MASILONYANA LOCAL MUNICIPALITY

THEUNISSEN / MASILO
WINBURG / MAKELEKETLA
BRANDFORT / MAJWEMASWEU
SOUTPAN / IKGOMOTSENG
VERKEERDEVLEI / TSHEPONG

INFRASTRUCTURE MASTERPLAN FOR MASILONYANA LOCAL MUNICIPALITY (2009 – 2039)

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1. FROM VISION TO ACTION

1.1 Introduction

In order to achieve Masilonyana Local Municipality's (MLM) vision, ***"to be an integrated developmental and viable local municipality"***, and to give effect to the community driven Integrated Development Plan (IDP) process, specifically in the area of infrastructure development, the need was identified to develop a comprehensive Infrastructure Master plan (IM). The IM would then be used as a "road map" for the implementation of new infrastructural projects as well as the management of the operation and maintenance costs (O&M) of existing infrastructure in a logical and a coordinated manner after the necessary social and economical analysis ensuring application of capital investment.

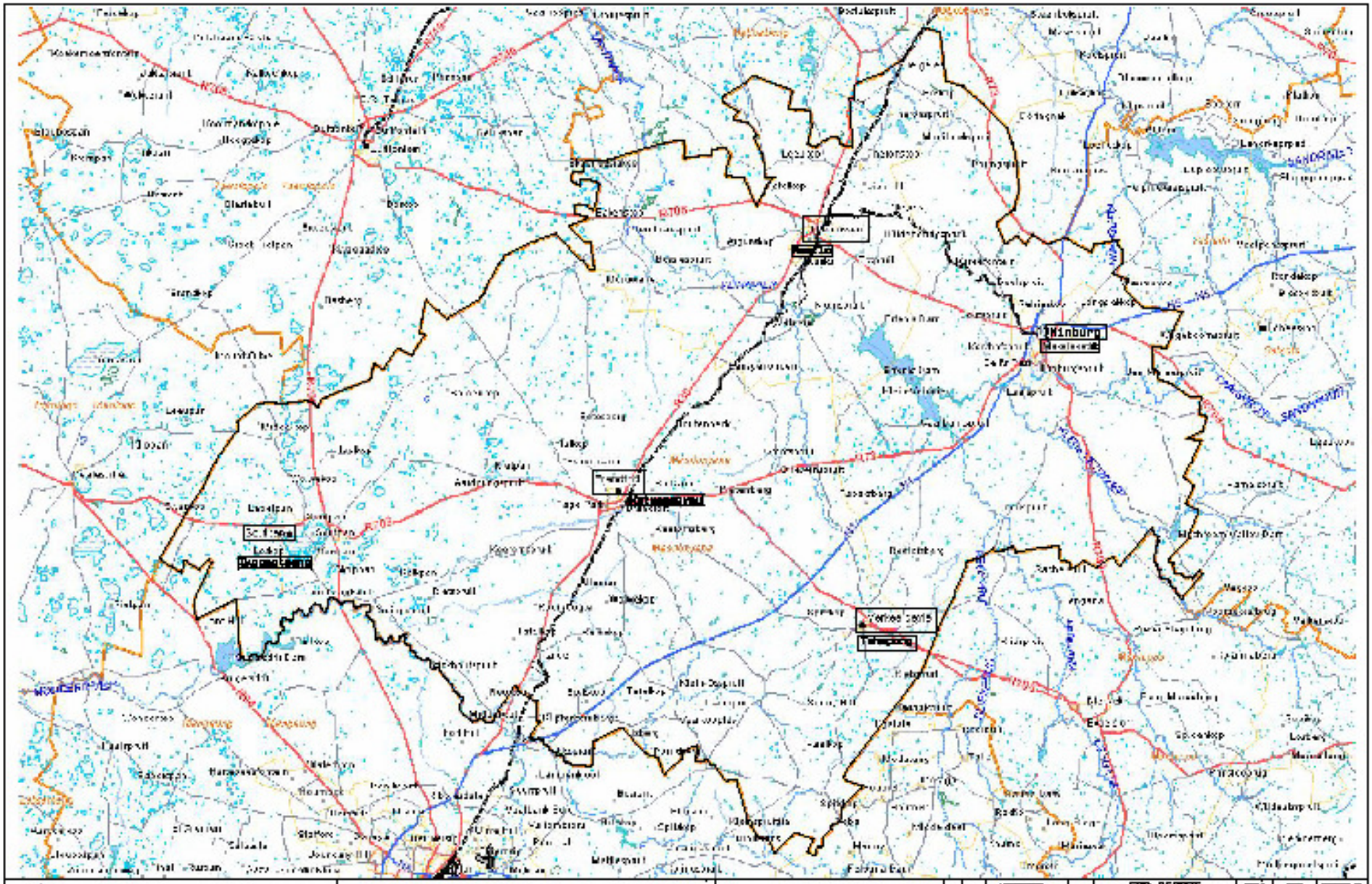
As the first IM for MLM it would have a 30 year framework, up to 2039, with the intention of MLM undertaking regular updates say every 3-5 years, as the community's needs and priorities changed. The IM would be aligned with MLM's IDP, the Free State Growth and Developments Plan (FSGDP) and other priorities of the National Government.

Sustainable development means development that allows present generations to meet their own needs without compromising the ability of future generations to meet their own needs. Integration means that all planning is guided by the need to cater for the three concepts of health, environment and development.

1.2 Location

Masilonyana Local Municipality is located in the central Free State within Lejweleputswa District Municipality that includes four other local municipalities, namely Matjhabeng, Tswelopele, Nala and Tokologo. It borders the Motheo District Municipality to the southeast and Thabo Mofutsanyane to the northeast and has an area of 8 320 km^2. It is accessible via the national road N1 which runs between Gauteng and Western Cape provinces and the N5 which connects the Free State province to Kwazulu-Natal province (refer to the attached locality plan P110045/001).

Masilonyana Local Municipality consists of the five towns of Theunissen / Masilo, Winburg / Makeleketla, Brandfort / Majwemasweu, Soutpan / Ikgomotseng and Verkeerdevlei / Tshepong and the adjacent rural areas.



MASILONYANA LOCAL MUNICIPALITY

INFRASTRUCTURE MASTERPLAN FOR MASILONYANA LOCAL MUNICIPALITY (2008 - 2038)

LOCALITY MAP SHOWING MASILONYANA LOCAL MUNICIPALITY BOUNDARIES

ISA

NO.	DATE	DESCRIPTION	DES.	FOR REPORT

P11/0045/001

2

3 Economy

The economy of Masilonyana Local Municipality relies mainly on agriculture, stock and crop farming, gold and diamond mining and steel and peanut processing factories. Most businesses, service providers and light industries in the towns are centered on supporting these agricultural mining and manufacturing activities.

The average annual rainfall of Masilonyana Local Municipality is 500 mm. The rain falls in the summer months between October and March and the winters are relatively dry with the driest months between June and August.

1.4 Population

The MLM population distribution is as shown in the table below:

Table 1: Masilonyana Local Municipality Population Distribution

	Town	Population
1	Theunissen/Masilo	42,546
2	Winburg/Makeleketla	23,010
3	Brandfort/Majwemasweu	22,026
4	Soutpan/Ikgomotseng	5,328
5	Verkeerdevlei/Tshepong	3,552
	Total population	**96,462**

The current population is based on updated population figures from Masilonyana Local Municipality's Technical Department as well as the Statistics SA 2007 Community Survey.

1.5 Methodology

i) Preparation of the framework for the compilation of the IM

The framework that was utilized during the process to develop the IM was similar to that submitted during the tender process and it outlined the various steps that were to be followed to produce the IM.

ii) Preparation of the proposed level of services

After a number of consultations with the Technical Department of Masilonyana Municipality the proposed levels of services for the IM 2009-2039 were agreed upon and are presented in **Table 2** below. The term "**service level**" refers to the ways in which the user experiences the service. The term "**basic service**" refers to that level that is adequate to ensure the health and safety of users.

Table 2 - PROPOSED LEVEL OF SERVICES FOR IM (2009-2039)

	SERVICE	PROPOSED SERVICE LEVEL
1	Water (Internal)	Metered yard taps and water reticulation network with sufficient gate valves, fire hydrant and zone meters
2	Water (bulk) & raw water sources	Water treatment works, reservoirs, pump stations, ground water (boreholes) and surface water (dams, rivers) sources with adequate capacity
3	Sanitation (Internal)	Toilet structures on each erf with full connection to the sewer network or existing properties connected to the sewer network and VIP toilets for the rural areas
4	Sanitation (Bulk)	Waste Water treatment works and pump stations with adequate capacity
5	Roads (Bus or Taxi Routes)	Paved streets with kerbs (6m wide) and taxi ranks
6	Roads (Internal/Access)	Gravel roads (5m)
7	Storm water drainage	Open storm water channels, reinforced concrete side drains and reinforced concrete culverts
8	Solid waste disposal	Kerb side collection and proper waste disposal landfill sites
9	Electricity (Internal)	Every house should have a metered electricity connection With a minimum capacity of 30 Amps for low income house holds
10	Electricity (bulk)	Street lights and high mast lights and sufficient HV transformers
11	Geotechnical Investigations	Ground conditions map to guide various developments

The choice of level of service is dictated by affordability and community needs. Convenience may be as important to a particular community as health, environmental and economic factors. The additional cost of convenience differentiates the service levels. MLM has a responsibility for the final decision regarding the service level to offer. The Municipal Infrastructure Grant (MIG) funds any service only up to the basic level of convenience, while any additional cost must be transferred by MLM discretion.

iii) Standard definitions for "basic service levels" for any service are as follows:

a) Water supply – is the provisions of basic water supply facility and the sustainable operation of the facility such that water is available at least 350 days per year and not interrupted for more than 48 consecutive hours per incident and the communication of good water use, hygiene and related practices;

b) Sanitation – is the provision of a basic sanitation facility which is easily accessible to a household, the sustainable operation of the facility, including the safe removal of human waste and waste water from the premises where this is appropriate and necessary and the communication of good sanitation hygiene and related practices;

c) Roads – based on the Municipal Infrastructure Investment Framework, this refers to all weather access to within 500 metres of a dwelling;

d) Stormwater drainage – this refers to open channels (whether lined or unlined) or use of underground pipes and catch pits;

e) Solid waste disposal – in line with the national government requirements, this means that refuse is removed at least once every week;

f) Electricity – a metered electricity connection with a minimum capacity of 30 Amps for low income households;

iv) As-Built infrastructure information collection

A base level of information on the existing infrastructure in MLM had to be compiled and captured accurately before the proposed new infrastructure could be planned. This was the first major challenge since there was no central location for all the as built information for all the five towns.

v) On site verification of existing services and interviews with Masilonyana Local Municipality Planning and maintenance officials

Due to the absence of as-built information a significant amount of time was spent doing on-site assessments and measurements to verify the status of existing services. Numerous interviews were conducted with MLM's staff working in the Technical departments, planning and maintenance units. Where no information was available some assumptions were made based on appropriate engineering evaluations.

vi) Collection of data from water and wastewater treatment facilities and geotechnical investigations

For assessment of water quality, it was necessary to obtain monthly samples taken from the water treatment works (WTW) and wastewater treatment works (WWTW). Only information from the water treatment plants was being collected during this stage and MLM was in the process of ensuring samples were collected from the WWTWs. This information is crucial in determining the capital requirements for WTWs and WWTWs if their water quality falls below the guidelines published by the Department of Water Affairs and Environment (DWAE).

vii) Review of MLM's IDP, WSDP and SDP

A review of MLM's latest Integrated Development Plan (IDP), Water Services Development Plan (WSDP) and Spatial Development Plan (SDP) was undertaken to ensure that the IM was aligned to these development frameworks.

viii) Engineering evaluation and planning of proposed raw infrastructure as well as the operation and maintenance requirements

An engineering evaluation exercise was undertaken on all the services and this provided the following information:

a) Status of the existing infrastructure and estimated lifespan;

b) Upgrading requirements of existing infrastructure to meet the proposed level of services;

c) Proposed requirement for new infrastructure;

d) Proposed Operations and Maintenance (O&M) requirements to maintain serviceability levels of existing infrastructure.

ix) Capturing of as-built information and proposed infrastructure into CAD and GIS

x) Preparation of financial requirements and implementation programme for proposed new infrastructure as well as the operation and maintenance requirements.

xi) Preparation of the IM report.

1.6 The Guiding Principles and Justification for the IM

The guiding principles for IM are founded on the economic and social impact analysis with a view to ensure the most effective and efficient use of existing and proposed infrastructure.

Human scale development planning is focused and based on the satisfaction of fundamental human needs, on the generation of growing levels of self-reliance, and on the construction of organic articulations of people with nature and technology, of global processes with local activity, of the personal with the social, of planning with autonomy and of civil society with the state. Human scale development assumes a direct and participatory democracy that nurture those conditions that help to transform the conventional, paternalistic role of a state into a role that encourages and seeks creative solutions from the bottom up.

- There is current approved planning legislation such as the Development Facilitation Act (No 67 of 1995) which emphasizes a planning framework and process based on need, integration and community participation.

- Due to the multi-disciplinary nature of planning it must be recognized that there is a tendency in planning practice for planning and development to be managed by project managers who are not necessarily professional planners. The specific role of the planner in the planning process has shifted from purely technical to that of mainly a technical expert, co-ordinator, facilitator and advocate.

- While the role of theory in understanding method and participation is very important, context and realistic circumstances prevailing in South Africa (including MLM), must also inform method and participation (The IDP).

- In the past communities did not play an important role in planning and development. However, communities have vast wealth of local knowledge that they can offer as well as a natural understanding of their needs, requirements, local conditions and relationships. This knowledge is a great asset if employed as part of planning and development.

1.7 Implementation of the IM

The IM has suggested strategic decisions and necessary policy guides to steer decision making by the council staff in decision making. The implementation suggestions offered are in line with the strategic directions and policies. Action on implementation will only be by the approval and discretion of the council. For instance the council would benefit from approving the following initiatives:

- Planning studies involving alternative servicing scenarios and major system planning initiatives;
- Operational surveys studies that track system performance and Efficiency;
- Engineering studies touching on areas of system definition, inventory, modelling and rehabilitation;
- Asset management strategies which ensure adequate re-investment in existing infrastructure, maintain levels of service and guarantee sustainability;
- Creation and maintenance of design guidelines and engineering and construction standards;
- Innovation studies on new technologies and service delivery Methods;
- Environmental assessments for capital projects that are required to receive provincial and /or national government consent.

The initiatives suggested may change over the planning horizon. The master plan should be reviewed if monitoring finds that substantive change has occurred or otherwise as per the councils discretionary review intervals and thereafter updated as necessary.

In addition, implementation of this plan will require the co-operation of various other stakeholders outside of the MLM.

- MLM must partner with the national government and the provincial government in issues such as National Infrastructure strategy;

- A partnership with neighbouring provinces on shared resources use and conservation is also imperative;

- Partnering with private sector investors could provide greatly needed capital for infrastructure budgets and required technology;

- The personal choices of the individuals and the larger public has an impact on the effectiveness of infrastructure planning as they support the initiatives to build, repair and conserve all facilities. Public awareness and buy-in is very crucial and the MLM must spearhead the campaign.

2. UNDERSTANDING GROWTH IMPACT ON INFRASTRUCTURE

The understanding of growth impact on infrastructure is a key strategic direction in the compilation of the Infrastructure Masterplan. As an example, plans for more intense development may allow delivery of service at a lesser unit cost but at the same time exert more pressure on repair needs. Successful infrastructure planning requires sufficient flexibility and effective response where there are changes in growth expectations upon which planning had been based.

2.1 Population growth

The reality of population growth within MLM is that this will increase. The rate of population growth and the patterns are however not certain. Detailed considerations of population and employment growth are necessary for successful IM process and following possible questions should guide the planning process:

- Are water and waste water use patterns changing as the population changes?
- Can use pattern changes be initiated as an infrastructure planning tool?
- How will land be used to support growth and hence how shall it be used?
- Will more intense development require changes to the city's storm water management planning practices?

Over the next 30 years the population of MLM will grow to approximately 125,000 assuming a growth rate of 1%.

A comprehensive assessment of the characteristics of population growth is needed for effective and efficient provisions of infrastructure services for roads, sewer, water, waster water and storm water to the residents of MLM. MLM will ensure policies are formulated that will address the characteristics of population growth and their impacts on services planning such as:

- Spatial growth characteristics – Where and by how much the current population is expected to grow, and either requires extension of services (within designated serviced areas) or a study of the private service resource base?

- Timing and rate of growth – When will increased demand for growth start affecting present levels of service to warrant major facility upgrades or result in concern for the sustainability for the private service resource base?

- Changes in settlement characteristics – how will the official plan emphasis of increased density intensification in rural areas affect infrastructure requirements in built areas of the city?

- Changes in employment characteristics – how will the projected employment characteristics affect demand patterns within the urban boundary?

- Growth in the rural areas – What effect will growth in the rural areas have on the need for the creation of new public service areas?

2.2 Supply and demand planning

Increasing infrastructure demand from population growth will be addressed by the complementary processes of demand planning and supply planning. Supply planning has been the more dominant approach to infrastructure planning in the developed world from as early as 1950's. It was commonly held at that time that resources were available in unlimited proportions or that engineering and capital solutions could make up for resource shortages. This has since changed with modern realities showing that resources and capital indeed have limits.

2.2.1 Demand planning

Demand planning entails limiting the need for ever increasing supply has become more important for sustainable infrastructure planning. Demand planning aims for better understanding of the nature of total demands and peak demands and where possible reduce the size of new infrastructure and extend the useful life of existing infrastructure. By achieving unit demand deduction, the new infrastructure does not grow in the same proportion as the population growth. Demand planning can contribute to cost-effective growth planning.

2.2.2 Supply planning

Supply planning is the basis upon which a major portion of growth planning is completed. Extensions of infrastructure systems and major facilities expansion are methods of supply planning.

2.2.3 Demand planning and choices

Demand planning initiatives present opportunities to minimize the cost of new infrastructure and optimize the value of existing ones. A great deal of this opportunity rests with the consumers of the services, who may need to make personal choices so that many of the demand planning initiatives can be a success. Following are examples of such personal choices:

- Rural residents can carefully control water usage thus reducing draw volumes from wells and even reduce volume of waste water returning to the ground;

- Town residents can cut down on outdoor water use habits with resultant reduction of peak demand on the water supply system;

- Rain water from roofs can be directed to soft landscaped surfaces to promote ground seepage and reduce volumes of runoff going into the storm water system.

MLM must also make choices for it to realize the long term benefits of demand planning. A commitment now to infrastructure system planning practices, which reduce demand will facilitate timely and orderly growth servicing and control the cost of providing new infrastructure. Following are such choice examples that MLM can adopt:

- Public awareness programs to explain, promote and demonstrate the value of demand planning initiatives and in particular those that require the participation of the residents;

- Understand the impact of land development on ground water resources to ensure that rural development is sustainable;

- Direct MLM programs and priorities to urban systems capacity loss programs such a identification of unaccounted for water and reduction of extraneous flow into sanitary sewer systems;

- Encourage land development practices that reduce urban storm water runoff;

- Make a commitment to the apt levels of monitoring so that the values of MLM initiatives can be confirmed.

2.3 Infrastructure system monitoring

For all public service systems there are two primary factors that will influence the timing and location of most capital projects – system demands (based on the operations characteristics of the existing systems and the location and rate of growth for new systems) and the physical conditions of aging infrastructure. Critical to the determination of timing and need of capital projects is sufficient monitoring information. There are a variety of monitoring requirements which support public infrastructure systems planning as explained in the subsequent sections.

2.3.1 Monitoring system demands

In order to accommodate growth in the most effective manner, use of available infrastructure capacity in existing and future systems must be monitored.

- **Demand from population growth**

Monitoring when and where population growth is occurring and projected to occur in MLM is vital, especially due to the time frame needed to execute major capital projects as needed. MLM will therefore:

- Monitor development approvals and other growth characteristics to ensure timely information for infrastructure planning;

- Update capital projects needs and timing based on regular review of growth characteristics;

- Assess how other factors related to population growth such as employment characteristics and demographics may impact infrastructure planning and incorporate these considerations into the prediction for the timing and need for infrastructure.

- **Demand evidenced by systems performance**

Direct monitoring of demand on infrastructure systems provides accurate information to the infrastructure planning process and is required to allow risk management while maximizing the use of infrastructure. In case of sewer systems for instance, for which performance is impacted more by wet weather events than population growth, permanent real time monitoring of system performance is essential to maximizing the use of existing infrastructure to allow for cost effective growth. MLM will do the following:

- Confirm system demands through real time system monitoring.
- On a regular basis review design parameters and allowances based on data from real time monitoring.

MLM will put into place a policy framework that over time will:

a) Maintain sufficient permanent real time monitoring devices to provide the level of detail required to predict and plan for systems performance;

b) Determine system performance based on detailed analysis of real time system monitoring;

c) Determine water consumption patterns based on detailed analysis of zone water consumption and water meter records;

d) Identify potential priority areas for demand planning initiatives based on real time performance and evidence of system deficiencies.

2.3.2 Monitor physical conditions of existing infrastructure

MLM will monitor the physical conditions of its existing infrastructure in its infrastructure management program. This is because the success of IM is not only related to expanding and extending the existing infrastructure, but also to maximize the use of existing system capacity through rehabilitation, rehabilitation plays a crucial role in growth planning.

2.3.3 Other monitoring

Effective and efficient planning, design and operation of MLM infrastructure systems are complicated and challenging. To meet these challenges, MLM will proactively identify and monitor future issues and opportunities as follows:

- Monitor legislative changes affecting systems planning and design;
- Investigating technological advances and applications;
- Monitoring trends in infrastructure planning in other cities and internationally;
- Search for and identify potential partnerships such as research initiatives;
- Identify potential funding sources (infrastructure programs, public-private initiatives etc.).

2.4 Service delivery methods and alternatives

In the public service areas of MLM the service delivery method is primarily by piped systems for water sewer and waster water, while using open channels as well for storm water. These are time tested and reliable delivery systems, they are also cost effective and environmentally apt. In addition, the design, material and construction standards for these systems provide a well defined, known and reliable product.

2.4.1 Public systems service delivery method

There are various options available to MLM in providing public services. The routing those options. The industry also maintains vast amount planning, engineering and operations specifications that guide MLM decisions. MLM will accordingly:

a) Maintain service level standards to direct the design process and service delivery for roads, sewer, water and waste water as well as storm water.

b) Maintain and update the design, operating, maintenance materials, construction and tendering standards for infrastructure works and services.

2.4.2 Considering alternative services

MLM will continually seek new means to deliver services. One option to continue investigations is to support and partner with engineering consultants, academic, research, governmental and professional associations who conduct infrastructure related research. Another option involves monitoring of infrastructure systems planning initiatives in other municipalities and participating in benchmarking/peer review processes to re-validate the effectiveness of our present practices. It is important not only to consider and adopt new technologies but promote innovative engineering wherever it can be applied to produce more cost effective services. MLM in partnership with research, education and professional groups, in an attempt to improve levels of service, will regularly review products with a view to include them in their design standards. Priority will be accorded to investigation of products with broad application and thus with the best potential to return good value. MLM will accordingly act as follows:

- Promote and co-operate in research and monitor servicing technologies for adoption in the towns design guidelines, materials specifications, operations and maintenance practices and procedures, construction specifications and life cycle cost recovery models;
- Co-operate in investigation and research related to materials, techniques and products for municipal servicing applications;
- Investigate applications for technologies either in standard municipal servicing or in response to special servicing needs within the towns;
- Review specifications, costs and benefits for technologies with municipal application;
- Adopt or review service level criteria, design guidelines, material specifications, operations ad construction practices to incorporate servicing technologies shown to provide cost-benefit to the city.

3. STRATEGIC DIRECTION

MLM should pursue a strategic direction that ensures a high level of service and reliability while being economically sound and sustainable. MLM must be committed to sound infrastructure planning in order to provide a reliable service that in turn drives the much needed pubic support for infrastructure growth and maintenance of assets.

3.1 PROPOSED LEVEL OF SERVICES FOR MLM

Table 2 - PROPOSED LEVEL OF SERVICES FOR IM (2009 - 2039)

	SERVICE	PROPOSED SERVICE LEVEL
1	Water (Internal)	Metered yard taps and water reticulation network with sufficient gate valves, fire hydrant and zone meters
2	Water (bulk) & raw water sources	Water treatment works, reservoirs, pump stations, ground water (boreholes) and surface water (dams, rivers) sources with adequate capacity
3	Sanitation (Internal)	Toilet structures on each erf with full connection to the sewer network or existing properties connected to the sewer network and VIP toilets for the rural areas
4	Sanitation (Bulk)	Waste Water treatment works and pump stations with adequate capacity
5	Roads (Bus or Taxi Routes)	Paved streets with kerbs (6m wide) and taxi ranks
6	Roads (Access)	Gravel roads (5m)
7	Storm water drainage	Open storm water channels, reinforced concrete side drains and reinforced concrete culverts
8	Solid waste disposal	Kerb side collection and proper waste disposal landfill sites
9	Electricity (Internal)	Every house should have a metered electricity connection With a minimum capacity of 30 Amps for low income house holds
10	Electricity (bulk)	Street lights and high mast lights and sufficient HV transformers
11	Geotechnical Investigations	Ground conditions map to guide various developments

3.2 Setting the stage

Being the first time MLM is formulating a long-term infrastructure planning blue print, it will rely heavily on case studies of similar successful ventures, mostly done in the developed world. The MLM must first become aware of its duty to support both the safety and sustainability of both the rural and urban infrastructure systems. MLM should first commit to understand and balance all settlement, public health and environmental issues pertaining to use of wells and septic systems, water use, storm water and the road networks. To achieve this MLM should take responsibility for septic system approvals, aquifers protection and investigations of private services both in the urban and surrounding rural set ups.

3.3 Moving forward – the strategic directions

In keeping with the modern realities, MLM shall need to shift their focus from the technical issues of the infrastructure systems towards the broader planning and management issues important to long term sustainability and common to any infrastructure. This approach recognizes that infrastructure assets include not only the fixed assets but also the natural, monetary and people assets, important to the success and sustainability of all facilities. This can be achieved by pursuing three strategic directions as follows:

3.3.1 Understanding growth impacts on infrastructure

- MLM will predict and monitor the impacts of population and employment growth on infrastructure in order to ensure that infrastructure and services are delivered on time to support orderly growth;

- In order to maximize the use and efficiency of both the infrastructure and natural resources, MLM will adopt an effective demand planning approach in order to address the impacts of growth;

- MLM will investigate all methods of service delivery, thereby addressing challenges and seeking to increase value, while continuing to incorporate 'out-of-the-box' ways of planning and delivery of services.

3.3.2 Cost and value

- MLM will determine the cost and value of infrastructure services required to support existing land uses and growth and put in place mechanisms to equitably assess cost and value and in particular recover the direct financial costs of growth infrastructure;

- MLM will explicitly define the social and environmental value of public service along with their economic value;

- MLM will encourage and consider the role of private enterprise in providing value to its customers.

3.3.3 Integrate infrastructure planning

- MLM will recognize the important links between the infrastructure and the environment by bringing the planning for roads, sewer, water, waste water and storm water as well the Municipal's role of supporting private infrastructure service into one IM;

- MLM will integrate the assessment of needs and priorities in order to ensure that infrastructure planning and spending are directed towards achieving the priorities of MLM;

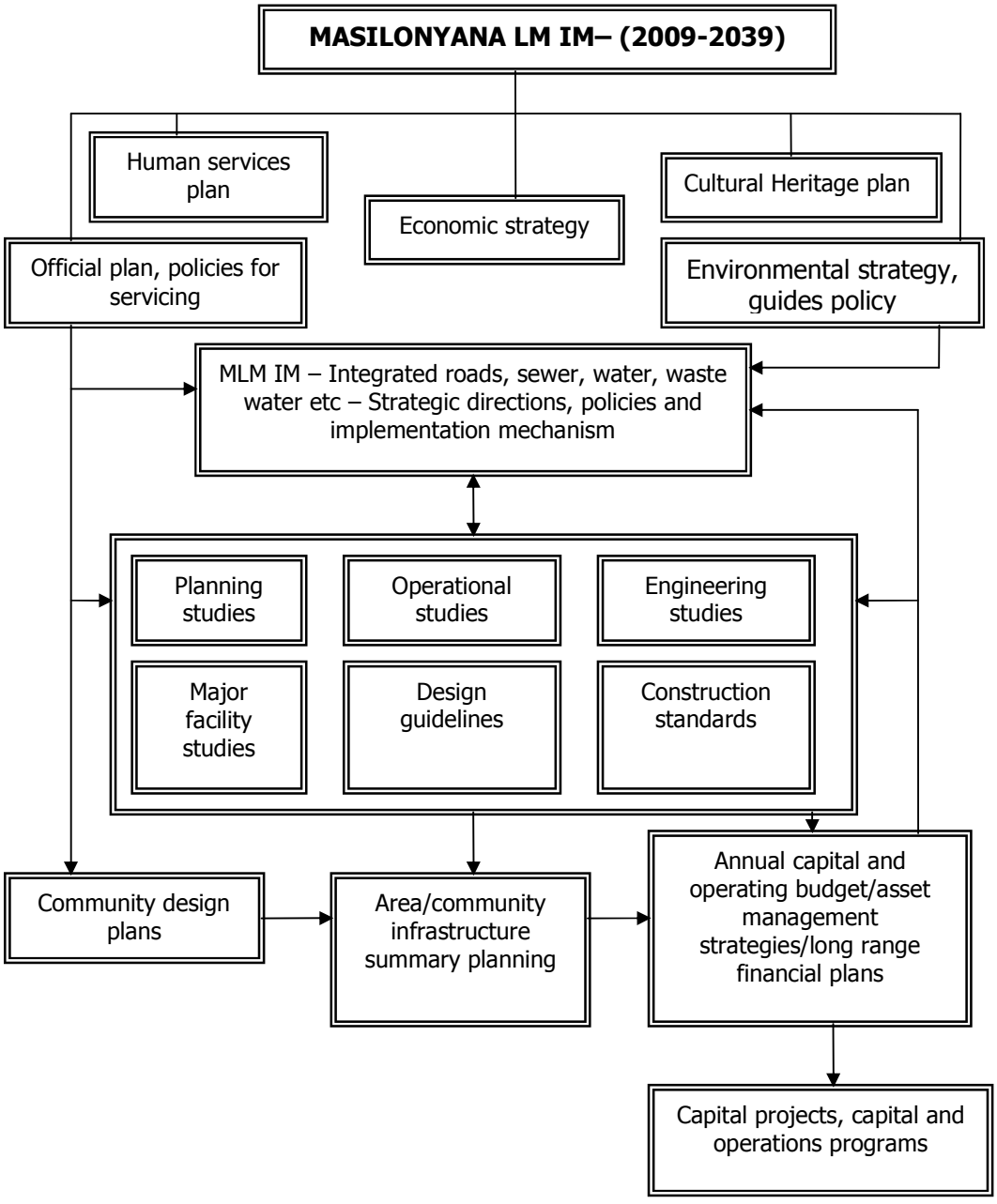
- MLM will understand the role and value of effective communication in infrastructure planning including obtaining the best value from the experience of municipal employees, relationships with external agencies and the expectations of the customers and the general public of MLM.

3.4 The infrastructure planning process

"Failing to plan is planning to fail", so the old adage goes. Quality time must be spent in the conception and development stages for all infrastructure services. This approach will guarantee MLM success in their mandate to provide modern and world class roads, sewer, water, waste water and storm water facilities. This complicated process involves identification, planning, scoping, prioritization, co-ordination, scheduling, funding and construction of capital infrastructure projects.

A properly defined infrastructure planning process is vital to achieving successful implementation of the IM. A wholesome process should thus involve multi-disciplinary professions, other government departments of MLM, as well as the public and private sector interest participation. Infrastructure planning is a complex and on-going process requiring the co-ordination and efforts a wide range of specialists. MLM should ensure they establish and maintain these capable teams to steer their IM. Figure 1 shows a typical schematic of Integrated IM process.

Figure 1 – Infrastructure Planning Process



MLM will adopt the infrastructure planning process schematic as a model to guide the planning of its infrastructure.

3.5 Capital projects list – Roads, sewer, water, wastewater and storm water

It is necessary that MLM reviews all current capital infrastructure projects and those expected to start in the next 12 months, to see whether planning integration had been considered effectively. This should also help to validate the necessity of employing the IM in all future infrastructure projects.

The table 3 below shows the various projects that MLM has prioritised for the 2009 - 2012 financial years.

TABLE 3 – MLM CAPITAL PROJECTS LIST FOR 2009 – 2012

	Project Description	Service Type	Budget (R)
1	Winburg/Makeleketla - upgrading of existing Sewer	Sewer	8,000,000.00
2	Brandfort/Majwemasweu – upgrading of water purification plant	Water	8,000,000.00
3	Theunissen/Masilo - upgrading of streets to surfaced roads	Roads	4,515,000.00
4.	PMU Budget		1,085,588.20
	Total (2009)		**21,700,000.00**
5	Winburg / Makeleketla – Upgrading of existing Water treatment plant phase 2	Water	8,000,000.00
6	Masilo/Theunissen – water reticulation & paving of streets	Water	4,800,000.00
7	Soutpan/Ikgomotseng - water reticulation and paving streets	Water / Roads	2,400,000.00
8	Winburg/Makeleketla- water reticulation and paving streets	Water / Roads	4,800,000.00
9	Theunissen/Masilo - upgrading of sports facility	General	2,200,000.00
10	Verkeerdevlei/Tshepong- paving of streets and water	Water / Roads	2,460,000.00
11	PMU Budget		1,297,600.00
	Total (2010)		**25,952,000.00**

	Project Description	Service Type	Budget (R)
12	Theunissen/Masilo - upgrading of existing waste Water Treatment plant	Wastewater	8,000,000.00
13	Brandfort/Majwemasweu – upgrading sewer oxidation ponds	Sewer	5,000,000.00
14	Soutpan/Ikgomotseng – Provision of 1m litres water storage reservoir	Water	2,000,000.00
15	Winburg/Makeleketla- upgrading of sports facility	General	2,000,000.00
16	Verkeerdevlei/Tshepong – paving of streets	Roads	5,000,000.00
17	Verkeerdevlei/Tshepong and Soutpan / Ikgomotseng Oxidation ponds	Sewer	3,000,000.00
18	Installation of high mast lights all (5) five towns		2,000,000.00
19	Soutpan/Ikgomotseng – paving of streets	Roads	5,000,000.00
20	PMU Budget		1,647,588.20
	Total (2011)		**35,673,000.00**
21	Theunissen/Masilo – upgrading of the storage reservoir to 4 Mℓ	Water	4,000,000.00
22	Winburg/Makeleketla – upgrading of the storage reservoir to 2.5 Mℓ	Water	4,000,000.00
23	Paving of access roads to cemeteries for (5) five towns	Roads	8,000,000.00
24	Winburg/Makeleketla – upgrading of streets	Roads	4,000,000.00
25	Installation of high mast lights all (5) five towns		2,000,000.00
26	Brandfort/Majwemasweu – upgrading of streets from Gravel to surface	Roads	2,000,000.00
27	Masilo – Upgrading of Masilo stadium	General	14,000,000.00
28	Masilo/Theunissen – water reticulation and paving streets	Water / Roads	4,800,000.00
29	PMU Budget		2,000,000.00
	Total (2012)		**44,800,000.00**
GRAND TOTAL			**128,125,000.00**

4. RATE INFRASTRUCTURE PLANNING

4.1 Introduction

Integration of infrastructure planning is one of the strategic directions presented in MLM IM. In this plan "integration" is considered in the broadest context possible to ensure maximization of opportunities to improve the value and sustainability of infrastructure services.

The opportunities for integration considered in the MLM IM include:

- Infrastructure and the natural environment: Integrated roads, sewer, water, wastewater and storm water planning as well as the MLM role in private infrastructure services under the uniform strategic and policy direction of the IM ensures that all infrastructure planning caters for the consideration of impacts on the natural environment;

- Existing infrastructure: Integrating growth planning into the existing infrastructure planning under the uniform strategic and policy direction of the IM ensures that MLM's objective of intensification and maximization of use of existing infrastructure are addressed in the remediation, rehabilitation and reconstruction of MLM's existing infrastructure;

- Optimization: Integrating planning, engineering and operational solutions to challenges and optimization by balancing all possible solutions ensures that the best opportunities for cost effective management of growth are identified;

- Communication: the IM recognizes the role and value of effective communication in infrastructure planning including obtaining the best value from the experience of municipal employees, our relationship with external agencies and the expectations of our customers and the citizens of MLM.

4.2 Infrastructure and the natural environment

Roads, water supply, sewer and storm water management processes all rely on and impact on surface and/or groundwater. In areas where access to these resource has become limited (for any number of reasons including natural reduction in supply or quality, increase in growth beyond sustainable levels, increase in the cost to deliver he service, etc.), the challenges to infrastructure planning is enormous.

The relationship between the environment and the infrastructure is complex. Some of the stresses on the MLM infrastructure are related to the natural environment. For instance, prolonged dry spells result in the greatest demands on MLM's public water supply system and cause concerns in the rural areas when well water supply may become inadequate. Spring snow melting raises river levels and ground water levels resulting in increased infiltration into sanitary wastewater collection systems – the highest flows at the waste water treatment facility happens during the wet weather.

The wet weather conditions can also cause problems in the rural septic tank systems. Intense summer storms can overwhelm MLM's storm water collection systems and drainage facilities and may as a result cause private property flooding and damages to roads. Full scope planning for this intricate relationship between the environment and the infrastructure helps to ensure good infrastructure planning.

The following are examples of opportunities arising from environment and infrastructure integrated planning:

- Recognition of the role and value of the natural resource base and particularly the limited nature of these resources ensures that all infrastructure planning decisions are futuristic;

- Understanding the intimate and to some degree the unpredictable role nature plays in the performance of infrastructure helps MLM to better understand and manage risks;

- Implementation of an integrated, science based approach to assessing the health of local rivers and streams may lead to more effective ways to maintains and/r improve he overall health of these watercourses.

4.3 Infrastructures Management planning and policy guides

4.3.1 Water supply

The water supply planning and policy guides should consider:

- **Administration** – The community should be involved in the planning, implementation and maintenance of the projects.

- **Financing** – a tariff structure and expense recovery mechanism must be agreed with the recipient community.

- **Development impact** – as far as possible local labour, material and technologies should be used, but they must be cost effective.

- **Health** – there should be a deliberate plan to increase community awareness about water health related problems and their causes, so that service quality improvement can be achieved.

- To ensure a sustainable water supply system.

4.3.2 Sewerage/sanitation management planning and policy guides

The sanitation policy should be informed by the following in line with the National sanitation policy:

- To improve the health and the quality of life of the whole population;

- To improve the development of a community in the provision of sanitation;

- To protect the environment;

- To place the responsibility for household sanitation provision with the family or household;

- To ensure a sustainable sanitation service system

4.3.3 Roads management planning and policy guides should include:

- Environmental impact especially in relation to storm water effects;

- Financing of the capital intensive roads system;

- Utilisation of innovate technologies to construct low volume roads cost effectively;

- Ability of recipient community to repay affordably;

- Impact to development within the region and externally;

- The need to accommodate other street furniture within the roads way-leave and hence maximize land utilization.

4.3.4 Storm water management planning should involve, inter alias:

- Determination of the recurrence period of the flood events;
- Provision of guidelines on run-of detention requirements, pollution abatement strategies, the powers and responsibilities of developers and authorities within the catchment area;
- Consideration of land use within flood plains;
- Guidelines on operational safety and maintenance;
- Reference to integrated management procedures and principles underpinning the Reconstruction and Development program;
- Ensure sustainability of the storm water service system.

4.4 Growth planning for existing infrastructure

MLM owns and maintains a significant number of existing infrastructures. It carries out programs to maintain, rehabilitate and replace existing ones. These programs address a wide range of needs in existing infrastructure, including physical deterioration, life cycle planning and major system management initiatives. It is expected that cost effective growth can be achieve by promoting intensification and development in serviced areas, therefore the considerations and methodologies for planning rehabilitation and reconstruction of this infrastructure include planning for growth.

4.5 Identification and notification of stakeholders

Partnerships work most effectively where here is an organized power base in the community to which citizen leaders are accountable. Effective participation can be obtained if representatives, who have been elected through democratic structures, are involved. It is, however, very difficult to develop and operate an organisational system that reaches the majority of the citizens. Therefore one must use existing institutions and their networks to achieve what needs to be done, such as the local councils, resident's organizations, business organizations, NGO and civic organizations.

Stakeholder notification can be done via:

- Press release;
- Scheduled meetings with representative bodies;
- Pamphlets/photos;
- Telephone calls;

- Mail drop.

4.6 Negotiation of a participation strategy

Once the stakeholders have been identified, the public participation strategy needs to be negotiated with all parties including communities. One must not casually inform the community of its role in a specific project. It is crucial to set the ground rules for participation where all roles, responsibilities, participation limits and rights as well as the process are agreed upon upfront. There should never be a barrier to participants joining at any stage during the participation process though the rules for joining should be specified in the participation strategy. This helps to cater for change management. Once the participation strategy has been agreed on it must be documented and signed off by all stakeholders. This helps to create ownership of the process and the outcome. Depending on the way institutions are structured, their interactions will either support or obstruct participation and partnership. It is very important for members of the public to be able to meet government representatives, the decision makers in order to facilitate participation. Institutions need to review and/or change their structures and modes of operation in order to promote appropriate interactions.

4.7 Setting of goals and objectives

This phase requires the translation of needs into goals and objectives that are realistic, given the nature and physical conditions of infrastructure projects, financial and other resource constraints. It is important for MLM to introduce and debate the performance qualities to be achieved in development infrastructure and for the technical professionals to ensure that stakeholders understand all sensitive technical aspects related to infrastructure projects. The participation process should focus on:

- Enabling interested parties and affected parties and authorities to bring to the attentions of the project team their concerns, attitudes and perceptions about the infrastructure projects and related matters;

- Ensuring that the interested parties and affected parties concerns, attitudes and perceptions are addressed by the project team.

5. COST AND VALUE

5.1 Introduction

Understanding cost and value is one of the strategic directions in the IM. Provision of public infrastructure services has high capital and operating costs. Also, public and private infrastructure has high economic, social and environmental value. Understanding and balancing the "cost" and "value" of infrastructure is an important aspect of infrastructure planning. The selection of the service levels and packages involves not only the initial provision of these services, but also operation and maintenance for many decades after their installation. In selecting service levels the on-going management implications and costs must therefore be carefully considered. It is important that operation and maintenance requirements should suit the capacity of MLM for the necessary works. If services are provided that are difficult to operate the on-going viability of the service will be at risk owing to downtime, leaving people without a service or causing damage to the environment.

- **Cost of growth:** MLM will determine the cost and value of infrastructure services required to support existing land uses and growth. Mechanisms will be put in lace to equitably assess the direct financial costs of growth infrastructure and to assess the cost of life cycle of infrastructure and infrastructure services.

- **Value of infrastructure:** Assessment of the value of infrastructure will include social, environmental and economic value in order to make appropriate decisions on policy as well as how to define and assess value to customers and residents.

- **Public private partnerships:** MLM will consider opportunities for the role of private enterprise in providing value to its customers.

The following describes some of the important cost and value considerations in infrastructure planning and presents some of the requirements MLM expect to achieve in the near future related to cost and value – a Development Charge By-law and an Asset Management Strategy. The content of the IM will be structured to provide the required input into these costs and value tools.

5.2 Costing and paying for growth

Infrastructure provided to support the extensive of intensive urban land use, while costly, creates a return for the land owner and potentially for the municipality. In considering mechanisms and priorities for funding infrastructure extensions and upgrades required to support growth, it is important that MLM obtains the best possible value for its residents. Advantageous cost per unit of servicing is reflected in lower taxes, lower development charges and lower use rates, all playing a role in making MLM a choice location for business and labour. Provincial legislation sets out the process and MLM controls on growth financing of infrastructure. MLM will prepare a Develop Charge By-law as a mechanism to fund growth infrastructure.

The process of determining and assessing costs directly to development is an effective strategy for deriving value from the infrastructure assets. Detailed engineering and financial plans are required in support of the By-law in order to ensure an equitable division of costs and benefits. The infrastructure planning process and the development charge process, together, will provide a basic assurance that the growth cost will be known and funded.

The IM identifies some of the growth challenges facing MLM's infrastructure and proposes strategies, recommendations and action plans to address those challenges. The following are important suggestions as to what should be considered in the Development Charge Bylaw:

- That in order to maximize the value to MLM derived from on-going distribution of development charge funds, that development charge funded projects be prioritized and undertaken based on the benefit derived to the city;

- That in order to maximize the planning and distribution of rate based funds, development charge funds be required to "front-end" that portion of projects considered to provide benefit to existing rate payers for a period not to exceed 5 years;

- That in order to recognize and plan for intensification growth and to maximize the distribution of rate based funds; the By-law includes an assessment dedicated to all rehabilitation and reconstruction projects;

- That in order to recognize the opportunities to permit growth through demand planning initiatives such as water conservation an flow removal, that these programs be funded primarily from Development Charge assessments (an the capacity "created" through these initiatives be dedicated to permitting growth);

- That the By-law states clearly MLM authority regarding distribution of development charge derived funds, including its authority to dedicate funds to equivalent projects being those projects not specifically identified in the development charge calculation but deemed to provide equivalent benefit to development and equivalent or higher value to the MLM.

5.3 Reliability of infrastructure

Reliability is a key factor in ensuring value in public and private infrastructure services. Reliability has two main components – ability to meet service standards, including peak demands, on a consistent basis and ability to provide service in the event of a component system failure. Private systems are the responsibility of owners, and reliability depends mostly on god operation maintenance practices.

As MLM grows at the limits of existing infrastructure systems, more and more residents are becoming dependent on systems which require significant investment to provide reliability. The degree of protection provided to ensure reliability must be carefully assessed. Incorporating reliability protection from major system failures can be very expensive, however major system failures can result in significant expense in unplanned emergency responses, impacts on customers and sometimes safety and public health concerns. All of these must be balanced to determine the required investment in reliability. Accordingly MLM will act as follows:

- Design infrastructure systems to meet approved reliability factors in design guidelines;

- Have in place contingency plans including public and customer notification plans in the event of both minor and major system component failure;

- Develop uniform reliability guidelines as part of development of new municipal infrastructure design guidelines.

5.4 Cost and value of existing systems

MLM is responsible for a significant portfolio of fixed (land, buildings, equipment, fixtures) and perpetual (rights of way and easements, pipe collection and delivery of public infrastructure services. These assets are capital intensive to build, own and maintain and therefore can be considered based on a financial model asset management strategy. Such a strategy relates primarily to physical assets and is applicable to both existing assets and planning for increased assets resulting from system expansion to address growth.

Ultimately the success and economic viability of the MLM infrastructure will rely to a great extent on a clear, long term stewardship approach to protecting these significant capital investments. This approach must include minimization of the total capital and operating cost over the entire life of the assets as well as development of programs to sustain core service delivery and the provision of the expected service levels necessary to meet growth objectives.

A financial model for asset management will be supported by policies and processes that ensure effective infrastructure planning and management. The policies should be directed to ensure the following:

- Asset decisions (whether for renewal or new emplacement) are consistently made with the appropriate knowledge and consequence information representative of the total expected life or use of the asset;

- A continuous review and determination of reinvestment requirements through thorough condition management practices, risk assessment priority setting, technological improvements and adaptation to changing requirements;

- Implementation of optimization processes necessary to ensure system management, renewal and growth plans are implemented in such a manner as to provide continuous, safe and reliable services and the well managed environment expected for residents, business, innovation and growth;

- Protection of the assets while minimizing total cost of implementation, operation and renewal and delivering the service expected by residents and business communities;

- A means of benchmarking and monitoring the effectiveness of system management policies in conjunction with the IM and operational review performance measurement;

- A strategic link in the preparation and implementation of community design plans and the infrastructure planning process.

5.5 Alternative value assessments

In an integrated infrastructure planning process, "value' incorporates social and environmental considerations as well as economic costs and benefits. In an environment of constrained capital resources, the social and environmental values become an increasingly important component of decision making. MLM must be able to clearly explain and justify the value – economic, social and environmental – of its growth management, capital and operational infrastructure spending decisions.

5.5.1 Green infrastructure

It is clear that local natural resources are important to the long term success of MLM. Application of am economic type model for the natural resource base- green infrastructure – could provide a mechanism to evaluate and compare the value being placed on the natural resources base. The simplest mechanism for determining an economic indicator for the value placed on green infrastructure is to determine total spending on programs related to protection and enhancement of that infrastructure. Another mechanism of assessing economic value is to determine the costs related to replacement of the infrastructure with an alternate source. For instance, how much would it cost MLM to find and supply water if the current river source is no longer there? Benchmark studies are another means to assess, validate and set MLM's level of spending on green infrastructure. MLM's environmental strategy provides further direction regarding its support for its natural environment.

5.5.2 Personal choices

The value system of the residents of MLM is expressed each day by the personal choices that they make. Providing opportunities for the citizens, to make the type of personal choices which have a role and impact on infrastructure planning, is an excellent means by which to include the values of the citizens of MLM, in infrastructure planning. Providing such opportunities in a manner, which offers a benefit over and above the placed on choices (for instance reduction in personal costs) is an effective means for MLM to promote the collective value objectives.
In infrastructure planning, "demand planning" initiatives are seen as one of the best means to incorporate values and personal choice alternatives into the planning process. Many such initiatives undertaken by a city for its own purpose economic, social and environmental value), can be structured to provide opportunities for participation and choices by residents.

For residents to make personal choices they require timely and accurate information regarding infrastructure planning and the impact their choices ca make. MLM must make a commitment to communication with customers and residents to provide the requisite information.

5.6 Public Private partnerships

Public services were originally developed as a cost effective means to deliver a common service to growing populations and as a mechanism of public health policy. In recent times many municipal level governments have chosen to place publicly owned infrastructure and services into semi public or private ownership. While the results of such decisions are considered to be mixed, the opportunity for public-private partnership should be considered in the overall planning of infrastructure and the delivery of value for the service.

For MLM to obtain value from such engagements, it is very crucial to first understand the value (economic, social and environmental) of existing services and to understand the model under which a public-private partnership would deliver the same services. Monitoring the performance of these efforts is a key tool for MLM to understand and confirm the value of public-private partnership opportunities. Accordingly, the city will:

- Recognize and support the value of public service infrastructure;
- Consider opportunities for public-private partnerships in all areas of planning and service delivery;
- Communicate effectively with customers and the public to understand the value upon which MLM can make decisions related to public-private partnerships;
- Benchmark the cost and value of MLM's infrastructure services to those of other municipalities;
- Undertake detailed investigations of models, costs and effectiveness of public-private partnerships in other municipalities in order to confirm the applicability/relevance of opportunities to MLM.

6. EXISTING SERVICES ANALYSES AND SERVICES UPGRADING OPTION

For the analyses of the existing services and the proposed service upgrading options the erven and population (2009 and 2030 estimates) details in Table 4 below were utilised. The population growth rate between 2009 and 2039 was assumed to be 1%.

Table 4: Masilonyana Local Municipality – Erven, Population, Size details

Area	No of Erven	Population 2009	Population 2039	Size (km^2)
Theunissen	738	4,428	4,702	2.37
Masilo	6,353	38,118	51,377	4.44
Totals	**7,091**	**42,546**	**56,079**	**6.81**
Winburg	713	4,278	4,542	2.61
Makeleketla	3,122	18,732	25,248	2.45
Totals	**3,835**	**23,010**	**29,790**	**5.06**
Brandfort	936	5,616	5,963	2.54
Majwemasweu	2,735	16,410	22,118	1.98
Totals	**3,671**	**22,026**	**28,081**	**4.52**
Soutpan	94	188	200	1.13
Ikgomotseng	1,028	5,140	6,928	1.95
Totals	**1,122**	**5,328**	**7,128**	**3.08**
Verkeerdevlei	516	1,032	1,096	1.16
Tshepong	504	2,520	3,397	0.35
Totals	**1,020**	**3,552**	**4,492**	**1.51**
Grand Total	**16,739**	**96,462**	**125,570**	**20.98**

The basis of the elements in the proposed service upgrading options was obtained from Table 2 – proposed level of services for the IM (2009 – 2039) that was approved by MLM.

The details of the existing services were obtained from field investigations, as-built drawings, interviews with MLM officials and various analyses.

The upgrading costs were obtained from current (2009) Construction rates for the various services with cross references to the MIG's "Industry Guide to Infrastructure Service Delivery Levels and Unit Costs".

The primary documents utilised for establishing the relevant upgrade standard for the services were the:

1) "Guidelines for Human Settlement, Planning and Design (CSIR)",

2) The Municipal Infrastructure Grant's (MIG) "Guide for Service Delivery Levels and Unit Costs" and various other Planning and Design documents published by the Department of Water Affairs, Transport and Energy.

6.1 Water Services – Internal

6.1.1 For the older town areas of Theunissen, Winburg, Brandfort, Soutpan and Verkeerdevlei, as part of the Water Demand Management (WDM) and Water Conservation (WC) strategy it is envisaged that all the old existing Asbestos Cement (AC) and Cast Iron (CI) water pipelines will be replaced with uPVC water pipelines to address water losses caused by frequent leaks and pipe bursts. Asbestos cement replacement pipeline will also addresses the health concerns associated with exposure to asbestos.

6.1.2 Based on an evaluation of operational challenges witnessed in the 5 towns with regards to attending to pipe bursts and fixing of leaks on the main water pipeline network, whereby in order to undertake repairs to a pipe burst, the whole town has to have the water supply closed off at the "only" gate valve on the main supply pipeline, it is proposed that in the older town areas of Theunissen, Winburg, Brandfort, Soutpan and Verkeerdevlei, the old existing gate valves and fire hydrants need to be replaced with sufficient numbers new gate valves and fire hydrants to enable efficient isolation of pipe bursts. It is further proposed that MLM's maintenance staff undergo training in operation and maintenance of these new gate valve and fire hydrants to prevent premature damage.

6.1.3 It is proposed that the replacement of the existing Asbestos Cement and Cast iron water pipelines should be done as soon as possible, preferably in the first, 5 year period (2009-2014), however, in recognition of the available funding challenges facing MLM, this work has been budgeted for completion over the next 10 years, up to 2019. The installation and replacement of erf water meters (wm), Fire hydrants (FH), gate valves (GV) and Zone Meters has been similarly scheduled to take place over the next 10 years.

6.1.4 For additional details of the existing and proposed water services (internal) for the 5 towns, please refer to drawing no. P110045/A/1/001, P110045/A/1/002, P110045/A/1/003, P110045/B/1/045, P110045/B/1/046, P110045/B/1/047, P110045/B/1/048, P110045/C/1/089, P110045/C/1/090, P110045/C/1/091, P110045/C/1/092, P110045/D/1/133, P110045/D/1/134, P110045/D/1/135, P110045/E/1/177, P110045/E/1/178, P110045/E/1/179 and P110045/E/1/180.

TABLE 5: WATER SERVICES – INTERNAL

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
THEUNISSEN	Water Networks	21,574 m of AC Pipelines	Poor, frequent bursts due to age (±50yrs)	Replacement of 21,574 m of AC Pipelines with uPVC pipelines	**R 2,329,992.00**
		1,135 m of uPVC Pipelines	Good	None	**R 0.00**
	Water Meters (WM)	447 erf WMs in place	Fair, 291 Erven need WMs	291 New erf WMs are required	**R 505,905.30**
	Fire Hydrants (FH)	39	Poor, 90% need replacement	35 New FHs are required	**R 45,647.00**
	Gate Valves (GV)	63	Poor, 90% need replacement	222 New GVs are required	**R 1,065,111.60**
	Zone Meters (ZM)	1	Fair, more ZMs are required	2 New ZMS are required	**R 157,018.00**
MASILO	Water Networks	67,094 m of uPVC Pipelines	Good	None	**R 0.00**
	Water Meters (WM)	1,498 erf WMs in place	Good, 4,855 erven do not have WMs	4,855 New erf WMs are required	**R 2,666,851.50**
	Fire Hydrants (FH)	93	Poor, 90% need replacement	84 New FHs are required	**R 109,552.80**
	Gate Valves (GV)	156	Poor, 90% need replacement	263 New GVs are required	**R 1,261,821.40**
	Zone Meters (ZM)	3	Good	None	**R 0.00**

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
BRANDFORT	Water Networks	18,867 m of AC Pipelines	Poor, frequent pipe burst due to age (±50yrs)	Replacement of 18,867m of AC Pipelines with uPVC pipelines	**R 2,037,636.00**
		3,459 m of uPVC Pipe	Good	None	**R 0.00**
	Water Meters (WM)	571 erf WMs in place	Fair, 365 erven need WMs	365 New erf WMs are required	**R 200,494.50**
	Fire Hydrants (FH)	56	Poor, 90% need replacement	54 New FHs are required	**R 70,426.80**
	Gate Valves (GV)	69	Poor, 90% need replacement	139 New GVs are required	**R 666,894.20**
	Zone Meters (ZM)	1	Good	None	**R 0.00**
MAJWEMASWEU	Water Networks	30,728m of uPVC Pipelines	Good	None	**R 0.00**
	Water Meters (WM)	1,037 Erf WMs in place	Good, 1,698 erven do not have WMs	1,698 new erf WMs are required	**R 932,711.40**
	Fire Hydrants (FH)	42	Poor, 90% need replacement	38 New FHS are required	**R 49,559.60**
	Gate Valves (GV)	80	Poor, 90% need replacement	244 New GVs are required	**R 1,170,663.20**
	Zone Meters (ZM)	1	Good, 3 more ZMs required	3 New ZMs are required	**R 235,527.00**

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
WINBURG	Water Networks	24,286 m of AC and CI Pipelines	Poor, frequent pipe burst due to age (±50yrs)	Replacement of 24,286 m of AC & CI pipelines with uPVC pipelines	**R 2,622,888.00**
	Water Meters (WM)	371 erf WMs in place	Good, 342 erven do not have WMs	342 new erf WMs are required	**R 187,869.60**
	Fire Hydrants (FH)	59	Poor, 90% need replacement	69 New FHS are required	**R 89,989.80**
	Gate Valves (GV)	90	Poor, 90% need replacement	102 New GVs are required	**R 489,375.60**
	Zone Meters (ZM)	1	Good, 3 more ZMs are required	3 New ZMs are required	**R 235,527.00**
MAKELEKETLA	Water Networks	33,752 m of uPVC pipelines	Good	None	**R 0.00**
	Water Meters (WM)	2,101 erf WMs in place	Good, 1,022 erven need WMs	1,022 new erf WMs are required	**R 561,411.49**
	Fire Hydrants (FH)	29	Poor, 90% need replacement	72 New FHS are required	**R 93,902.40**
	Gate Valves (GV)	33	Poor, 90% need replacement	176 New GVs are required	**R 844,412.80**
	Zone Meters (ZM)	1	Good, 2 more ZMs are required	2 New ZMs are required	**R 157,018.00**

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
SOUTPAN	Water Networks	9,626m of uPVC pipelines AC Pipeline	Poor, frequent pipe burst due to age (±50yrs)	Replacement of 9,626m of AC Pipelines with uPVC pipelines	**R 1,039,608.00**
	Water Meters (WM)	14 erf WMs in place	Good, 80 erven need WMs	80 new erf WMs are required	**R 43,944.00**
	Fire Hydrants (FH)	2	Good	16 New FHS are required	**R 20,867.20**
	Gate Valves (GV)	2	Good	63 New GVs are required	**R 302,261.41**
	Zone Meters (ZM)	0	None	1 new ZM is required	**R 78,509.00**
IKGOMOTSENG	Water Networks	13,446 m of uPVC pipelines	Good	None	**R 0.00**
	Water Meters (WM)	650 erf WMs in place	Good, 378 erven need WMs	378 new erf WMs are required	**R 207,645.35**
	Fire Hydrants (FH)	0	Good	38 New FHS are required	**R 49,559.60**
	Gate Valves (GV)	0	Good	215 New GVs are required	**R 1,031,527.00**
	Zone Meters (ZM)	1	Good	None	**R 0.00**

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
VERKEERDEVLEI	Water Networks	6,940 m of AC Pipelines	Poor, frequent pipe burst due to age (±50yrs)	Replacement of 6,940 m of AC pipelines with uPVC pipelines	**R 749,520.00**
	Water Meters (WM)	48 erf WMs in place	Good, 468 erven need WMs	468 new erf WMs are required	**R 257,072.40**
	Fire Hydrants (FH)	9	Poor, 90% need replacement	14 new FHs are required	**R 18,258.80**
	Gate Valves (GV)	20	Poor, 90% need replacement	33 New GVs are required	**R 158,327.40**
	Zone Meters (ZM)	0	None	1 New ZMs is required	**R 78,509.00**
TSHEPONG	Water Networks	6,997 m of uPVC pipelines	Good	None	
	Water Meters (WM)	466 erf WMs in place	Good, 38 erven need WMs	38 new erf WMs are required	**R 20,873.40**
	Fire Hydrants (FH)	12	Poor, 90% need replacement	16 new FHs are required	**R 20,867.20**
	Gate Valves (GV)	55	Poor, 90% need replacement	70 New GVs are required	**R 335,846.20**
	Zone Meters (ZM)	1	Good, 1 new ZM required	1 new ZMs is required	**R 78,509.00**
				GRAND TOTAL	**R 23,279,911.95**

6.2 Water (Bulk)

6.2.1 The towns of Theunissen/Masilo, Winburg/Makeleketla, Brandfort/Majwemasweu have all primarily utilised surface water sources for their raw water and the upgrading proposals outlined in Table 6 consists of elements of increasing the drawdowns from these existing sources.

6.2.2 The ground water sources have been listed for exploitation to provide at least 20% of the raw water requirements for Winburg/Makeleketla, Brandfort/Majwemasweu and Soutpan,Ikgomotseng, while in Verkeerdevlei/Tshepong, the more boreholes will have to be drilled to meet the town's needs.

6.2.3 The sizing of the various bulk water elements provides for a per capita water consumption of 120 ℓ/day to satisfy the demands up to 2039.

6.2.4 Due to the urgency of providing adequate water supplies to the towns for the waterborne sewerage systems to function properly, the proposal is for the bulk water upgrades to be implemented over the next 10 years up to 2019.

6.2.4 Blue Drop Certification for MLM's Water Treatment Works

Overall		**Sites are categorised as follows:**
Acceptable	All parameters monitored satisfy required minimum standards/guidelines	All parameters monitored satisfy at least SABS 241 – 2001 Class I (Acceptable) Limits or other required minimum guidelines
Needs Attention	One or more parameters monitored do no satisfy required minimum standards/guidelines	One or more parameters monitored do no satisfy SABS 241 – 2001 Class I (Acceptable) Limits or other required minimum guidelines
Needs Urgent Intervention		One or more parameters monitored do not satisfy SABS 241 – 2001 Class II (Maximum Allowable) Limits

Presently, the 4 Water Treatment Works in Masilonyana meet the Blue Drop certification. However, the increased demand for potable water and the pressure on existing raw water sources makes this a critical issue to address from both the physical upgrading element as well as the training and development of maintenance staff.

TABLE 6: WATER (BULK)

	EXISTING SERVICE	CAPACITY /QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
THEUNISSEN / MASILO	Surface Water	Vet River (Sand-Vet GWS), current DWA allocation is 1,818.4Ml/yr	Allocation from DWA is currently insufficient, additional drawing rights will have to be applied for	Additional allocation from DWA of 4,072.7 Ml/year	R 0.00
	Ground water	None	N/A	None	R 0.00
	Water Treatment Works (WTW)	6.8 Mℓ/day	Fair, an upgrade to meet current demand (12.7 Mℓ/day) and the future demand of 16.14 Mℓ/day is required	Extra WTW capacity of 9.34 Mℓ/day	R 38,700,000.00
	Pump stations (PS) - Raw water	1 PS, 79 ℓ/s capacity	Fair, extra capacity is required to supply additional raw water to the WTW from the Vet River	1 new raw water PS with a capacity of 108 ℓ/s	R 6,490,000.00
	Pump stations (PS) - Clear water	2, total capacity of 79 ℓ/s	Fair, 1 new PS to supply the additional potable water to the reservoirs	1 new clear water PS With a capacity of 108 ℓ/s	R 6,490,000.00
	Bulk Pipelines – Raw Water	1, 300 mm dia AC, 0.5 km long	Fair, extra capacity is required to supply additional raw water to the WTW from the Vet River	New 400 mm dia GRP pipeline, 0.5 km long	R 450,000.00
	Bulk Pipelines – Clear Water	2, 300 mm dia AC, 15 km long and 250 mm dia AC, 15 km long	Fair, an additional pipeline from the WTW will be required to deliver the additional potable water to the reservoirs	New 400 mm dia GRP pipeline, 15 km long	R 13,500,000.00
	Reservoirs	4, total capacity of 6.75 Mℓ (3, 2 Mℓ ground and 1, 0.75 Mℓ raised RC)	Good, an upgrade to meet the Current storage demand of 15.4 Mℓ and the future storage demand of 19.6 Mℓ is required	Extra reservoir storage capacity of 12.81 Mℓ	R 14,710,000.00
				TOTAL	**R 80,340,000.00**

	EXISTING SERVICE	CAPACITY /QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
BRANDFORT/ MAJWEMASWEU	Surface Water	Vet River (Sand-Vet GWS), DWA allocation is 1,818.4Ml/year	Allocation from DWA is currently insufficient, additional drawing rights will have to be applied for	Additional allocation from DWA of 1,149.1 Ml/year	R 0.00
	Ground water (Boreholes (BH))	16 existing BHs	Only 4 BHs are currently in use yielding approx. 0.14 Ml/d	Proposal to rehabilitate 6 existing BHs and to drill 18 new boreholes	R 8,740,572.00
	Water Treatment Works (WTW)	2.4 Mℓ/day	Poor, an upgrade to meet current demand (6.6 Mℓ/day) and the future demand of 8.13 Mℓ/day is in progress	Extra WTW capacity of 5.73 Mℓ/day	R 0.00
	Pump stations (PS) - Raw water	3 PSs in series, 40 ℓ/s capacity at each	Fair, extra capacity is required to supply additional raw water to the WTW from the Vet River	New M&E equipment at 3 existing PSs to increase the capacity to 94 ℓ/s	R 1,660,000.00
	Pump stations (PS) - Clear water	1, total capacity of 97 ℓ/s	Good, adequate to meet the future demand	None	R 0.00
	Bulk Pipelines – Raw Water	2, 200 mm dia AC/FC, 30.6 km long	Fair, extra capacity is required to supply additional raw water to the WTW from the Vet River	New 300 mm dia GRP pipeline, 30.6 km long	R 22,950,000.00
	Bulk Pipelines – Clear Water	2, 250 mm dia AC 0.4 km long and 250 mm dia AC, 0.5 km long	Good, adequate to meet future capacity requirements from the WTW to the reservoirs	None	R 0.00
	Reservoirs	3, total capacity of 7.6 Mℓ (3, 2 Mℓ ground and 1, 1.6 Mℓ RC)	Good, an upgrade to meet the current storage demand of 8.0 Mℓ and the future storage demand of 10.0 Mℓ is required	Extra reservoir storage capacity of 2.40 Mℓ	R 2,760,000.00
				TOTAL	**R 36,110,572.00**

	EXISTING SERVICE	CAPACITY /QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
WINBURG/ MAKELEKETLA	Surface Water	3 dams - Rietfontein, Wolwas1 & Wolwas 2, total capacity 1,801 Mℓ	Insufficient to meet present and future raw water demand	New raw water pipeline from Erfenis dam to existing WTW, 30 km long, 300 mm dia GRP pipeline	See Item below on bulk pipelines
	Ground water (Boreholes (BH))	5 BHs, 2 existing, 3 new	None are operational	Proposal to equip these 5 BHs and to drill 18 new boreholes	R 8,363,616.00
	Water Treatment Works (WTW)	3.5Mℓ/day	Poor, an upgrade to meet current demand (6.9 Mℓ/day) and the future demand of 8.6 Mℓ/day is required	Extra WTW capacity of 5.1 Mℓ/day	R 21,100,000.00
	Pump stations (PS) - Raw water	2 PSs, 51.4 ℓ/s capacity at Rietfontein dam, 40 ℓ/s cap. at Laaispruit channel	Fair, extra capacity is required to supply additional raw water to the WTW from Rietfontein dam	Additional M&E equipment at Rietfontein dam to increase capacity to 100ℓ/s	R 3,540,000.00
	Pump stations (PS) - Clear water	1, capacity of 52.5 ℓ/s	Fair, extra capacity will be required to supply additional potable water to the reservoirs	Additional M&E equipment at Rietfontein dam to increase capacity to 100ℓ/s	R 1,480,000.00
	Bulk Pipelines – Raw Water	2, 160 mm dia uPVC, 1.2 km long, 250 mm dia AC, 0.5 km long	Fair, extra capacity is required to supply additional raw water to the WTW from the Rietfontein and Wolwas dams	New 300 mm dia GRP pipeline, 30 km long From Erfenis dam to Rietfontein dam	R 22,500,000.00
	Bulk Pipelines – Clear Water	2, 250 mm dia AC, 4.35 km long and 200 mm dia uPVC, 4.35 km long	Fair, newer 200 mm dia uPVC pipeline failed and the older 250 mm dia AC pipeline is inadequate to meet demand	Project to install a new 300mm dia GRP pipeline to cater for future demand is in progress	R 0.00
	Reservoirs	4, total storage capacity of 4Mℓ capacity	Good, an upgrade to meet the current storage demand of 8.4 Mℓ and the future storage demand of 10.4 Mℓ is required	Extra reservoir storage capacity of 6.40 Mℓ	R 7,350,000.00
				TOTAL	**R 64,333,616.00**

	EXISTING SERVICE	CAPACITY /QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
SOUTPAN/ IKGOMOTSENG	Surface Water	Krugersdrift dam (Modder River GWS) DWA allocation is 185 Ml/year	Allocation from DWA is currently insufficient, additional drawing rights will have to be applied for	Additional allocation from DWA of 563 Ml/year	R 0.00
	Ground water (Boreholes (BH))	7 BHs, 4 existing, 3 new	None are operational	Proposal to equip these 3 boreholes and drill 8 new BHs	R 2,633,065.00
	Water Treatment Works (WTW)	0.75 Mℓ/day	Poor, an upgrade to meet current demand (1.6 Mℓ/day) and the future demand of 2.1 Mℓ/day is required	Extra WTW capacity of 1.3 Mℓ/day	R 25,000,000.00
	Pump stations (PS) - Raw water	1 PS, 9 ℓ/s capacity at Krugersdrift dam	Fair, extra capacity is required to supply additional raw water to the WTW from Krugersdrift dam	Additional M&E equipment at Krugersdrift dam PS to increase capacity to 24ℓ/s	R 380,000.00
	Pump stations (PS) - Clear water	1, capacity of 9 ℓ/s	Fair, extra capacity will be required to supply additional potable water to the reservoirs	Additional M&E equipment at WTW PS to increase capacity to 24ℓ/s	R 750,000.00
	Bulk Pipelines – Raw Water	1, 200 mm dia uPVC, 1.5 km long	Fair, adequate to meet current and future raw water demand to the WTW from Krugersdrift dam	None	R 0.00
	Bulk Pipelines – Clear Water	1, 200 mm dia uPVC, 30 km long g	Fair, adequate to meet current And future potable water Demand to reservoirs from WTW	None	R 0.00
	Reservoirs	1.1 Mℓ capacity	Good, an upgrade to meet the current storage demand of 2.0 Mℓ and the future storage demand of 2.4 Mℓ is required	Extra reservoir storage capacity of 1.30 Mℓ	R 1,490,000.00
				TOTAL	**R 30,253,065.00**

	EXISTING SERVICE	CAPACITY /QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
VERKEERDEVLEI/ TSHEPONG	Surface Water	No viable dams are close to Verkeerdevlei	N/A	None	R 0.00
	Ground water (Boreholes (BH))	8 BHs	Good, all 8 Bhs are operational	Proposal to drill at least 10 new BHs to meet current demand (1.1 Mℓ) and future demand (1.3 Mℓ)	R 4,449,570.00
	Water Treatment Works	None	N/A	N/A	R 0.00
	Pump stations	None	N/A	N/A	R 0.00
	Reservoirs	0.56 Mℓ capacity	Good, an upgrade to meet the current storage demand of 1.3 Mℓ and the future storage demand of 1.6 Mℓ is required	Extra reservoir storage capacity of 1.04 Mℓ	R 1,190,000.00
	Bulk Pipelines	None	N/A	Proposal to construct a pipeline from Thaba Nchu to get water from BloemWater if BHs are insufficient	R 0.00
				TOTAL	**R 5,639,570.00**
GRAND TOTAL					**R 216,676,823.00**

6.3 Sanitation (Internal)

6.3.1 For all the 5 towns, funds were allocated for the Bucket Eradication Programme (BEP) to construct toilets and sewer networks for 8,252 sites in Masilonyana Local Municipality. It has been assumed that this work was completed and all occupied sites in Masilonyana Local Municipality have access to a fully functioning waterborne sewer system and all defects liability problems will be addressed through normal contractual channels and according no provision has been made in the Infrastructure Masterplan for internal sanitation costs.

6.3.2 Any AC Sewer pipelines that need replacement through localised failures will be replaced under the operations and maintenance budget.

6.3.3 For additional details of the existing and proposed sanitation (internal) for the 5 Towns, please refer to drawing no. P110045/A/3/009, P110045/A/3/010, P110045/A/3/011, P110045/B/3/053, P110045/B/3/055, P110045/C/3/097, P110045/C/3/099, P110045/D/3/143, P110045/E/3/186 and P110045/E/3/187.

TABLE 7: SANITATION (INTERNAL)

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
THEUNISSEN / MASILO	Sewerlines (reticulation)	13,374 m of AC pipeline uPVC in Theunissen	Good	None	R 0.00
		13,891 m of uPVC in Masilo	Good	None	R 0.00
	Toilets & Erf Connections (BEP)	3,532	Good	None	R 0.00
BRANDFORT/ MAJWEMASWEU	Sewerlines (reticulation)	15,216 m of AC pipelines in Brandfort	Good	None	R 0.00
		21,119 m of uPVC in Majwemasweu	Good	None	R 0.00
	Toilets & Erf Connections (BEP)	1,575	Good	None	R 0.00
WINBURG/ MAKELEKETLA	Sewerlines (reticulation)	5,268 m of AC pipelines and uPVC in Winburg	Good	None	R 0.00
		24,817 m uPVC in Makeleketla	Good	None	R 0.00
	Toilets & Erf Connections (BEP)	2,261	Good	None	R 0.00
SOUTPAN/ IKGOMOTSENG	Sewerlines (reticulation)	6,206 m uPVC in Ikgomotseng	Good	None	R 0.00
		None in Soutpan	N/A	None	R 0.00
	Toilets & Erf Connections (BEP)	400	Good	None	R 0.00
VERKEERDEVLEI/ TSHEPONG	Sewerlines (reticulation)	None in Verkeerdevlei	N/A	None	R 0.00
		7,222 m UPVC in Tshepong	Good	None	R 0.00
	Toilets & Erf Connections (BEP)	552	Good	None	R 0.00
GRAND TOTAL					**R 0.00**

6.4 Sanitation (Bulk)

6.4.1 For all towns with new proposals, the sanitation services (waste water treatment works, pumping stations, rising mains and outfall sewers), the capacities are to be upgraded to meet the basic levels of service based on the population. They should provide environmentally safe and reliable means of human waste disposal in line with the guidelines for human settlement requirements for health, safety and sustainability.

6.4.2 The upgrading proposals for the waste water treatment works in Theunissen/Masilo, Winburg/Makeleketla and Brandfort/Majwemasweu will meet the DWA General effluent standard. For Soutpan/Ikgomotseng and Verkeerdevlei/Tshepong, the effluent from the Oxidation ponds will be irrigated on adjacent land to address the inability of the Oxidation Ponds systems to meet the DWA General effluent standard.

6.4.3 In light of the urgent need to treat the increased sewer flows from the 5 towns, the waste water treatment works need to be upgraded urgently, preferably within the next 5 years, however, due to funding limitations, it has been proposed that this work should be implemented over the next 10 years, up to 2019.

6.4.4 Green Drop Certification for MLMs Waste Water Treatment Works.

Overall		**Site are Categorised as follows:**
Acceptable	All parameters monitored satisfy least DWAF General Authorisation General Limits	All parameters monitored satisfy at least DWAF General Authorisation General Limits
Needs Attention	One or more parameters monitored do not satisfy DWAF General Authorisation General Limits	One or more parameters physico-chemical parameters (excluding faecal coliforms and COD) monitored do not satisfy DWAF General Authorisation General Limits
Needs Urgent Intervention		Faecal coliforms and/or COD do not satisfy DWAF General Authorisation General Limits

Presently only the Theunissen/Masilo and Winburg/Makeleketla WWTWs meet DWAs green drop certification in terms of compliance with the General Effluent Standard. Brandfort/Majwemasweu, Soutpan/Ikgomotseng and Verkeerdevlei/Tshepong WWTWs do not meet DWAs General Effluent Standard. Accordingly, there is an urgent need to undertake the physical upgrading of these WWTWs to reduce further pollution of the receiving rivers.

TABLE 8: SANITATION (BULK)

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
THEUNISSEN / MASILO	Wastewater Treatment Works (WWTW)	3.5 Mℓ/day activated sludge at Theunissen	Good	Upgrade to 6Mℓ/day	R 20,000,000.00
	Pumpstations (PS)	None	N/A	None	
	Outfall Sewer	400 mm dia uPVC, 1.5 km long	Good	None	
BRANDFORT/ MAJWEMASWEU	Wastewater Treatment Works (WWTW)	2.4 Mℓ/day, Anaerobic ponds with Biological Trickling Filters works	Poor, the WWTW is in urgent need of an upgrade	Upgrade to 3Mℓ/day by adding Activated Sludge unit	R 15,000,000.00
	Pumpstations (PS)	2, Brandfort PS (10 ℓ/s) and Majwemasweu PS (15 ℓ/s)	Good	None	R 0.00
	Rising Mains	2, 250 mm dia uPVC, total length 5 km long	Good	None	
WINBURG/ MAKELEKETLA	Wastewater Treatment Works (WWTW)	1 Mℓ/day activated sludge at Winburg	Good	Upgrade to 3Mℓ/day	R 43,000,000.00
	Pumpstations	3 in Makeleketla, PS 1 (15 ℓ/s), PS 2 (5 ℓ/s) and PS 3 (10 ℓ/s)	Fair	PS 1 & 2 need to be replaced with 1 new PS	R 2,000,000.00
	Outfall Sewer / Rising Mains	2 Rising mains, 250 mm dia AC, 1,5 km Long, 200 mm dia UPVC, 0.6 km long, 1 outfall sewer, 250 mm dia AC, 1 km long	Good	Location of upgraded WWTW will determine the Need for this upgrade	R 8,000,

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
SOUTPAN/ IKGOMOTSENG	Wastewater Treatment Works (WWTW)	0.7 Mℓ/day Oxidation ponds + anaerobic ponds at Ikgomotseng	Good	Upgrade to install irrigation equipment for effluent is in progress	R 0.00
	Pumpstations	None	N/A	None	R 0.00
	Outfall Sewer	1, 250 mm dia uPVC, 0.7 km long	Good	None	R 0.00
VERKEERDEVLEI / TSHEPONG	Wastewater Treatment Works	0.5 Mℓ/day Oxidation ponds	Good	Upgrade to install irrigation equipment for effluent is in progress	R 0.00
	Pumpstations	None	N/A	None	R 0.00
	Outfall Sewer	1, 250 mm dia uPVC, 0.5 km long	Good	None	R 0.00
GRAND TOTAL					**R 88,000,000.00**

6.5 Roads – Bus/Taxi Routes and Internal/Access roads

6.5.1 For all towns with new proposals, the roads infrastructure services (bus/taxi routes and internal/access roads) are to be upgraded to meet the basic levels of services which should provide sustained accessibility and travel safety as per the guidelines on human settlement;

6.5.2 The cost of implementation is spread over a fairly long period in line with financing constraints, since this is a capital intensive undertaking. The costs are to be distributed evenly over six, five year cycles between 2009 and 2039. The various options of spreading the costs are as outlined below:

6.5.2.1 Option I (**Preferred option**) - construct the bus/taxi routes by conventional methods in three gravel layers with a Capeseal surfacing and to spread the cost from 2009 up to 2024, while the internal roads are to be constructed by conventional methods in two gravel layers with a Capeseal surfacing, with the costs spread out from 2015 up to 2039;

6.5.2.2 Option II - construct the bus/taxi routes with concrete block paving (CBP) and two gravel layers, spreading the cost from 2009 up to 2024, while the internal roads are to be constructed with concrete block paving (CBP) and two gravel layers, with the costs spread out from 2015 up to 2039;

6.5.2.3 Option III – construct the bus/taxi routes by conventional methods in three gravel layers with Capeseal surfacing and to spread the costs from 2009 up to 2014 and the internal roads to be ripped and re-gravelled with one layer of imported material, with the costs spread out from 2015 up to 2039;

6.5.2.4 Option IV – construct the bus/taxi routes in concrete block paving (CBP) and two gravel layers, spreading the cost from 2009 up to 2014, while internal roads are to be ripped and re-gravelled with one layer stabilised with Ecobond with the costs spread out from 2015 up to 2039;

6.5.2.5 Options V – construct the bus/taxi routes by conventional methods in three gravel layers with Capeseal surfacing and to spread the costs from 2009 up to 2014, while internal roads are to be constructed in Ecobond with the costs spread out from 2015 up to 2039;

6.5.2.6 Option VI – construct the bus/taxi routes in concrete block paving (CBP) and two gravel layers, spreading the costs from 2009 up to 2014, while internal roads are to be constructed in Ecobond with the costs spread out from 2015 up to 2039.

6.5.3 Ecobond is an innovative stabilising agent that can be utilised on a wide variety of soil types in existing road layer, transforming them into a durable base layer which can then be surfaced with tarmac seal, e.g. Cape Seal. For low volume roads, e.g. the internal or access roads, this presents an opportunity to construct greater lengths of roads at lower costs as is evidenced in options iv, v and vi in the summary of capital costs Table 17.

6.5.4 The philosophy behind the costing of the Pavement Management System (PMS) for internal roads is to have four interventions within the 30 years duration of the masterplan as follows:

a) 1st Intervention – To do resurfacing in the year 2009;
b) 2nd Intervention – To do Minor patching by the year 2016;
c) 3rd Intervention - To do extensive patching and resealing by the year 2023;
d) 4th Intervention – To do Reconstruction by the year 2030.

This is based on best practice for road maintenance works.

6.5.5 For convenient referencing purposes Town A refers to the older town areas of Theunissen, Winburg, Brandfort, Soutpan and Verkeerdevlei while Town B refers to the newer town areas of Masilo, Makeleketla, Majwemasweu and Ikgomotseng and Tshepong.

6.5.6 For additional details of the existing and proposed roads (bus/taxi routes and internal/access roads for the 5 towns, please refer to drawing nos. P110045/A/6/021, P110045/A/6/022, P110045/A/6/023, P110045/A/024, P110045/A/8/031, P110045/A/8/032, P110045/B/6/065, P110045/B/6/066, P110045/B/6/067, P110045/B/6/068, P110045/B/8/075, P110045/B/8/76, P110045/C/6/109, P110045/C/6/110, P110045/C/6/111, P110045/C/6/112, P110045/C/8/119, P110045/C/8/120, P110045/D/6/153, P110045/D/6/155, P110045/D/6/156, P110045/D/8/164, P110045/E/6/197, P110045/E/6/198, P110045/E/6/199, P110045/E/6/200, P110045/E/8/207 and P110045/E/8/208.

(9 & 10) ROADS – BUS/TAXI ROUTES AND ACCESS ROADS

Item	Town	Existing service	Proposed service by 2039	Cost
1	Theunissen	Tarmac roads (49.8%) – 12.38 km	PMS to be applied	R 42,839,451.96
		Gravel roads (50.2%) – 12.46 km	Internal/Access roads (12.4 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	
2	Masilo	Tarmac roads (8.9%) – 6.19 km	PMS to be applied	
		Gravel roads (39.7%) – 27.73 km	Bus/taxi routes (3.16 km) to be upgraded to surfaced/paved standard in the next 15 years. Internal/Access roads (60.5 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	R 48,088,993.05
		Informal roads (51.4%) – 35.93 km		
3	Brandfort	Tarmac roads (93%) – 21.81 km	PMS to be applied	R 82,857,918.79
		Gravel roads (2.2%) – 0.51 km	Internal/Access roads (1.64 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	
		Informal roads (4.8%) – 1.13 km		
4	Majwemasweu	Tarmac roads (8.7%) – 3.08 km	PMS to be applied	R 15,807,155.00
		Paved roads (4.4%) – 1.53 km		
		Gravel roads (86.9%) – 30.62 km	Bus/taxi routes (1.78 km) to be upgraded to surfaced/paved standard in the next 15 years. Internal/Access roads (30.4 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	
5	Winburg	Tarmac roads (26.8%) – 6.87 km	PMS to be applied	
		Paved roads (0.5%) – 0.14 km		R 99,295,516.70
		Gravel roads (53.4%) – 13.66 km	Internal/Access roads (18.59 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	
		Informal roads (19.3%) – 4.93 km		

Item	Town	Existing service	Proposed service by 2039	Cost
6	**Makeleketla**	Tarmac roads (9.9%) – 3.59 km	PMS to be applied	R 18,614,877.99
		Gravel roads (54.2%) – 19.59 km	Bus/taxi routes (3.0 km) to be upgraded to surfaced/paved standard in the next 15 years. Internal/Access roads (28.0 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	
		Informal roads (35.9% – 12.98 km		
7	**Soutpan**	Gravel roads (100%) – 9.24 km	Internal/Access roads (9.24 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	R 0.00
8	**Ikgomotseng**	Tarmac roads (2.2%) – 0.3 km	PMS to be applied	
		Gravel roads (7.2%) – 0.96 km	Bus/taxi routes (1.3 km) to be upgraded to surfaced/paved standard in the next 15 years. Internal/Access roads (10.8 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	R 6,277,512.15
		Informal roads (90.6%) - 12.12 km		
9	**Verkeerdevlei**	Tarmac roads (27.7%) – 4.84 km	PMS to be applied	R 19,549,534.00
		Gravel roads (72.3%) – 12.59 km	Internal/Access roads (12.4 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	
10	**Tshepong**	Paved roads (4.1%) – 0.33 km	PMS to be applied	R 4,740,710.33
		Gravel roads (95.9%) – 7.55 km	Bus/taxi routes (1.68 km) to be upgraded to surfaced/paved standard in the next 15 years. Internal/Access roads (5.78 km) to be upgraded to surface/paved standard over the next 24 years between 2015 – 2039	
GRAND TOTAL				**R 338,071,670.00**

6.6 Stormwater Drainage

6.6.1 For all towns with new proposals, the storm water drainage services (culverts, channels and open drains) capacities are to be upgraded to meet the basic levels of service. They should be durable structures which protect the roads from erosion and flooding damage. They should also be capable of safely channeling away rain water from the roads and settlement areas thus improving on the quality of life of the habitable environment. This is in line with the guidelines for human settlement requirements for health, safety and sustainability.

6.6.2 Due to the significant negative effect on existing infrastructure that uncontrolled stormwater can cause through flooding, it is proposed that surface concrete v-drains in the minor system be constructed throughout the towns while lined open stormwater canals and concrete culverts should be constructed for the major system. The minimum size of culvert or pipe should not be less than 750 mm in diameter to prevent blockages, and allow for easy maintenance.

6.6.3 The costs are to be distributed evenly in three, five year cycles between 2009 and 2024.

6.6.4 For additional details of the existing and proposed stormwater drainage for the 5 towns, please refer to drawing no. P110045/A/7/025, P110045/A/7/026, P110045/A/7/027, P110045/A/7/028, P110045/B/7/069, P110045/B/7/070, P110045/B/7/071, P110045/B/7/072, P110045/C/7/113, P110045/C/7/114, P110045/C/7/115, P110045/C/7/116, P110045/D/7/160, P110045/D/7/162, P110045/E/7/201, P110045/E/7/202, P110045/E/7/203, P110045/E/7/204.

TABLE 11: STORMWATER DRAINAGE

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
THEUNISSEN / MASILO	Stormwater Channels	0	N/A	0	R 0
	Reinforced concrete side drains	556.79 m	Good	69,422.62 m of 1500 x 150 open V drain	R 43,609,040.94
	Reinforced Concrete culverts	0	N/A	0	R 0
BRANDFORT/ MAJWEMASWEU	Stormwater Channels	0	N/A	0	
	Reinforced concrete side drains	3111.53 m	Good	30,053.78 m of 1500 x 150 open V drain	R 18,473,88.56
	Reinforced Concrete culverts	0	N/A	0	
WINBURG/ MAKELEKETLA	Stormwater Channels	198.28 m	Good	0	
	Reinforced concrete side drains	15,205.67 m	Good	14,755.64 m of 1500 x 150 open V drain	R 10,900,784.44
	Reinforced Concrete culverts	1,616.98 m	Good	0	R 0
SOUTPAN/ IKGOMOTSENG	Stormwater Channels	0	N/A	0	R 0
	Reinforced concrete side drains	0	N/A	5,924.42 m of 1500 x 150 open V drain	R 4,376,687.51
	Reinforced Concrete culverts	0	N/A	0	R 0
VERKEERDEVLEI/ TSHEPONG	Stormwater Channels	0	N/A	0	R 0
	Reinforced concrete side drains	1,696.97 m	Good	23,610.58 m of 1500 x 150 open V drain	R 14,605,590.68
	Reinforced Concrete culverts	0	N/A	0	
GRAND TOTAL					**R 92,370,915.00**

6.7 Solid Waste Disposal

6.7.1 The proposed capacities are based on the present and future population with an assumed growth of 1% per annum, a waste generation of 2 kilograms per capita per day and a 120ℓ waste bin per household.

6.7.2 For all towns with new proposals, the solid waste disposal services capacities are to be upgraded to meet the basic levels of service whereby waste is collected at least once per week and safely disposed away from the human settlement using the new waste trucks that will be purchased for each town. This helps to reduces health risks associated with accumulation of garbage and incidental increase of disease spreading vermins and vectors. This is in line with the guidelines for human settlement requirements for health, safety and sustainability.

6.7.3 It is assumed that the disposal sites will be landfills handling **general waste** (waste that does not pose significant health hazards and environmental impacts) only, and no **hazardous waste** (such as toxic, carcinogenic, ignitable and corrosive materials) shall be deposited in them.

6.7.4 It is assumed that proper landfill management practices will be followed and enforced in both existing and future landfill sites, whereby the type of waste involved, the size of waste stream and the potential of significant leachate generation have been duly considered.

6.7.5 That site specific unique needs which may require extra precautionary measures must be addressed as per the DWA, Waste management guidelines.

6.7.6 The costs are to be distributed evenly in two, five year cycles between 2015 and 2024.

TABLE 12: SOLID WASTE DISPOSAL

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
THEUNISSEN / MASILO	Kerb side collection	0	N/A	Provide one waste bin per household (7,091) and 1 new waste truck per town	R 4,336,400.00
	Waste disposal landfill	N/A	Informal dumping sites	New small capacity (> 25 and < 150 Tonnes per day) Landfill as per DWAE Requirements	R 8,000,000.00
BRANDFORT/ MAJWEMASWEU	Kerb side collection	0	N/A	Provide one waste bin per household (3,671) and 1 new waste truck per town	R 2,968,400.00
	Waste disposal landfill	N/A	Informal dumping sites	New small capacity (> 25 and < 150 Tonnes per day) Landfill as per DWAE Requirements	R 8,000,000.00
WINBURG/ MAKELEKETLA	Kerb side collection	0	N/A	Provide one waste bin per household (3,835) and 1 new waste truck per town	R 3,034,000.00
	Waste disposal landfill	N/A	Informal dumping sites	New small capacity (> 25 and < 150 Tonnes per day) Landfill as per DWAE Requirements	R 8,000,000.00
SOUTPAN/ IKGOMOTSENG	Kerb side collection	0	N/A	Provide one waste bin per household (1,122) and 1 new waste truck per town	R 1,948,800.00
	Waste disposal landfill	N/A	Informal dumping sites	Communal landfill with <25 Tonnes per day capacity as per DWAE Requirements	R 4,000,000.00
VERKEERDEVLEI/ TSHEPONG	Kerb side collection	0	N/A	Provide one waste bin per household (1,020) and 1 new waste truck per town	R 1,908,000.00
	Waste disposal landfill	N/A	Informal dumping sites	Communal landfill with <25 Tonnes per day capacity as per DWAE Requirements	R 3,000,000.00
GRAND TOTAL					**R 45,195,600.00**

6.8 Electrical (Internal & Bulk)

6.8.1 For all towns with new extensions, the electrical supply services are to be upgraded to meet the basic levels of service (street lights and high mast lights), in line with the guidelines for human settlement requirements for health, safety and sustainability.

6.8.2 Provision and maintenance of electricity infrastructure in the older towns of Theunissen, Winburg, Brandfort, Soutpan and Verkeerdevlei is managed by Masilonyana Local Municipality while Eskom is responsible for the provision and maintenance of electricity infrastructure in Masilo, Makeleketla, Majwemasweu, ikgomotseng and Tshepong. This arrangement is expected to continue for the foreseeable future.

6.8.3 The annual growth cost provision stated is based on a 1% population growth as per the population figures in table 4.

6.8.4 The annual cost provision for basic services allocates one street light to 4 new households and one high mast light to 30 new households in the high density areas.

6.8.5 For additional details of the existing electrical (internal and bulk) for the 5 towns, please refer to drawing no. P110045/A/9/035, P110045/B/9/077, P110045/B/9/079, P110045/C/9/123, P110045/D/9/167, P110045/E/9/209 and P110045/E/9/211.

TABLE 13 & 14: ELECTRICAL (INTERNAL & BULK)

	EXISTING SERVICE	QUANTITY	STATUS	PROPOSED SERVICE UPGRADING	UPGRADING COST
THEUNISSEN / MASILO	Metered Electricity, street lights and high Mast lights	30 Amps minimum per Household connection	Good	Provision for growth at 1% per year with 1 street light for @ 4 houses; 1 high mast per 30 houses each; electrification and operating costs per year	R 1,845,657.40
BRANDFORT/ MAJWEMASWEU	Metered Electricity, street lights and high Mast lights	30 Amps minimum per Household connection	Good	Provision for growth at 1% per year with 1 street light for @ 4 houses; 1 high mast per 30 houses each; electrification and operating costs per year	R 1,070,759.55
WINBURG/ MAKELEKETLA	Metered Electricity, street lights and high Mast lights	30 Amps minimum per Household connection	Good	Provision for growth at 1% per year with 1 street light for @ 4 houses; 1 high mast per 30 houses each; electrification and operating costs per year	R 1,106,190.45
SOUTPAN/ IKGOMOTSENG	Metered Electricity, street lights and high Mast lights	30 Amps minimum per Household connection	Good	Provision for growth at 1% per year with 1 street light for @ 4 houses; 1 high mast per 30 houses each; electrification and operating costs per year	R 338,885.10
VERKEERDEVLEI /TSHEPONG	Metered Electricity, street lights and high Mast lights	30 Amps minimum per Household connection	Good	Provision for growth at 1% per year with 1 street light for @ 4 houses; 1 high mast per 30 houses each; electrification and operating costs per year	R 268,023.40
GRAND TOTAL					**R 4,629,515.90**

7. Geotechnical Investigations Data

7.1 Bearing in mind that all infrastructure is built upon the existing ground, the Municipality should have a reliable geotechnical data base. Tests were therefore conducted targeting the potential development areas in each township and the results are presented in Table 15. This information is useful in guiding decision making for developers of infrastructure.

7.2 For additional details of the test hole positions for geotechnical investigation data for the 5 towns, please refer to drawing no. P110045/A/11/041, P110045/A/11/043, P110045/B/11/085, P110045/B/11/087, P110045/C/11/129, P110045/C/11/131, P110045/D/11/173, P110045/D/11/175, P110045/E/11/217 and P110045/E/11/219.

TABLE 15: GEOTECHNICAL INVESTIGATIONS

	Existing Ground Conditions	Recommendations
Theunissen (TH 2)	Light brown Clayey soils with high PIs and weathered dolerite and grave from 1.0 m deep and rock from 1.2 m deep in some areas	Building foundations should allow for expansive clayey soils and other services that require deeper installations need significant allowance for rock
Masilo (TH_s 1,3 & 4)	Yellow Clayey soils with high PIs, weathered dolerite and gravel from 0.5 m deep and dolerite rock from 1.0 m deep	Building foundations should allow for expansive clayey soils and other services that require deeper installations need significant allowance for rock
Winburg (TH_s 1 & 2)	Brown Clayey soils with high at PIs at shallow depths and dolerite rock at depths of 0.4 m deep in some areas.	Building foundations should allow for highly expensive soils and rock at shallow depths up to 0.5 m deep in some areas
Makeleketla (TH_s 1 & 2)	Clayey soils with high PIs with some dolerite gravel at depths up to 1.0 m deep	Building foundations should allow for highly expansive clayey soils and rock at depths from 1.2 m deep in most areas
Brandfort (TH 4)	Reddish brown Clayey soils with high PIs up to depths of 1.0 m with gravel or rock at shallow depths	Building foundation should allow for highly expansive clayey soils up to 1.0 m deep and little rock thereafter
Majwemasweu (TH_s 1,2 & 3)	Brown Clayey soils with medium PIs up to depths of 1.0 m and some gravel at deeper levels.	Building foundations should allow for expansive Clayey soils up to 1.0 deep and some rock at depths from 1.5 m deep
Soutpan (TH 1)	Brown sandy clayey soils with low PIs and shale rock at shallow depths up 0.6 m deep	Building foundations should allow for slightly expansive clayey soils and rock at shallow depths from 0.6 m deep
Ikgomotseng (TH_s 1,2 & 3)	Yellow clayey soils with some dolerite gravel in places of medium PIs with dolerite rock at depths of 1.5 m deep in some areas	Building foundations should allow for medium expansive clayey soils and rock from depths of 1.5 m deep in some areas
Verkeerdevlei (TH_s 1 & 2)	Dark brown clayey soils of medium PIs up to depths of 0.6 m and dolerite gravel up to depths of 1.0 m and limited rock at depths beyond 1.5 m	Building foundations should allow for medium expansive clayey soils with some dolerite gravel up to 1.0 and some dolerite rock from 1.5 m deep
Tshepong (TH_s 3 & 4)	Light brown clayey soils with high PIs up to depths of 0.5 m and dolerite gravel up to depths of 1.0 m thereafter dolerite rock at depths of 1.2 m in some areas	Building foundations should allow for highly expansive clays with dolerite gravel from 0.5 m deep. Dolerite rock will present from depths of 1.2 m in some areas

8. GLOBAL FINANCIAL SUMMARIES

The overall financial expenditure for Masilonyana Local Municipality for the Infrastructure Masterplan between 2009 and 2039 is divided into two groups namely capital expenditure (Capex) and operation and maintenance expenditure (O&M) as shown in tables 16, 17, 18 and 19 below.

8.1 Capital Expenditure (CAPEX) Summaries

Due to the various options available to Masilonyana Local Municipality to upgrade the roads these are again presented in 6 different options derived as follows:

1) Option I (**Preferred option**) - Construct the bus/taxi routes by conventional methods in three gravel layers with a Capeseal surfacing and to spread the cost from 2009 up to 2024, while the internal roads are to be constructed by conventional methods in two gravel layers with a Capeseal surfacing, with the costs spread out from 2015 up to 2039;

2) Option II - Construct the bus/taxi routes with concrete block paving (CBP) and two gravel layers, spreading the cost from 2009 up to 2024, while the internal roads are to be constructed with concrete block paving (CBP) and two gravel layers, with the costs spread out from 2015 up to 2039;

3) Option III – Construct the bus/taxi routes by conventional methods in three gravel layers with Capeseal surfacing and to spread the costs from 2009 up to 2014 and the internal roads to be ripped and re-gravelled with one layer of imported material, with the costs spread out from 2015 up to 2039;

4) Option IV – Construct the bus/taxi routes in concrete block paving (CBP) and two gravel layers, spreading the cost from 2009 up to 2014, while internal roads are to be ripped and re-gravelled with one layer stabilised with Ecobond with the costs spread out from 2015 up to 2039;

5) Options V – Construct the bus/taxi routes by conventional methods in three gravel layers with Capeseal surfacing and to spread the costs from 2009 up to 2014, while internal roads are to be constructed in Ecobond with the costs spread out from 2015 up to 2039;

6) Option VI – Construct the bus/taxi routes in concrete block paving (CBP) and two gravel layers, spreading the costs from 2009 up to 2014, while internal roads are to be constructed in Ecobond with the costs spread out from 2015 up to 2039.

For the purposes of this report the full summary presented is for option (I) above in Table 16 only, the full summaries for options II, III, IV, V and VI are presented in Annexure B while their summary table is presented in Table 17.

Table 16.1: Capital Costs (CAPEX) - Option 1

Services	2009 - 2014	2015 - 2019	2020 - 2024	2025 - 2029	2030 - 2034	2035 - 2039	Total cost (ZAR)
Water (internal)	R 11,639,956	R 11,639,956					R 23,279,912
Water (bulk) & raw water sources	R 108,338,412	R 108,338,412					R 216,676,823
Sanitation (bulk)	R 44,000,000	R 44,000,000					R 88,000,000
Roads (Bus/Taxi/Routes-Option 1)	R 112,690,557	R 112,690,557	R 112,690,557				R 338,071,670
Roads (Internal) Town A		R 9,424,327	R 9,424,327	R 9,424,327	R 9,424,327	R 9,424,327	R 47,121,636
Roads (Internal) Town B		R 23,597,119	R 23,597,119	R 23,597,119	R 23,597,119	R 23,597,119	R 117,985,593
Stormwater drainage	R 30,790,305	R 30,790,305	R 30,790,305				R 92,370,915
Solid waste		R 22,597,800	R 22,597,800				R 45,195,600
Electricity	R 6,185,425	R 6,185,425	R 6,185,425	R 6,185,425	R 6,185,425	R 6,185,425	R 37,112,550
Sub Total (1)	**R 313,644,654**	**R 369,263,900**	**R 205,285,532**	**R 39,206,871**	**R 39,206,871**	**R 39,206,871**	**R 1,005,814,699**
Professional fees (20%)	R 62,728,931	R 73,852,780	R 41,057,106	R 7,841,374	R 7,841,374	R 7,841,374	R 201,162,940
Sub Total (2)	**R 376,373,585**	**R 443,116,680**	**R 246,342,639**	**R 47,048,245**	**R 47,048,245**	**R 47,048,245**	**R 1,206,977,638**
Escalation costs (10%)	R 37,637,358	R 44,311,668	R 24,634,264	R 4,704,824	R 4,704,824	R 4,704,824	R 120,697,764
Sub Total (3)	**R 414,010,943**	**R 487,428,348**	**R 270,976,903**	**R 51,753,069**	**R 51,753,069**	**R 51,753,069**	**R 1,327,675,402**
VAT (14%)	R 57,961,532	R 68,239,969	R 37,936,766	R 7,245,430	R 7,245,430	R 7,245,430	R 185,874,556
Total cost	**R 471,972,475**	**R 555,668,316**	**R 308,913,669**	**R 58,998,499**	**R 58,998,499**	**R 58,998,499**	**R 1,513,549,958**

TABLE 17: CAPITAL COSTS (CAPEX) – SUMMARY OF OPTIONS I - VI

Options	2009 - 2014	2015 - 2019	2020 - 2024	2025 - 2029	2030 - 2034	2035 - 2039	Total cost (ZAR)
Option I	R 471,972,475	R 555,668,316	R 308,913,669	R 58,998,499	R 58,998,499	R 58,998,499	R 1,513,549,958
Option II	R 386,526,703	R 427,210,123	R 180,455,476	R 100,117,056	R 100,117,056	R 100,117,056	R 1,294,543,469
Option III	R 375,628,825	R 345,024,753	R 98,270,106	R 17,931,686	R 17,931,686	R 17,931,686	R 872,718,742
Option IV	R 386,526,703	R 370,516,879	R 123,762,231	R 43,423,811	R 43,423,811	R 43,423,811	R 1,011,077,246
Option V	R 375,628,825	R 363,255,590	R 116,500,943	R 36,162,522	R 36,162,522	R 36,162,522	R 963,872,924
Option VI	R 386,526,703	R 363,255,590	R 116,500,943	R 36,162,522	R 36,162,522	R 36,162,522	R 974,770,802

8.2 Operations and Maintenance (OPEX) Summaries

To establish realistic Operation and Maintenance (OPEX) estimates for the proposed new infrastructure as well as the existing infrastructure, it was necessary to evaluate Masilonyana Local Municipality's 2009/2009 budget as well as industry average OPEX Costs.

To establish OPEX Costs for existing infrastructure, it was necessary to estimate the value of the existing infrastructure. This value was calculated utilising current construction materials and current construction industry rates, refer to Table 18 for details.

The OPEX Costs for the following services were calculated based on 10% of the average total value of the service at the end of each 5 year period:

i) Water – Internal and Bulk;
ii) Sanitation - Internal and Bulk;
iii) Stormwater Drainage.

The OPEX Costs for both Bus/Taxi routes and Internal/Access roads were calculated utilising PMS guidelines.

The OPEX Costs for Electricity and Solid Waste were obtained from analysing MLM's budget and including only non-employee remuneration items. The estimated OPEX Cost for Solid Waste removal was estimated at 50% of that of Electricity.

With reference to the options available to MLM for upgrading of the roads, six OPEX options are also available and only option I is included in this report Table 19.1), the other five options are presented in Annexure C and the Summaries are presented in Table 20.

Allowing for alternative methods of calculating the OPEX Costs, the sensitivity analyses of the final costs would range within a ±15% margin.

The Combined value of the CAPEX and OPEX Costs is presented in Table 21 and provides a reliable estimate of the costs of upgrading the infrastructure services for Masilonyana Local Municipality between 2009 and 2030.

TABLE 18: ESTIMATED ASSET VALUE OF EXISTING INFRASTRUCTURE

	SERVICE	EXISTING SERVICES	ASSET VALUE OF EXISTING INFRASTURE
1	Water (Internal)	Metered yard taps and water reticulation network with gate valves, fire hydrant and zone meters	R 79,254,287.00
2	Water (bulk) & raw water sources	Water treatment works, reservoirs, pump stations, ground water (boreholes) and surface water (dams, rivers) sources	R 190,198,156.00
3	Sanitation (Internal)	Toilet structures on each erf with full connection to the sewer network or existing properties connected to the sewer network and VIP toilets for the rural areas	R 119,103,990.00
4	Sanitation (Bulk)	Waste Water treatment works and pump stations	R 37,312,857.00
5	Roads (Bus or Taxi Routes)	Tar or Paved streets with kerbs and Public transport facilities	R 76,666,792.00
6	Roads (Access/Internal)	Gravel roads	R 218,205,484.00
7	Storm water drainage	Open storm water channels, reinforced concrete side drains and reinforced concrete culverts	R 14,984,300.00
8	Solid waste disposal	Waste collection and informal waste disposal landfill sites	R 1,000,000.00
9	Electricity (Internal)	Every house with a metered electricity connection With a minimum capacity of 30 Amps for low income house holds	R 10,815,350.00
10	Electricity (bulk)	Street lights and high mast lights and LV and HV transformers	R 85,968,167.00
GRAND TOTAL			**R 833,509,383.00**

TABLE 19.1: OPERATIONS AND MAINTENANCE COSTS (OPEX) – OPTION 1

Services	2009 - 2014	2015 - 2019	2020 - 2024	2025 - 2029	2030 - 2034	2035 - 2039	Total cost (ZAR)
Water (internal)	R 9,089,424	R 9,205,824	R 10,126,406	R 11,139,047	R 12,252,952	R 13,478,247	R 65,291,900
Water (bulk) & raw water sources	R 29,853,657	R 30,937,041	R 34,030,745	R 37,433,819	R 41,177,201	R 45,294,921	R 218,727,384
Sanitation (bulk)	R 8,131,286	R 8,571,286	R 9,428,414	R 10,371,256	R 11,408,381	R 12,549,219	R 60,459,842
Roads (Bus/Taxi/Routes-PMS			R 11,269,056	R 11,269,056	R 12,395,961	R 12,395,961	R 47,330,034
Roads (Internal) Town A - PMS				R 6,928,340	R 7,621,174	R 8,383,291	R 22,932,805
Roads (Internal) Town B - PMS				R 17,014,864	R 18,716,350	R 20,587,985	R 56,319,200
PMS Town A	R 52,879,672	R 58,167,640	R 63,984,404	R 70,382,844	R 77,421,128	R 85,163,241	R 407,998,930
PMS Town B	R 15,131,907	R 16,645,097	R 18,309,607	R 20,140,568	R 22,154,625	R 24,370,087	R 116,751,891
Stormwater drainage	R 4,577,460	R 4,885,364	R 5,035,207	R 5,538,727	R 6,092,600	R 6,701,860	R 32,831,218
Solid waste	R 3,092,713	R 3,401,984	R 3,742,182	R 4,116,400	R 4,528,040	R 4,980,844	R 23,862,163
Electricity	R 6,185,425	R 6,803,968	R 7,484,364	R 8,232,801	R 9,056,081	R 9,961,689	R 47,724,327
Sub Total (1)	**R 128,941,544**	**R 138,618,202**	**R 163,410,385**	**R 202,567,722**	**R 222,824,494**	**R 243,867,347**	**R 1,100,229,693**
Escalation costs (10%)	R 12,894,154	R 13,861,820	R 16,341,038	R 20,256,772	R 22,282,449	R 24,386,735	R 110,022,969
Sub Total (2)	**R 141,835,698**	**R 152,480,022**	**R 179,751,423**	**R 222,824,494**	**R 245,106,943**	**R 268,254,082**	**R 1,210,252,662**
VAT (14%)	R 19,856,998	R 21,347,203	R 25,165,199	R 31,195,429	R 34,314,972	R 37,555,571	R 169,435,373

Total cost	**R 161,692,696**	**R 173,827,226**	**R 204,916,623**	**R 254,019,923**	**R 279,421,915**	**R 305,809,653**	**R 1,379,688,035**

Table 20: OPERATIONS AND MAINTENANCE COSTS (OPEX) – SUMMARY OF OPTIONS I - VI

Options	2009 - 2014	2015 - 2019	2020 - 2024	2025 - 2029	2030 - 2034	2035 - 2039	Total cost
Option I	R 161,692,696	R 173,827,226	R 204,916,623	R 254,019,923	R 279,421,915	R 305,809,653	R 1,379,688,035
Option II	R 161,692,696	R 173,827,226	R 197,796,141	R 250,325,988	R 275,358,587	R 302,894,446	R 1,361,895,084
Option III	R 161,692,696	R 173,827,226	R 204,916,623	R 250,597,688	R 275,657,457	R 301,668,749	R 1,368,360,439
Option IV	R 161,692,696	R 173,827,226	R 197,796,141	R 245,601,551	R 270,161,706	R 296,406,676	R 1,345,485,997
Option V	R 161,692,696	R 173,827,226	R 204,916,623	R 252,116,925	R 277,328,617	R 303,507,025	R 1,373,389,112
Option VI	R 161,692,696	R 173,827,226	R 197,796,141	R 244,996,444	R 269,496,088	R 295,674,496	R 1,343,483,091

TABLE 21: COMBINED VALUE OF CAPEX AND OPEX COSTS

Options	2009 - 2014	2015 - 2019	2020 - 2024	2025 - 2029	2030 - 2034	2035 - 2039	Total cost
Option I	R 633,665,171	R 729,495,542	R 513,830,292	R 313,018,422	R 338,420,414	R 364,808,152	R 2,893,237,994
Option II	R 548,219,399	R 601,037,349	R 378,251,617	R 350,443,044	R 375,475,643	R 403,011,501	R 2,656,438,552
Option III	R 537,321,521	R 518,851,979	R 303,186,729	R 268,529,374	R 293,589,143	R 319,600,435	R 2,241,079,181
Option IV	R 548,219,399	R 544,344,104	R 321,558,373	R 289,025,362	R 313,585,517	R 339,830,487	R 2,356,563,242
Option V	R 537,321,521	R 537,082,816	R 321,417,565	R 288,279,447	R 313,491,140	R 339,669,548	R 2,337,262,036
Option VI	R 548,219,399	R 537,082,816	R 314,297,084	R 281,158,966	R 305,658,610	R 331,837,019	R 2,318,253,893

8.3 Sources for funding for Masilonyana Local Municipality

8.3.1 Masilonyana Local Municipality is a relatively poor municipality with large numbers of indigent people with a relatively small agriculturally based economy, therefore internally generated funds for CAPEX and OPEX are limited.

8.3.2 The normal source of funds for CAPEX and OPEX are:

a) The Municipal Infrastructure Grant (MIG), the 2009/2010 allocation was **R 21.7 million** rand and for planning purpose this will be increased by 15% per year for the next 10 years, this is MLM's Principle source of CAPEX funding;

b) The Free State Provincial Government (FSPG) provides approximately **R 3 million** per year, and for planning purposes, this will be increased by 10% per year for the next 10 years, these funds are normally utilised for CAPEX;

c) The National Government's Equitable Share allocation to MLM was **R 23.8 million** in 2009/2010 and for planning purpose this will be increased by 15%, this is MLM's principle source of OPEX funding;

d) Masilonyana Local Municipality's Service Charges Surplus was **R 2.0 million** in 2009/2010 and for planning purposes it will be increased by 25% per year with increased revenue collection expected from households with metered water connections;

e) Masilonyana Local Municipality's Property Rate Surplus was **R 3.0 million** in 2009/2010 and with the implementation of the Property Valuation Roll in 2010 extending to the Gold and Diamond mines and farms within MLM, significant additional income is expected from this source in future for planning purposes, it will be estimated that R 10 million per year, increasing by 10% per year will be raised over the next 25 years from 2014;

f) Other funds, e.g. Electrification grant, the Regional Bulk Water Infrastructure Grant (MIG), the Bulk Sanitation Infrastructure Grant (BSIG) and other special funding vehicles will contribute towards Masilonyana Local Municipality's CAPEX requirements. It is assumed that the Bulk Water and Bulk Sanitation upgrading requirements will be funded through the RBIG and BSIG funds through a Department of Water Affairs National Initiative.

g) It is proposed that projections for MLM's CAPEX and OPEX funding can only be made for the next 10 years, up to 2019, due to the high possibility of changes in funding to local authorities in the future.

Table 22: Projected Funding Sources for Masilonyana Local Municipality's Infrastructure Masterplan

ITEMS	YEARS	2009 - 2014	2015 - 2019
	FUNDING SOURCE		
1	**MIG**	R 146,310,000	R 255,870,000
2	**FSPG**	R 20,230,000	R 35,400,000
3	**NATIONAL GOVERNMENT (Equitable Share)**	R 160,470,000	R 280,690,000
4	**MLM FUNDS (Service Charges Surplus)**	R 13,480,000	R 23,600,000
5	**MLM FUNDS (Property Rates Surplus)**	R 20,230,000	R 35,400,000
6	**RBIG & BSIG**	R 152,340,000	R 152,340,000
TOTALS		**R 513,060,000**	**R 783,329,000**

From Table 21, and assuming the funding projection in item 8.3.2 are realised, the shortfall between the CAPEX and OPEX Costs and the Projected Funds is R 120,61 million between 2009 – 2014 and positive R 53,79 million between 2014 – 2019.

9. GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND CAD DRAWINGS

As a result the field investigations and analyses of the record information available, ISA & Partners compiled all the services information onto CAD drawings (refer to the list in the Table of Contents and the accompanying book of drawings).

These drawings provide details of the existing services as well as the proposed upgrading options.

At the inception of this project for the Compilation of the IM, MLM had also commenced on a project to install a financial GIS package to assist in its collection of rates and services. The Infrastructure GIS was to have had linkages with the financial GIS system for convenience of MIL in the future.

ISA & Partners has prepared the basic GIS database and accompanying shape files for all five towns in MLM, (refer to Annexure A for the Roads Assessment GIS data sheets) which will be the basis for a fully interactive GIS system for MLM utilising Arc View GIS. Unfortunately, by the time preparation of the Infrastructure GIS database was finalised, the challenges with the implementation of the financial GIS system had not been resolved and the envisaged integration was not possible.

It is envisaged that MLM will obtain the Arc View GIS package and have trained personnel who will be able to administer the infrastructure GIS.

10. REFERENCES

1. Integrated Development Plan (IDP), Masilonyana Local Municipality, 2009-2010

2. Water Services Development Plan (WSDP), Masilonyana Local Municipality, 2004-2005

3. Spatial Development Plan (SDP), Masilonyana Local Municipality, 2009

4. Technical Guidelines for the Development of Water and Sanitation Infrastructure, Department of Water Affairs and Forestry, 2004

5. Guidelines for Human Settlement, Planning and Design, CSIR, 2006

6. Various technical guidelines for roads, water, sanitation, solid waste, etc