo Hotel, Kiel 116KS
- Basadi ba Bapedi Cultural Centre- Chuenespoort
- Traditional Tourism Centre- Mafefe

This project will result in waste generation during construction and after construction phase. The project will create employment, which will result in generation of disposal income for the local

communities. L-NLM will also be required to provide waste management services and this will result in extra service points and revenue for L-NLM.

Township Development

- Housing development at Grootshoek
- Conversion of reserved sites for business
- Lebowakgomo Unit P
- Proposed development of taxi rank at Moletlane
- Proposed development of taxi rank at Ga-Mphahlele
- Community hall- Dithabaneng
- Taxi rank construction- Lebowakgomo

This project will result in waste generation during construction and after construction phase. The project will create employment, which will result in generation of disposal income for the local communities. L-NLM will also be required to provide waste management services and this will result in extra service points and revenue collection in L-NLM.

Population growth rates per ward, as determined based on the census data are shown in Table 18:

Table 18 : Estimated population growth rates in L-NLM

Ward No.	Estimated Population (survey 2004)	Population growth (%) (Extrapolation from 1996 % 2001 census)
1	8172	2.4
2	9828	-0.4
3	21074	0.2
4		2.2
5	10997	0.1
6	17392	1.6
7	17743	4.1
8	50400	-3.6
9	8340	6.1
10	12480	3.5
11	15998	2.3
12	15708	-6.9
13	123	-
14	0	-
15	6129	-
16	26253	-
17	25766	-
18	9062	-
19	13197	-
20	1215	-
21	3021	-
22	13213	-
23	17331	-
24	19601	-
25	30757	-
Total	353800	

Note: Population growth for wards 13 to 25 are not indicated in the status quo report, hence an average growth rate of 0.96 % is used.

The population growth rates vary considerably across the municipality, from -6.9 % in Ward 12 to +6.1% in Ward 9, with an overall growth rate of 1.1 %. Wards 2, 8, and 12 indicate a negative population growth rates. This is attributed to the increased death rates caused by HIV/AIDS, and migration from rural to more urbanised areas.

Considering the medium to long-term planning for solid waste management, the main point of concern is whether to plan for growing or declining population. Table 19 presents the estimated future waste disposal quantities for L-NLM taking the expected population and wealth growth. The projection assumes a 10-year life cycle.

Table 19 : Estimated future waste quantities in L-NLM

Ward No.	IRD (t/day)	IRD (m ³ /day)	D (%)	MRD (t/day)	MRD (m ³ /day)
1	9.23	36.94	2.4	11.70	46.82
2	11.11	44.42	-0.4	10.67	42.67
3	24.59	99.88	0.2	25.10	101.90
4	-	-	2.2	-	-
5	13.17	54.38	0.1	13.30	54.93
6	20.00	81.00	1.6	23.44	94.93
7	20.62	106.98	4.1	30.82	159.89
8	63.54	232.13	-3.6	44.04	160.88
9	9.69	39.05	6.1	17.52	70.60
10	14.17	56.41	3.5	19.99	79.57
11	18.46	74.78	2.3	23.17	93.87
12	17.82	72.40	-6.9	8.72	35.42
13	0.49	0.84	0.9	0.54	0.92
14			0.9	-	-
15	7.18	29.13	0.9	7.85	31.86
16	29.95	120.29	0.9	32.76	131.57
17	29.33	117.41	0.9	32.08	128.42
18	10.43	41.91	0.9	11.41	45.84
19	15.83	64.99	0.9	17.31	71.08
20	1.57	5.49	0.9	1.72	6.00
21	3.41	13.65	0.9	3.73	14.93
22	15.43	62.48	0.9	16.88	68.34
23	20.31	82.16	0.9	22.21	89.86
24	23.16	94.57	0.9	25.33	103.43
25	35.27	141.25	0.9	38.58	154.49
Total	414.90	1672.54		438.87	1788.22

Note: There are gaps in information provide for ward 13. Table 19 indicates that, ward 8 generates more waste as compared to other wards. The Minimum Requirements size classifications based on the MRD is presented in Table 20.

Table 20 : Minimum Requirements Landfill size classes

Landfill Size class	Maximum Rate of Deposition (MRD) (t/day)
Communal (C)	< 25
Small (S)	> 25 < 150
Medium (M)	> 150 < 500
Large (L)	> 500

Table 19 results indicate a MRD of 438.87 t/day for L-NLM, which falls in a **Medium** size class. Currently L-NLM is serviced by two un-permitted GSB landfill sites situated in Lebowakgomo, which is located in ward 13.

3.2.25.2.3 Refuse disposal and landfill operations

Formatted: Bullets and Numbering

The settlement pattern in L-NLM is spread and scattered and more waste is anticipated to be generated in wards 7, 8, 16, 17 and 25 in future. ALM is approximately 8748 km²/874 800 Ha. It is evident from the MRD determination that, in order for L-NLM to dispose of their waste in an acceptable manner, a Medium size disposal site is required. Due to the geographical spread of the area, transfer stations OR multiple low size class landfill site will be required. Transfer station serves the following purpose, and typical transfer stations are shown in the photos below.

- Provide temporary storage of waste after collection from services points and before transporting to disposal sites.
- Reduces the need for development of multiple low size class disposal sites, as a result alleviating the need for management and operation of multiple disposal sites.
- Reduces/Minimise the costs for management and operation of multiple disposal sites.
- Promotes the involvement of PPP/SMME in management of waste services.
- Promotes the involvement of PPP/SMME in management of waste services.
- Promotes the philosophy of regional disposal landfill sites.
- Provides facilities/platform for initiating recycling.
- Reduces the distance between service points and the disposal site.



Typical Transfer Station: Enclosed floor system

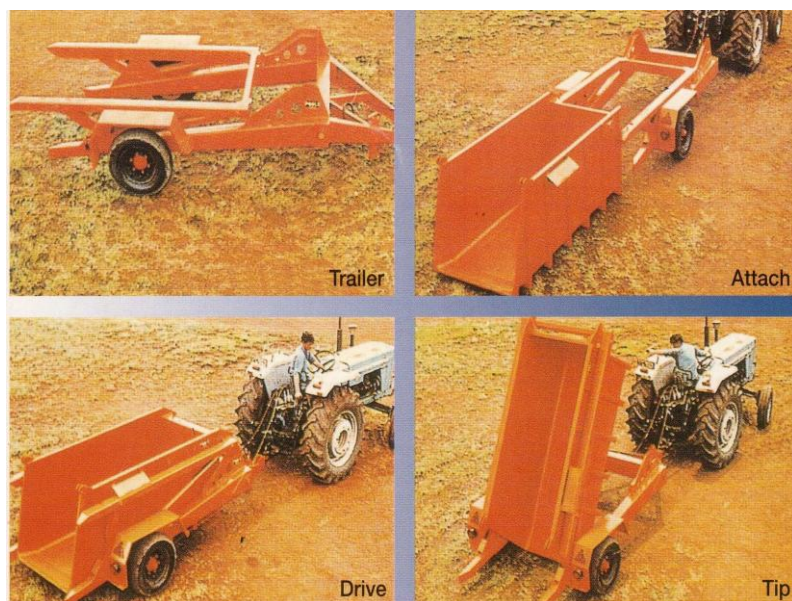


Typical Transfer Station: Open floor system

Mobile options



Typical Transfer Station: Mobile system



Typical Transfer Station: Mobile system

Due to the geographical spread of the municipality, it is proposed that waste generation clusters/zones be developed as indicated in Table 21 and Map 6.

Table 21 : Composite structure for L-NLM waste generation Clusters/Zones

Ward No.	2004 Population	IRD (t/day)	MRD (m ³ /day)	MRD (t/day)
Cluster 1				
23	17331	20.31	89.86	22.21
24	19601	23.16	103.43	25.33
Total	36932	43.47	193.29	47.54
Cluster 2				
4	-	-	-	-
6	17392	20.00	94.93	23.44
12	15708	17.82	35.42	8.72
13	123	0.49	0.92	0.54
14	-	-	-	-
15	6129	7.18	31.86	7.85
16	26253	29.95	131.57	32.76
17	25766	29.33	128.42	32.08
18	9062	10.43	45.84	11.41
19	13197	15.83	71.08	17.31
20	1215	1.57	6.00	1.72
21	3021	3.41	14.93	3.73
25	30757	35.27	154.49	38.58

Ward No.	2004 Population	IRD (t/day)	MRD (m ³ /day)	MRD (t/day)
Total	148623	171.28	715.46	178.14
Cluster 3				
1	8172	9.23	46.82	11.70
2	9828	11.11	42.67	10.67
5	10997	13.17	54.93	13.30
22	13213	15.43	68.34	16.88
Total	42210	48.94	212.76	52.55
Cluster 4				
7	17743	20.62	159.89	30.82
8	50400	63.54	160.88	44.04
9	8340	9.69	70.60	17.52
10	12480	14.17	79.57	19.99
11	15998	18.46	93.87	23.17
Total	104961	126.48	564.81	135.54

For L-NLM to provide a cost effective and acceptable waste management services to its community the following are proposed:

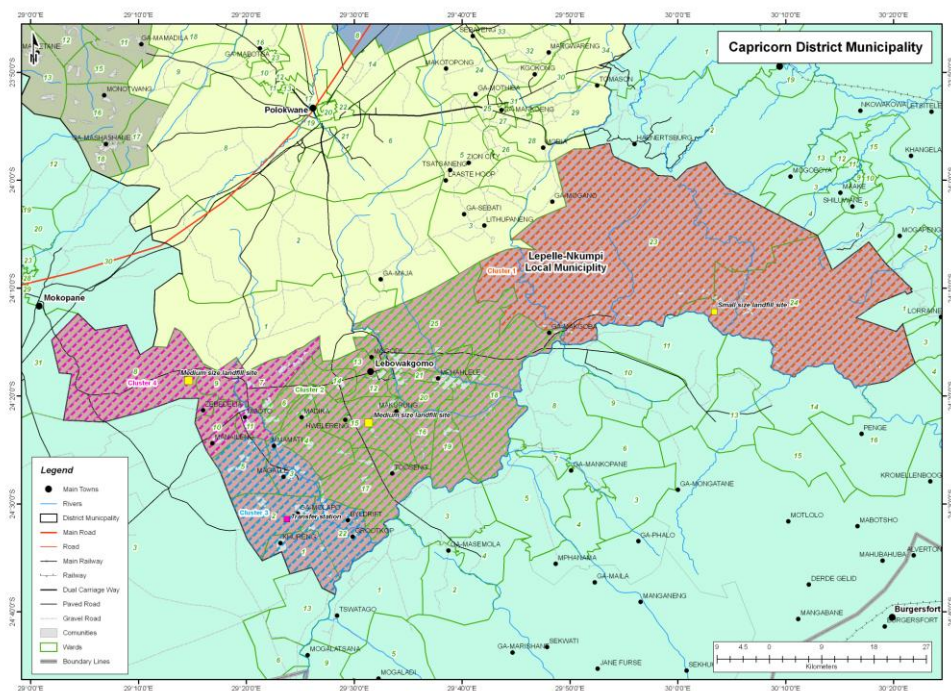
- Permitting and development of a Small (S) size landfill site to service Cluster 1. (Map 7 indicates the possible location of the site.)
- Permitting and development of Medium (M) size landfill sites in clusters/zones 2 and 4 (Map 7 indicates the possible location of the site.)
- Permitting and development of transfer station in cluster/zone 3 (Map 7 indicates the possible location of the site.)

The possible landfill sites locations are centric of each cluster/zone with a radius of approximately ± 20 km from each ward or transfer station. Table 22 presents the Minimum Requirements for permitting a Medium and Small size landfill sites.

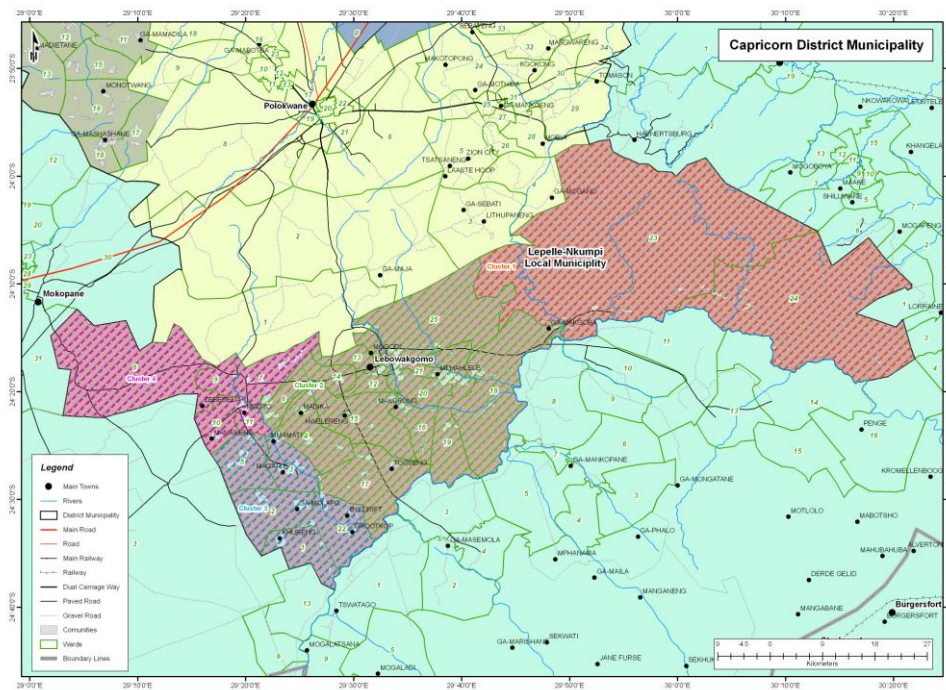
Table 22 : Minimum Requirements for Permitting Small and Medium Landfill Sites

Item No.	Minimum Requirements	Requirements (R – Required: N – Not Required: F - Flag)	
		Small	Medium
1	Permit all unpermitted and concept permitted landfills	R	R
2	Consult and apply figures 1,2, & 8 in MR	R	R
3	Appoint Responsible Person	R	R
4	Confirm site classification	R	R
5	Landfill Permit	R	R
6	Deal with Department's Regional office	R	R
7	Deal with Department's Head Office	N/F	F
8	Permit Application form	R	R
9	Site demarcated on a map	R	R
10	Site visit by state departments	F	R
11	Full Permit application Report	R	R
12	Feasibility Study Report	R	R
13	Geohydrological Report	R	R
14	Geological Report	R	R
15	Environmental Impact Assessment	F/R	R

Item No.	Minimum Requirements	Requirements	
		(R – Required; N – Not Required; F - Flag)	
16	Landfill concept design	R	R
17	Landfill technical design	R/F	R
18	Approval of design by the department	R/F	
19	Development plan	R	R
20	Operational and Maintenance Plan	R	R
21	Closure/Rehabilitation Plan	R	R
22	End-use plan	R	R
23	Water quality monitoring plan	F/R	R
24	Amend title deed to prevent building development on closed landfill	R	R
25	Report change in operation infrastructure	R	R
26	Report change of ownership	R	R
27	Site inspection prior to commissioning	N/R	R



Map 6 : Clusters/Zones



Map 7 : Waste management facilities

5.2.4 Refuse storage, collection and transportation

Storage

All forms of Municipal Solid Waste and Hazardous waste needs to be stored between the time of generation and when it is collected for transportation to be treated. The type of storage system used depends on the type of waste generated as well as the frequency of collection. Various types of storage containers are available for domestic waste and are all used by different Municipalities in South Africa as depicted below.



85 litre steel/rubberized bins and 60 litre plastic bags

Households mainly use the 85 litre steel/rubberized bins and 60 litre plastic bags



240 Litre mobile containers

The 240 litre mobile containers are used mainly for commercial waste.



3.5 m³ – 11 m³ skips

Skips are used mainly for garden cuttings and industrial waste



Recycling containers



Other Mobile containers

Table 23 presents the advantages and disadvantages for the various systems.

Table 23 : Advantages and disadvantages for various waste storage systems

Advantages	Disadvantages
85 Litre steel/rubberised bins	
Hard durable material	Tend to rust
Clean system with little resulting litter	Need to return the containers to each household thereby slowing the collection system
Good for ash i.e. does not melt	Separate lid is a problem when handling
Controlled volume of waste collected	Small capacity
60 Litre plastic bags	
Cheapest system	Break easily when containing high moisture content waste
Can be collected on the run as the container does not need to be returned	No control over amount of bags being placed on kerbside
Can limit volume of waste through number of bags collected	Dogs and scavengers tend to break bags placed on kerbside
240 litre mobile containers	
No spillage/low maintenance	Costly to implement
Are rolled from kerb to collection vehicle	Collection is slowed by need to return container
Mechanical lifters fitted to vehicles lift and empty containers	Mechanical lifters are costly and high maintenance
Volume controlled by size of container	Encourages generators to fill containers with garden cuttings, rubble etc
3.5 m³ – 11 m³ skips	
Volume controlled by size of container	Requires a truck fitted with a special lifting device
Hard durable material	Tend to rust
Ideal for use at transfer stations	Costly to implement

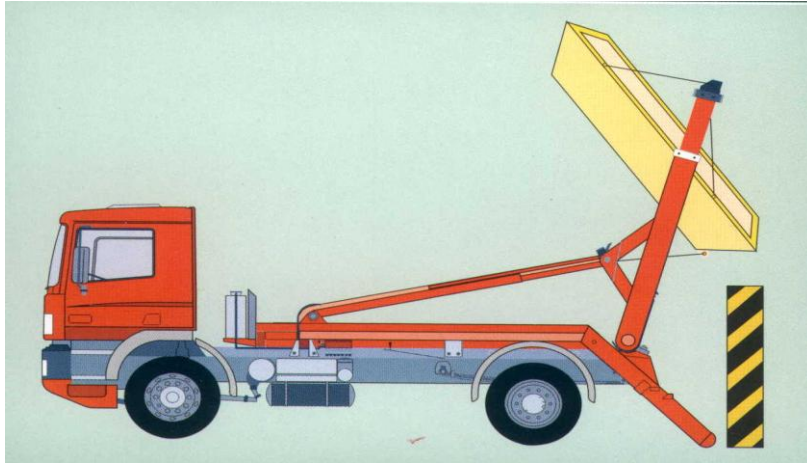
L-NLM comprise mainly of Peri-Urban dwelling units. Waste generated is disposed off in ‘own dump’ or burnt. In order to minimize/prevent the continuation of this habit, L-NLM should provide storage facilities to these communities. Awareness creation and training to this regards is vital to ensure sustainability of the system. Most of the households in L-NLM areas have little or no income, and may not be able to pay for services rendered. Therefore, the storage facilities to be provided should be of such nature that little or no payments would be expected from the communities.

Collection and Transportation

Collection and transportation costs make up 60 – 80 % of the cost of waste disposal. There are different types of vehicle used for waste transportation. They are:



Non-compacting vehicle



Container handling equipments



Compacting Vehicles



Gravity Compactor



Compacting Vehicle



Various informal transport systems

Container handling equipments

Table 24 presents the advantages and disadvantages for the various systems.

Table 24 : Advantages and disadvantages for various waste collection and transportation systems

Advantages	Disadvantages
Non compacting vehicles	
Low capital outlay (purchase price)	Nominal or no compaction
Low maintenance cost	Transport distance to landfill / transfer station should not be more than 10 – 12 km (therefore more transfer facilities required)
Create job opportunities	Low top speed
Easy maintenance	Minimal carrying capacity
Easy operation	
Quiet operation	
Can access inaccessible areas	
Container handling equipments	
Suitable for use where transfer station are available	The initial capital cost of vehicle and containers is high
Ideal for storage of light industrial waste, garden refuse and builders rubble	The size of the vehicle does not allow for manoeuvrability in tight road networks
Compacting vehicle	
Provides compaction of waste – nett mass	High capital cost
Faster than Tractor and Trailer system	High operating cost
Capacity of loading area	Mass distribution during operation

In order to implement collection and transportation services in L-NLM, a combination of different systems is required. Cost comparison of combined possible/potential systems to be implemented are outlined in section 4 of this document. The type of collection and transportation system used for each waste type must be reviewed on a regular basis. Any new system must, however, be thoroughly investigated and modelled before being implemented. Figure 7 presents aspects, which influence the waste collection and transportation capacity calculations.

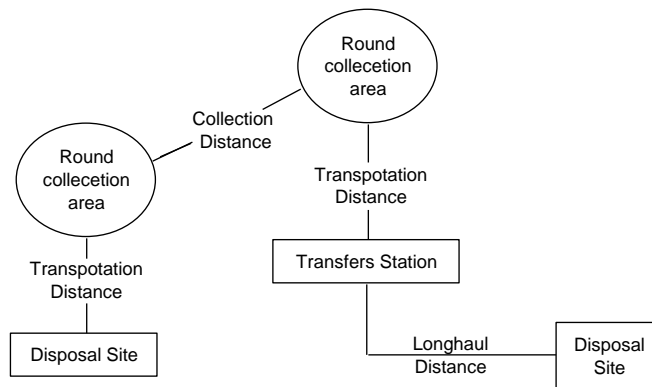


Figure 7 : Waste collection and Transportation capacity calculation model

Due to the high cost of waste collection vehicles it is important to optimise the system and strive for maximum capacity loads when round collections are completed. The need for road/rail transfer/drop off zones depends on:

- The distance from the collection area to the disposal site. The high operating cost of specialist collection vehicles and associated staff make them uneconomical over long distances.
- The type of collection system used. Tractor and trailer cannot travel at high speed on the open road.
- The waste composition and density.
- Volume of waste collected in the area.

The possible round collection areas, collection distances, transportation distances, waste volumes and long haul distances for each Cluster in L-NLM are presented in Table 25.

Table 25 : Waste collection and transportation routes

Round collection area	Waste Volume (m ³ /week)	Collection distance (km)	Transportation distance (Disposal site)	Transportation distance (Transfer station)	Long haul distance (Km)
Cluster 1					
Cluster 2					
Cluster 3					
Cluster 4					

Note: Collection routes to be identified ones the preferred waste management service is chosen.

Waste collection routes within L-NLM are presented in Map 8.

The System Analysis investigated different waste types collected and transported by the public waste services in the DMA. Their composition as well as the type of vehicles used for collection and transportation differentiates the waste types. Typical system which may be implemented in L-NLM un-serviced areas are listed below:

Waste Type: Domestic Formal Low Income Residential - DFLI

DFLI, is waste generated in low-density residential area by residents in the low-income group. The typical vehicle used, is an open bodied truck or tractor-trailer system. The waste is collected and transported un-compacted to the nearest transfer station or disposal site. Due to the inefficient load and slow travelling speed of these vehicles, their long-haul distance is limited to 7 –km.

Waste Type: Domestic Informal Dwelling Bags – DI Bags

DI Bags, is waste generated in informal dwelling areas. In areas where a service is provided, waste is collected in plastic refuse bags on a weekly basis or 5.5 m³ skips are used. As with the DFLI waste, the typical vehicle used are open bodied trucks or tractor-trailer systems. The waste is collected and transported un-compacted to the nearest transfer station or disposal site. Due to the inefficient load and slow travelling speed of these vehicles, their long-haul distance is limited to 7 –km.

Waste Type: Domestic Informal Dwelling Skips – DI Skips

DI Skip, is waste generated in informal dwelling areas. In areas where historically little to any formal waste collection service was provided, 5.5 m³ skips are placed at predetermined locations. Waste is then collected the local residents or by contracted individuals and transported by hand to the skip. The skips are then emptied using an industrial 20 m³ REL when required. This system needs to be upgraded as and when cost recovery in an area can be implemented successfully.

Map 8 : Waste collection routes within L-NLM

Waste Type: Commercial 240 litre Mobile Containers – Com. 240 l

Com. 240 l, is waste generated at commercial developments for example, shops, restaurants and offices. Commercial waste is generated in medium to high-density developments in and around the city centres. Commercial waste is collected from a daily to weekly basis. The most common storage medium for commercial waste is 240 litre mobile containers but certain areas use plastic refuse bags. 10 m³ to 20 m³ Rotopress and REL compaction vehicles are used to collect this waste.

Most of the commercial developments in L-NLM are low-density developments in and around rural towns.

Waste Type: Industrial Skip – Ind Skip

Ind Skips, is waste generated within industrial areas. The skips are placed at the waste generator's site on a contract basis. The individual contracts determine the collection frequency. Due to the composition and density of the waste, this waste needs to be collected and transported directly to the disposal sites using a Load Luger or Telehoist equipped vehicle.

Waste Type: Industrial 5.5 m³ Skip – Ind 5.5 m³

Ind. 5.5 m³ is also waste generated within industrial areas. The 5.5 m³ skips are placed on a contract basis at the waste generators site. The skips are emptied when required using an industrial 20 m³ REL with overhead winch. This is the most economical method of collecting and transporting light industrial waste. If, however, the density and composition of the waste does not lend itself to compaction, then a Telehoist system is required.

3.35.3 Employment creation, public information and awareness creation**Formatted: Bullets and Numbering**

The level of literacy within L-NLM is low and results in limited or no knowledge regarding waste and environmental issues. This also results in high level of unemployment. It is therefore important for L-NLM to implement waste management services, since provision of such services does not require a labour force with a high level of skill and training. Employment opportunities as a result of such services will also help with the creation of awareness relating to waste and environmental issues as well as enabling communities to pay for waste services rendered. The following can also stimulate economic growth and employment creation in L-NLM.

- Waste management, prevention and minimisation strategies.
- Establishment of Municipal Services Partnerships (MSPs).
- Establishment of Public Private Partnerships (PPP).

Various methods can be employed to make people aware and to disseminate information to them. Before a public information and awareness creation process begins, residents who will be the customers or end-users of the waste management system need to be consulted in terms of their views

on waste management, their waste behaviour patterns and attitude towards the necessity of waste removal. These views will provide the municipality and project team with valuable information on the existing knowledge, attitudes and practices in terms of waste disposal in communities. This has been achieved by conducting a survey of the communities in L-NLM. The outcome of this survey is detailed in the Status Quo Report. Public information and awareness creation can be achieved through the following methods:

- Posters.
- Pamphlets, flyers, leaflets, brochures (comic-style booklets).
- Group meetings where people are practically introduced to certain concepts.
- Visits to specific places of interest such as a waste disposal site to show people what disposal is all about.
- Radio advertisements.

3.3-15.3.1 Waste Management, minimisation and prevention strategy

Formatted: Bullets and Numbering

The following may be initiated within L-NLM.

- Local entrepreneurs can be encouraged to start recycling and composting projects.
- As part of the L-NLM cleansing services, local communities/ or local entrepreneurs can be mobilised to pick up litter as well as clear illegal dumping.
- Establishment of community environmental forum or committee.
- Environmental training workshop.
- Community consultation.

3.3-25.3.2 Establishment of Municipal Services Partnerships (MSPs)

Formatted: Bullets and Numbering

The following can be initiated within L-NLM.

- The waste collection and transportation services may be sub-contracted to local entrepreneurs

Literature review as well as industry examples indicate that waste management services becomes a success in most instances if the following key principles are promoted:

- A community takes “ownership” of the system.
- Community based contracting.
- Community based contractors – contracted directly to Local Municipality.

3.3.35.3.3 Establishment of Public Private Partnerships (PPP)

Formatted: Bullets and Numbering

The following can be initiated within L-NLM.

- Where long waste transportation distances are encountered, drop off/transfer stations need to be implemented, and the management and operations of such facilities be sub-contracted to local contractors/entrepreneurs.

46 FINANCIAL REQUIREMENTS

Formatted: Bullets and Numbering

Financial requirements for L-NLM have been divided in three main components, namely:

- Human Resources
- Capital expenditure and
- Operating costs (Fixed and running cost plus general expenses) and
- General expenses

Few scenarios are considered for calculating estimated collection, transfer and transportation costs within L-NLM and are:

- Using tractor tailor for waste collection (door – to –door)
- Using compaction vehicles for waste collection and transportation
- Using mobile transfer stations
- Using non compacting vehicle for collection and transportation of waste
- Appointment of MSPs for waste collection and transportation
- Appointment of PPPs for landfill and transfer sites operations

Estimate cost comparisons for these scenarios are given below and detailed cost estimations are included in **Appendix D**.

4.16.1 Cost Comparison

Formatted: Bullets and Numbering

4.1.16.1.1 Scenario 1

L-NLM takes full responsibility and control of the waste management services (i.e. operations of landfill sites and transfer stations, collection and transportation of waste). The following are required:

- Permitting and closing/continue operations of Lebowaqomo A and B Waste Disposal Sites
- Permitting and development of a transfer station in cluster 3
- Permitting and development of a Medium size landfill site in cluster 2 and 4.

- Permitting and development of Small size landfill site in cluster 1.
- Purchasing of 3 x tractor trailer for use in cluster 1 and 3
- Purchasing of 5 x gravity compactors for use in cluster 2 and 4.
- Appointment plant maintenance personnel
- Appointment of 4 x pay point operators
- Appointment of operators and supporting staff
- Appointment of waste site and transfer station operators
- Purchasing of medical waste collection and transportation
- Supply of 85 litre storage bins to households
- Supply of 240 mobile bins to business
- Supply of 240 litre bins to schools and crèches
- Supply 240 mobile bins to Hospitals, clinics, Police Stations and Administration offices

Table 26 reflects a cost estimate for Scenario 1

Table 26 : Scenario 1 cost estimation

Description	Cost/month	Cost/annum	Cost/service point
Human Resources	R 336000.00	R 4 032 000.00	-
Capital Expenditure	-	R 53 090 000.00	-
Operational Costs	R 1 701 000.00	R 20 412 000.00	-
Total	R 2 037 000.00	R 77 534 000.00	R 23.92 – R 75.88

4.1.26.1.2 Scenario 2

L-NLM takes partial responsibility and control of the waste management services (i.e. operations of landfill sites and transfer stations) and the collection and transportation of waste services sub-contacted to MSPs with assistance by waste and environmental consultant. The following are required:

- Permitting and closing/continue operations of Lebowaqomo A and B Waste Disposal Sites
- Permitting and development of a transfer station in cluster 3
- Permitting and development of a Medium size landfill site in cluster 2 and 4.
- Permitting and development of Small size landfill site in cluster 1.
- Appointment of 4 x pay point operators
- Appointment of waste site and transfer station operators
- Outsourcing of waste collection and transportation to MSP's

Formatted: Bullets and Numbering

- Outsourcing of medical waste collection and transportation to MSP's
- Supply of 85 litre storage bins to households
- Supply of 240 mobile bins to business
- Supply of 240 litre bins to schools and crèches
- Supply 240 mobile bins to Hospitals, clinics, Police Stations and Administration offices

Table 27 gives a cost estimate for Scenario 2

Table 27 : Scenario 2 cost estimation

Description	Cost/month	Cost/annum	Cost/service point
Human Resources	R 281 840.00	R 3 382 080.00	-
Capital Expenditure	-	R 51 140 000.00	-
Operational Costs	R 1 660 000.00	R 19 920 000.00	-
Total	R 1 941 840.00	R 74 442 080.00	R 22.81 – R 72.85

4.4.36.1.3 Scenario 3

Formatted: Bullets and Numbering

L-NLM outsources the waste management services required to MSPs and PPPs (i.e. operations of landfill sites and transfer stations by PPPs and collection and transportation of waste by MSPs). L-NLM ensures revenue collection and facilitates training for MSPs and PPPs. The following are required:

- Permitting and closing/continue operations of Lebowakgomo A and B Waste Disposal Sites
- Permitting and development of a transfer station in cluster 3
- Permitting and development of a Medium size landfill site in cluster 2 and 4.
- Permitting and development of Small size landfill site in cluster 1.
- Appointment of 4 x pay point operators
- Outsourcing the management and operation of transfer stations and disposal sites
- Outsourcing of waste collection and transportation to MSP's
- Outsourcing of medical waste collection and transportation to MSP's
- Supply of 85 litre storage bins to households
- Supply of 240 mobile bins to business
- Supply of 240 litre bins to schools and crèches
- Supply 240 mobile bins to Hospitals, clinics, Police Stations and Administration offices

Table 28 reflects cost estimates for Scenario 3.

Table 28 : Scenario 3 cost estimation

Description	Cost/month	Cost/annum	Cost/service point
Human Resources	R 77 520.00	R 930 240.00	-
Capital Expenditure	-	R 51 140 000.00	-
Operational Costs	R 1 960 000.00	R 23 520 000.00	-
Total	R 2 037 520.00	R 75 590 240.00	R 23.93 – 73.98

4.26.2 Summary of cost comparison

Formatted: Bullets and Numbering

Table 29 presents the summary of cost estimation of the above scenarios, and possible advantages and disadvantages are listed in Table 30.

Table 29 : Summary of cost estimation

Scenario No.	Human Resources (R/annum)	Capital Expenditure (R/annum)	Operating cost (R/annum)	Cost/service point (R/month)
1	R 4 032 000.00	R 53 090 000.00	R 20 412 000.00	R 23.92 – R 75.88
2	R 3 382 080.00	R 51 140 000.00	R 19 920 000.00	R 22.81 – R 72.85
3	R 930 240.00	R 51 140 000.00	R 23 520 000.00	R 23.93 – R 73.98

Table 30 : Advantages and disadvantages for various MLM waste management services scenarios

Advantages	Disadvantages
Scenario 1	
MLM takes full responsibility of system	High human resources costs
No MSP's & PPP involvement	High capital expenditure
Ideal structure for long term	No sense of community ownership/participation
Traditional system	Does not stimulate the entrepreneurial spirit
Scenario 2	
Low human resources costs	Training and close monitoring of MSP's
Community participation	Requires properly structured tender and contract documents
Promotion of MSP's systems	Subject MLM to fraudulent activities (i.e. increase of tonnages by non domestic wastes materials)
Low service costs	
Provides competitive pricing	
Scenario 3	
Community participation	High operating costs
Promotion of MSP's & PPP's systems	Requires properly structured tender and contract documents
Provides competitive pricing	Subject MLM to fraudulent activities (i.e. increase of tonnages by non domestic wastes materials)
	Training and close monitoring of MSP's & PPP's

57 RECOMMENDATIONS

The following are recommended:

- Develop plan to implement waste management services described in *Scenario 2*
- Initiate public information, consultation and awareness creation regarding waste management services
- Promotion of inter-governmental departments dialog and collaboration to address Health Care and Hazardous Waste matters
- Develop by-laws to facilitate implementation of waste management services
- Identify markets for promoting recycling and composting projects
- Initiate service costs for various service points after consultation process

68 CONCLUSIONS

The feasibility assessment indicates that, if adequate management structures and provision for recommended waste management services are adopted and enforced, waste management services in MLM are sustainable. Public information, training and awareness creation are key in enhancing the sustainability of the services.

The “*HOW SCENARIO*” is detailed in Volume 3, Integrated Waste Management Plan Report for Molemole Local Municipality.

79 REFERENCES

1. Kutu Waste Management Services (Pty) Ltd. (2004): Polokwane Waste Assessment Report. Report prepared for the Polokwane Local Municipality.
2. Hannes Lerm and Associates (July 2002): Lepelle-Nkumpi Municipality, IDP Report. Report prepared for the Lepelle-Nkmpu Local Municipality.
3. BVI Consulting Engineers (Pty) Ltd. (2004): Lepelle Nkumpi Local Municipality Status Quo Report.
4. Discussion document guidelines for the compilation of Integrated Waste Management Plans: DEAT
5. Minimum Requirements for waste disposal by landfill, Second Edition 1998, by DWAF
6. Integrated Waste Management Plan for Polokwane Local Municipality
7. Wastecon 2000, Biennial Conference and Exhibition. Somerset West, 2000. Proceedings Volume 1 &2
8. Wastecon 2002, Biennial Congress and Exhibition. Durban, 2002. Proceedings Volume 1 &2

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

Formatted: Bullets and Numbering

9. Wastecon 2004, Biennial Congress and Exhibition. Sun City, 2004. Proceedings
10. Solid Waste Management Annual Report 2002/2003 by Ekurhuleni Metropolitan Municipality

APPENDIX A

(The National Environmental Management Act – Act No. 107 1998)

APPENDIX B

(White Paper on Integrated Pollution and Waste Management of South Africa)

APPENDIX C

(White Paper on Municipal Services Partnerships (MSP's))

APPENDIX D
(Cost Estimations)