cooperative governance

Department:
Cooperative Governance
REPUBLIC OF SOUTH AFRICA

MOHOKARE
LOCAL MUNICIPALITY

MUNICIPAL INFRASTRUCTURE SUPPORT AGENCY

PROJECT: MISA/002/2013/TPSP/PROVINCES

PROVISION OF ENGINEERING AND PROJECT MANAGEMENT SUPPORT TO LOCAL MUNICIPALITIES

ABBREVIATED

MASTER PLAN FOR ROADS & STORMWATER

FOR

MOHOKARE LOCAL MUNICIPALITY

(SECOND DRAFT: 6 DECEMBER 2013)

PRO-PLAN
consulting engineers (pty) ltd

MAIN INDEX

EXECUTIVE SUMMARY

A: GENERAL

INDEX

1. INTRODUCTION

1.1 Appointment / Terms of Reference

Pro-Plan Consulting Engineers (Pty) Ltd was appointed by the Municipal Infrastructure Support Agency (MISA) to provide engineering and project management support to certain municipalities in Free State Province, one of which is Mohokare Local Municipality (LM). The commencement and completion dates of the project are 1 March 2013 and 30 June 2014 respectively.

In accordance with the requirements of the appointment, a Project Implementation Plan (PIP) was prepared in consultation with MISA and Mohokare LM, in which the project scope, budget, milestones and time frames were included. Infrastructure master planning was identified as a necessary task, with an abbreviated roads and stormwater master plan being one of the milestones.

1.2 Background information

Mohokare LM is situated in the Xhariep District Municipality, in the southern part of Free State Province, and comprises the towns of Smithfield/Mofulatshepe, Rouxville/Roleleathunya and Zastron/Matlakeng, as well as the surrounding rural areas as demarcated by the Demarcation Board of South Africa. The municipality shares a boundary with Lesotho to the east and the Eastern Cape to the south, further bordering Kopanong Municipality to the west and Naledi Municipality to the north.

According to the Mohokare SDF Review 2011/2012, the total population in 2007 was 41 859, representing a population density of approximately 5 persons/km^2. The total number of households in 2007 is given as 10 216, which implies an average household size of 4 persons.

There is also a general tendency of migration from rural to urban areas, as is the case in the rest of the province, which is characterised by mainly low-income individuals and households. The majority of the rural population is active within the agricultural sector.

In accordance with the Municipal Structures Act (Act 117 of 1998) Mohokare LM has been classified as a Category B municipality, meaning that it consists of a plenary executive system combined with a ward participatory system.

Figure A1 indicates a locality plan of Mohokare LM, while the road map in Figure A2 shows the three towns.

1.3 Key physical features

The main physical features of the municipality include the following:

- National route N6, which traverses the municipality in a north-south direction.

- The Caledon River, which crosses the N6 in an east-west direction between Smithfield and Rouxville.
- The Aasvoëlberg with the Eye of Zastron, a 9m wide hole through sandstone rock.
- The Orange River, which borders the municipality to the south and is a key water resource area of importance at both provincial and national levels.

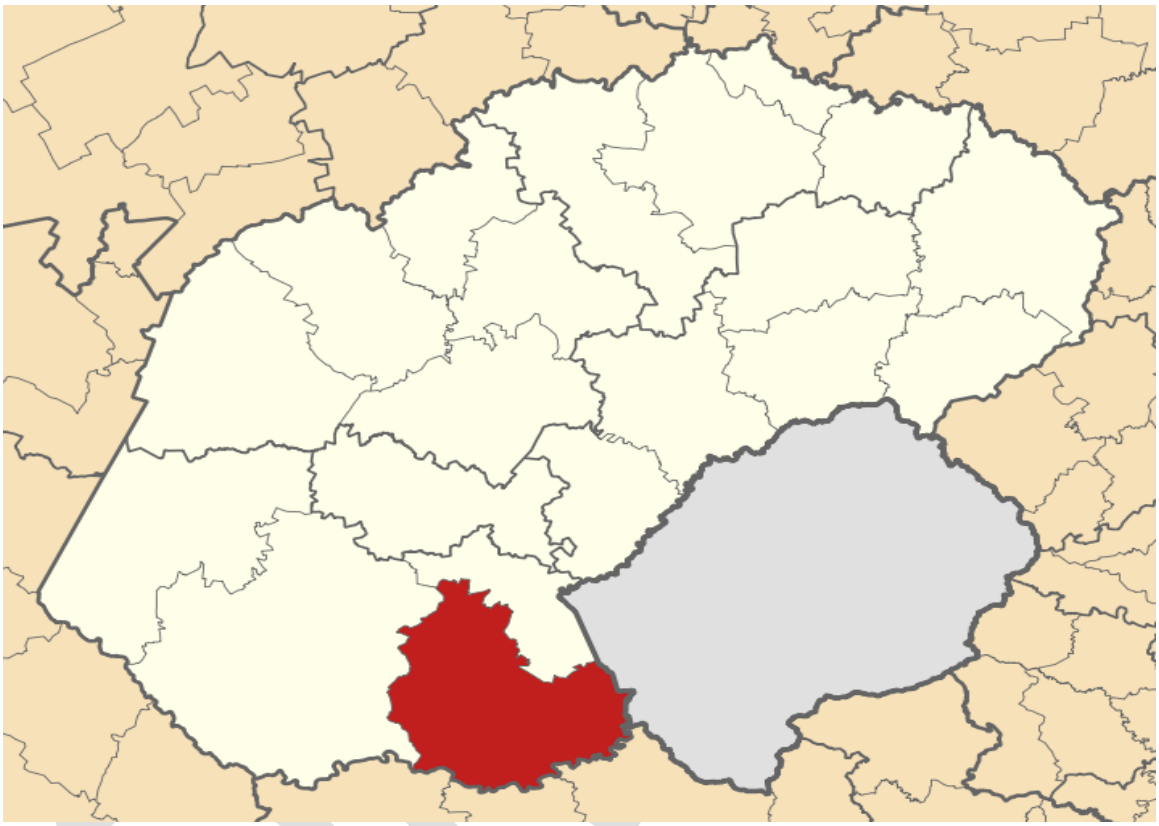

Figure A1: Locality plan of Mohokare LM

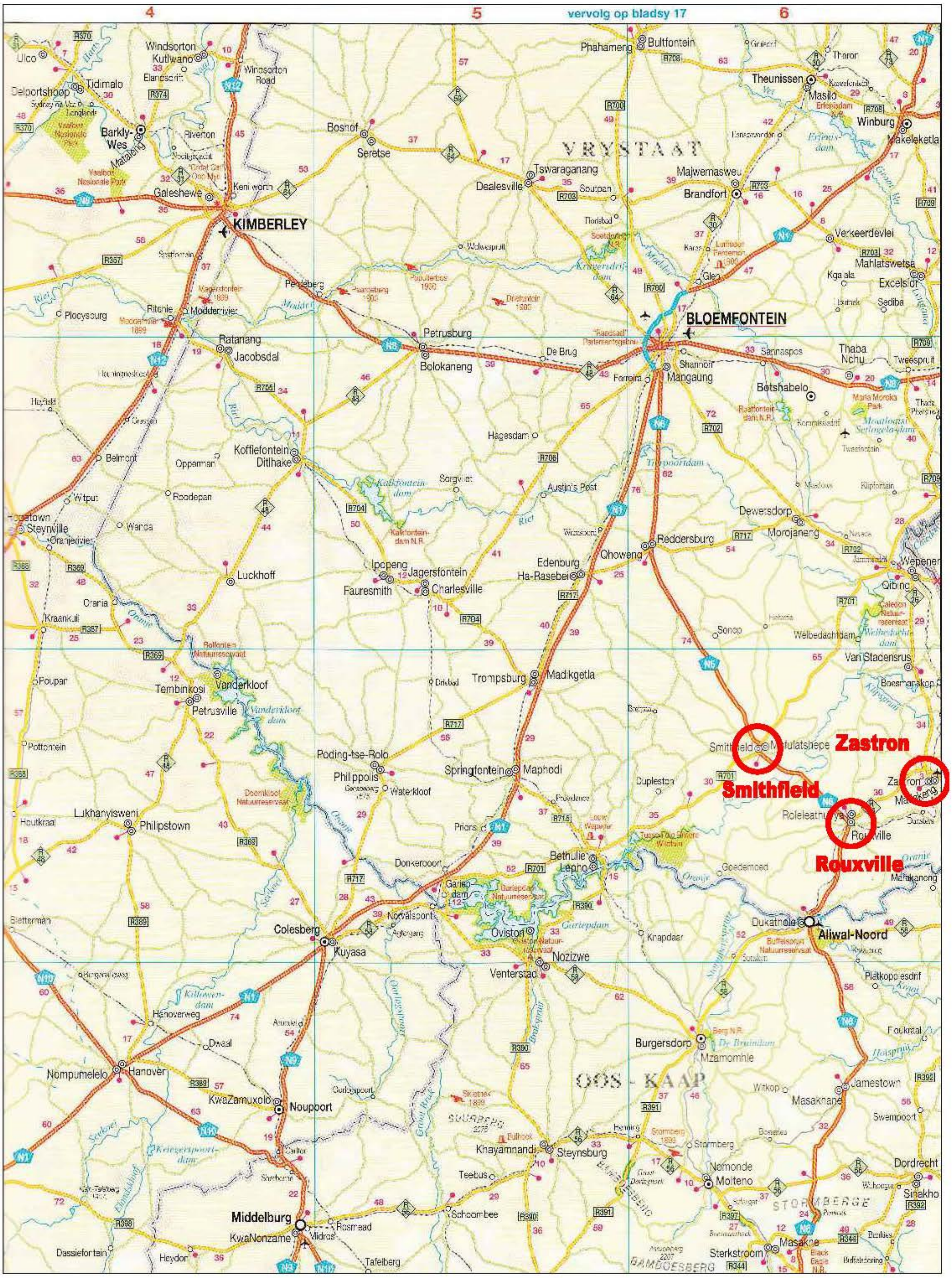

Figure A2: Road map of the towns comprising Mohokare LM

2. STUDY AREA

The urban boundaries currently include the following areas:

- Smithfield, with the townships of Mofulatshepe and Rietpoort to the east.
- Rouxville, with the townships of Roleleathunya to the north-east and Uitkoms to the south-east.
- Zastron, with the townships of Matlakeng, Refengkgotso, Phomolong, Esibeleng and New Rest to the east.

In addition to the above, future planning indicates proposed new developments as follows:

Smithfield:

- An area of high density residential development to the south-west; and
- an area of light industry development to the south-east.

Rouxville:

- An area of high density residential development north of Roleleathunya, adjacent to the N6;
- an area of business development around the N6/R26 intersection; and
- an area of light industry development on the western edge of Rouxville.

Zastron:

- An area of high density residential development to the north.

B: MASTER PLAN – ROADS

INDEX

1. INTRODUCTION

1.1 Background

The road network within the Mohokare LM area of jurisdiction consists of national, provincial, district and local municipal roads. The responsibility for the vast majority of urban roads and streets (much of which are unsurfaced) rests with Mohokare LM.

1.2 Objectives of the Master Plan

The objectives of the abbreviated Roads Master Plan are:

- A status quo evaluation of the road systems already in place;
- an engineering determination of the required elements of the road systems; and
- a prioritisation of projects required to manage, complete and maintain the road scheme(s) in the short, medium and long term.

Factors influencing the development of Mohokare up to the present will be taken into account, and a guideline for the further phased development of the roads management scheme(s) will be proposed.

Implicit in the objectives of the Master Plan are the following sub-objectives related to service delivery:

- Ensuring the preservation of the road network;
- protecting investment and promoting road safety;
- improving access to communities; and
- promoting non-motorised transport.

The following additional sub-objectives of the Master Plan are related to poverty alleviation:

- Ensuring utilisation of local labour to enhance job creation; and
- facilitating empowerment of contractors and suppliers from historically disadvantaged backgrounds.

An aspect hindering the development of a comprehensive roads master plan is the fact that Mohokare has no Local Economic Development strategy. The areas of interest have therefore not been defined.

2. INFRASTRUCTURE

2.1 Status quo evaluation

2.1.1 General

The road infrastructure of Mohokare LM is varied in terms of level of service within each of the towns, and also varies from town to town. Poor quality of some roads, particularly in the

townships, makes access difficult, especially for emergency vehicles. Bus transport is also not possible in these areas.

Transportation is one of peoples' fundamental needs. It provides the essential link between activities and is also one of the important factors for promotion of social and economic development. It has a major impact, not only on the physical form of the towns within the municipality, but also on the liveability of these towns and the interaction between them.

In the previously disadvantaged areas transport infrastructure is almost non-existent except for taxis, and the main mode of transport is non-motorised, such as walking and cycling. There are, however, few facilities to promote this type of transport. Bicycle paths and lanes are the main infrastructure element defining bicycle transportation as a distinct system, and Mohokare LM should prepare a plan to encourage the use of bicycles and provide the necessary infrastructure. The quality of the pedestrian system and its facilities are also important, and pedestrian volumes are significant at times. There is thus a need for the provision and maintenance of sidewalks in these areas.

Table B1: Classes of road and street infrastructure in Mohokare (Source: Xhariep District Municipality ITP)

Class of road infrastructure (km)					Level of street infrastructure in urban area (km)			
National	**Access**	**Primary**	**Secondary**	**Total**	**Surfaced**	**Gravel**	**Graded**	**Total**
125	10	235	1424	1794	21	60	90	171

The attached plan shows which roads are surfaced and which are of gravel.

2.1.2 Smithfield/Mofulatshepe

With the exception of the main N6 through-route (Voortrekker Street and President Hoffman Street, which have recently been upgraded) and some other surfaced roads, the streets in Smithfield are mostly of gravel. These are in relatively good condition. Photograph 1 below illustrates a typical street in Smithfield.

The gravel streets in Mofulatshepe and Rietpoort, on the other hand, are mostly in poor condition. Erosion is common, and re-gravelling and re-shaping are required, as illustrated in photograph 2. Erosion generally takes place on steep sections of gravel roads. These sections are difficult to maintain and should be surfaced. It is recommended that concrete block paving be used for this purpose, as it is conducive to job creation opportunities.

The section of Kerk Street over the Groenspruit, where there is a low-level bridge, should be upgraded urgently, as flooding is a frequent occurrence and is a cause of much inconvenience to motorists and pedestrians (see photograph 3). This section of road is also badly eroded.

Photograph 1: Typical gravel road in Smithfield (good condition).

Photograph 2: Gravel roads on steep slopes are subject to erosion, as this street in Rietpoort shows.

Photograph 3: The section of Kerk Street over the Groenspruit in Mofulatshepe is subject to frequent flooding and should be upgraded urgently.

2.1.3 Rouxville/Roleleathunya

With the exception of the main streets which are surfaced, the roads in Rouxville are mostly of gravel. These are generally in good condition. However, some shaping of the verges is required in order to facilitate proper drainage. This is illustrated in photograph 4 below. Maintenance is also urgently required at the edges of some surfaced roads where the surfacing has broken away (see photograph 5). If this is not done timeously, the damage will spread further.

Street name boards are generally lacking in Rouxville. This is an inconvenience for visitors and tourists.

Streets in Roleleathunya are a mixture of gravel and concrete block paving. The paved roads are in very good condition (photograph 6), while the gravel sections are generally in need of shaping in order to facilitate proper drainage (photograph 7). Some of the streets are just dirt tracks.

It is recommended that the gravel and dirt roads in Roleleathunya be surfaced with concrete block paving, as this type of construction lends itself to job creation and skills building.

Photograph 4: This street in Rouxville needs shaping of the verge in order to facilitate proper drainage.

Photograph 5: Edge break at a surfaced road in Rouxville. This requires urgent repair in order to prevent further damage.

Photograph 6: Posholi Street in Roleleathunya is constructed of concrete block paving and is in very good condition. This type of construction is recommended.

Photograph 7: This gravel track in Roleleathunya is eroded and needs to be gravelled and properly shaped in order to facilitate efficient drainage.

2.1.4 Zastron/Matlakeng

A mixture of surfaced and gravel roads are evidenced in Zastron and Matlakeng. The condition of the surfaced roads varies from fair to poor, and the gravel roads from poor to very poor. Erosion is common, the surfaced roads are breaking up and showing block cracking in places, while the gravel roads are badly in need of shaping. Gravel roads are also neglected, with grass growing through in places. A fog spray on some sections of the surfaced roads will be beneficial. Other road sections require complete reconstruction; concrete block paving is recommended as it is durable and also lends itself to labour intensive construction and thus job creation.

Photographs 8 to 14 illustrate some of the problems.

Photograph 8: Potholing of the main access road from R26 to Zastron. Reconstruction will be necessary in places.

Photograph 9: The street outside the hospital is breaking up and needs maintenance urgently.

Photograph 10: Many streets in Zastron are breaking up. Urgent maintenance is required before the situation gets worse and major reconstruction becomes necessary.

Photograph 11: Van Riebeeck Street in Zastron is eroded in places. Gravel roads with steep slopes should rather be paved. Concrete block paving is recommended.

Photograph 12: The main access road between Zastron and Matlakeng can no longer be patched and reconstruction is required.

Photograph 13: This surfaced road in Matlakeng has been neglected and major repair work is required.

Photograph 14: This is a typical gravel street in Matlakeng. It is eroded and inconvenient for cyclists and pedestrians. Re-gravelling should be undertaken.

2.2 Condition assessment

The existing roads vary considerably in quality. There is a need to begin a proper road management programme in order to ensure good maintenance. The deteriorating condition of particularly surfaced roads, as a result of irregular maintenance, is a tangible concern. There are no detailed pavement conditions available to determine or predict the life of the roads or to prepare a strategic plan for maintenance and upgrading.

The trend has been to allow the riding quality and structural condition of a pavement to deteriorate to a poor condition before taking measures to redress the situation. This has often resulted in high-cost rehabilitation projects. In some instances the municipality has not been able to afford such costly projects, and the result is very poor roads that sometimes lead to accidents.

2.3 Asset management

One of the important issues identified is the lack of proper asset management programmes. This will inevitably lead to further deterioration of the infrastructure and poor service provision. It is therefore of cardinal importance that asset management programmes be initiated as a matter of urgency. A comprehensive pavement management system (PMS) should be developed and adhered to.

The concept of preventive maintenance is encouraged. Preventive pavement management is about applying the right treatment to the right pavement at the right time. For preventive pavement management, it is critical to have a sound pavement management system in place.

2.4 Priorities

Priority should be given to maintenance of existing assets before any new work is undertaken. This means repair or reconstruction of surfaced roads in order to reinstate them to a good condition, and regravelling and reshaping of gravel and dirt roads. The latter is especially important for efficient stormwater drainage to take place, and to control erosion. A well-constructed and well-maintained gravel road provides a good level of service.

In order to carry out this work departmentally, the municipality will need to purchase various items of construction equipment, and also employ sufficient trained personnel to operate them. Minimum equipment will be a grader, a self-propelled roller, a hand-operated roller, a loader, a TLB and at least three tipper trucks, as well as a number of general workers. A concrete mixer should also be provided. Well-situated gravel borrow pits are essential.

Consideration can also be given to outsourcing the work, as this will obviate the problem of lack of trained operators. General labourers, however, should be drawn from the nearby communities in order to create local work opportunities. Outsourcing the maintenance of roads should be done on a yearly basis in order to provide continuity and to avoid regular protracted procurement procedures.

Maintenance and reconstruction work should target main access and transport routes first, followed by local streets. Consulting engineers should be appointed to carry out initial investigative work and to provide plans and specifications. They should also develop a full PMS and assist the municipality to implement it.

3. TECHNICAL CRITERIA

Reference should be made to chapters 7 and 8 of the CSIR publication *Guidelines for Human Settlement Planning and Design* ("Red Book") for the consideration of all elements of design and construction of roads in the municipality. This should encompass geometric design options, construction materials and methods, as well as management of new and existing roads.

4. BACKLOGS AND FUTURE DELIVERY REQUIREMENTS

4.1 Community infrastructure needs and policy options

There are areas within Mohokare Municipality that do not have an acceptable level of service of roads infrastructure. Decisions regarding infrastructure development must be made within the framework of the IDP and the available resources. The appropriate service levels should be selected and questions must be asked about affordability and sustainability. Infrastructure development has ongoing cost implications for municipalities and different infrastructure assets can have varying cost implications depending on the level of service. External funding is often available for infrastructure development, but ongoing operating and maintenance costs must be paid from the municipal budget.

Different policy options should be considered when deciding on infrastructure development, for example:

- Basic level of service : Graded
- Intermediate level of service : Gravelled
- Full level of service : Paved with kerbs.

4.2 Community involvement

All infrastructure programs are important, but some may be more urgent than others. For example, water and proper sanitation facilities are basic needs, and may be more important for a community than improving the roads or stormwater drainage. It is important to involve the community in setting the priorities and to keep communication channels such as ward committee meetings open and transparent in order to properly discuss programmes and priorities. In this manner, ownership of the infrastructure is taken by the communities. Awareness is also created about available financial resources, thus projects can be prioritised.

5. PROJECT LIST

5.1 General

The implementation of the spatial planning proposals as contained in the Spatial Development Framework (SDF) will require renewal and/or upgrading of various infrastructure services.

The projects identified for prioritisation were drawn from the IDP as well as from discussions with the Technical Department of Mohokare LM. A technical analysis was used to propose projects that would contribute to solving the key issues identified in the IDP.

5.2 Service levels

Service level is a concept used to describe the level of infrastructure provision (see section 4.1 above). Within Mohokare LM the long term goal is to provide all citizens with the same level of service, irrespective of property value or levels of rates and taxes being paid. Due to imbalances inherited from the past, however, this will not be possible for the foreseeable future. As an interim measure, minimum levels of service should be adopted. In the prioritisation of projects, cognisance should be taken of wards where minimum service levels are not being met, and these should enjoy preference. Backlogs in terms of service levels, therefore, form part of the prioritisation method proposed.

5.3 Project list

This is shown in Annexure A.

6. CONCLUSIONS

The main focus of this abbreviated Roads Master Plan was to consolidate and coordinate all the planning actions of Mohokare LM. The purpose was to present an acceptable infrastructure development plan to the Municipality in order to assist with the implementation of projects that will ensure the improvement and sustainability of the current road infrastructure.

The Master Plan should be seen as the first step in a continuous process consisting of:

- Project identification, normally based on a recognised problem or need;
- preliminary design of project solution;
- inclusion of project in database and on maps;
- prioritisation of projects;
- allocation of funding and project execution;
- updating of project status in database and on maps; and
- development of an asset management programme for all the infrastructure.

The above process should be integrated into the normal operation of the Technical Department of Mohokare LM.

ANNEXURE A

PROJECT LIST - ROADS

C: MASTER PLAN – STORMWATER

INDEX

1. INTRODUCTION

1.1 General

The building of roads, parking areas, the erection of buildings and the general improvement of land associated with development all have a direct impact on the hydraulic properties of the towns/townships in the Mohokare area of jurisdiction. By removing natural grass veld and replacing this with impermeable roofs or less permeable surfaces, the stormwater runoff properties are significantly altered. The construction of conduits and canalisation of natural watercourses routes the runoff of stormwater more effectively through a developed area, but at a greater velocity and in greater volumes than previously experienced in these catchment areas.

By altering the natural stormwater flow properties, a need arises for stormwater management while minimising the negative impacts of development.

In Clause 19 of the National Water Act (Act 36 of 1998) the prohibition of pollution is addressed. Of note here is that if pollution of a water resource occurs or might result from activities on land, the person who controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources.

1.2 Objectives of the master plan

The objectives of the abbreviated Stormwater Master Plan are:

- A status quo evaluation of the stormwater systems already in place;
- an engineering determination of the required elements of stormwater systems; and
- a prioritisation of projects required to manage, complete and maintain the stormwater scheme(s) in the short, medium and long term.

In terms of planning hierarchy, a Stormwater Master Plan fits in between a Catchment and River Management Plan and a Local Stormwater Plan. In practice, a Stormwater Master Plan concerns the functioning of bulk infrastructure within a catchment, and includes implementation tasks and schedules. However, it is difficult to determine implementation details in advance, as many variables are involved.

2. PURPOSE OF STORMWATER MANAGEMENT

The principles on which stormwater management is based are as follows:

- The need to protect the health, welfare and safety of the public and to protect property from flood hazards by safely routing and discharging stormwater;
- the quest to improve the quality of life of affected communities;
- the opportunity to conserve water and make it available to the public for beneficial uses;
- the responsibility to preserve the natural environment;

- the need to strive for a sustainable environment while pursuing economic development;
- the desire to provide optimum methods of controlling runoff in such a way that the main beneficiaries pay in accordance with their potential benefits;
- the need to ensure that artificial loading on wastewater treatment works (WWTW) is minimised; and
- the need to minimise the influence of faecal contamination in stormwater runoff.

While these goals may be reflected in other disciplines – and indeed may even be in apparent conflict with one another – specific objectives supporting these overall goals need to be identified by the planning team for each particular project.

3. INFRASTRUCTURE

3.1 Status quo evaluation

3.1.1 General

Mohokare Municipality does not currently have a Stormwater Bylaw or Stormwater Management Policy in place. It is recommended that such documents be compiled in accordance with the principles discussed in section 3.2 below.

Besides piped drainage, the various towns and townships rely to a large extent on surface drainage of stormwater, by means of roads and additional infrastructure such as unlined and lined channels.

The stormwater infrastructure can best be described as aged. In a number of cases capacity problems are also experienced, due in large part to accumulation of debris in the pipes and surface drains. This debris (gravel, silt, refuse, etc.) should be removed in order that the stormwater systems can function efficiently.

In some cases culverts crossing the roads have collapsed. In other cases grids from inlets have been stolen, which exacerbates the problem of refuse being deposited in the systems. Cast iron grids should be replaced by concrete ones.

There is a direct relationship between the stormwater runoff and increased sewage influent at the various WWTW, indicating that stormwater is entering the sewerage network. This problem needs to be attended to as a matter of urgency.

The major stormwater risks for Mohokare have been identified as follows:

- Stormwater bylaws and stormwater management policies not in place;
- stormwater ingression at sewer pipes;
- stormwater conduits and surface drains are obstructed or cannot handle the runoff;
- erosion;
- ponding takes place in streets, resulting in inaccessibility and damage to road surfaces;
- flooding takes place, which results in damage to property, and which also poses a risk of injury or loss of life;

- stormwater from domestic property being channelled into sewer gullies in many cases; and
- sewage overflows and enters the stormwater system or natural resources, resulting in environmental pollution.

3.1.2 Smithfield/Mofulatshepe

Stormwater drainage in Smithfield is mainly via surface channels in the road reserves. These appear to work well, but are in need of maintenance. Photograph 1 shows a typical stormwater channel.

In the Roads Master Plan above, mention was made of erosion of streets in Mofulatshepe and Rietpoort. Photograph 2 illustrates this. Proper shaping of roads and channels is required here. Channels should also preferably be lined.

Photograph 3 shows the low-level crossing of the Groenspruit (extension of Kerk Street) in Mofulatshepe/Rietpoort. The culvert openings are clearly too small and the crossing is subject to frequent flooding. As mentioned, this section of road should be upgraded urgently. Photograph 4 illustrates the natural size of the Groenspruit further north in Mofulatshepe.

Photograph 1: Typical stormwater channel in Smithfield.

Photograph 2: Proper shaping of gravel roads and channels is required in Mofulatshepe and Rietpoort. Channels should preferably be lined.

Photograph 3: The low-level crossing of Kerk Street over the Groenspruit in Mofulatshepe.

Photograph 4: The Groenspruit in its natural state in Mofulatshepe. This should be compared with the small opening allowed under Kerk Street (photograph 3 above).

3.1.2 Rouxville/Roleleathunya

Surface drainage is generally the norm in Rouxville and Roleleathunya. Erosion takes place where the drains are not lined. Some streets in Roleleathunya have been provided with concrete channels, but the roads are not suitably shaped and thus do not drain properly. This is illustrated in photograph 5. The same conditions exist in Rouxville (photograph 6).

Photograph 5: Gravel street in Roleleathunya. The road is not properly shaped so the channel does not drain the road effectively – grass grows where the water ponds.

Photograph 6: Street in Rouxville. The verge needs to be trimmed and shaped in order to facilitate proper drainage.

3.1.3 Zastron/Matlakeng

Drainage in Zastron is typically via lined channels adjacent to the roads, as shown in photograph 7. These appear to be working well, although some maintenance is required in a few places. In contrast to this, drainage in Matlakeng and Refengkgotso is rudimentary, and in many cases non-existent. This is a cause of great inconvenience to pedestrians and cyclists. Re-gravelling and shaping of roads and construction of lined channels will alleviate this problem. Photograph 8 illustrates the problem of poor drainage.

Photograph 7: An example of a good drainage channel in Zastron.

Photograph 8: Example of non-existent stormwater drainage in Matlakeng. This problem is common in the townships and can be alleviated by re-gravelling and shaping the road and constructing lined drains.

3.2 Required stormwater systems and strategy

3.2.1 General

Property developers, whether private or municipal, need to take heed of the important role they play in stormwater management. For example, a typical local authority requirement for new developments is that peak runoff must be reduced to pre-development levels before being released into the downstream infrastructure. The principle that developers must manage their own stormwater is generally accepted as reasonable.

Traditionally, runoff from frequent (minor) storms has been carried in the urban formal drainage systems. Typically this was achieved by draining runoff from properties onto the streets and then via conduits to the natural watercourses. The system was intended to accommodate frequent storms and associated runoff. Today, the value of property is of such significance that engineers need to consider not only the frequent storms but the more severe storms as well, which can cause major damage with sometimes catastrophic consequences. The dual system incorporates a *minor system* for the frequent storm events and a *major system* for the less frequent but severe storm events. The major system may include conduits and natural or artificial channels, but may also make use of the road system to convey runoff overland to suitable points of discharge. This is not very different from what has happened *de facto* except that formal recognition is now given to the routing of runoff from all storms via the secondary use of roads and other facilities in the urban environment.

During minor storm events the two functions of urban roads, namely the function of carrying vehicular, cycle and pedestrian traffic and the function of stormwater management, should not be in conflict. During major storm events the traffic function will be interrupted and the flood control function becomes more important as the roads will also act as channels. It is, however, important to acknowledge that during major storm events it is still important to be able to render emergency services, and major roadways and bus routes should therefore be designed to accommodate vehicular traffic in these instances.

A good road layout can substantially reduce the cost of the stormwater system, and thus also road maintenance costs.

Because Mohokare will for a number of years have a substantial length of gravel roads and gravel developing areas, the stormwater contributions from these areas will carry a large amount of grit that will quickly silt up and reduce the efficiency of open channels and underground stormwater conduits or even render the network useless. Use of pipelines in high-erosion environments is not recommended for this reason. This means that the design of even the minor stormwater systems should rather take into consideration the use of lined, above-ground stormwater channels in the short and medium term. Once funds become available for road surfacing and the extensive development of large areas has taken place, then the gradual phasing-in of underground stormwater conduits will be possible and preferable.

Roads with steep gradients should, as far as possible, not be used as drainage ways, nor should any adjacent side-drain be constructed without proper erosion protection. This protection can include drop structures, lining, or regular drainage from the roadway into intersecting roads or drainage ways.

Where the whole roadway is used as a drainage way for the major system, erosion protection on the lower road edge may need to be considered. The crossfall of the road should generally be against the natural ground slope so that the whole road width can act as a drainage way in the major system. To maximise the storage function of roads as part of the drainage system in major storm events, the township layout should be planned so that the greatest length of road closely follows the ground contour (the contour-planning concept).

3.2.2 Floodlines

It is well known that the hydrological properties of a catchment area and a watercourse are changed by developments. The timely determination of floodlines will greatly assist in directing developments and thus reducing the possibility of loss of life or property in any area. It is therefore recommended that the most important floodlines, such as the 1:25, the 1:50 and the 1:100 year floodlines are determined by Mohokare LM for all land set aside for development. This will assist in placing facilities such as sports fields in certain locations to aid flood management, while schools, churches, houses and high-value businesses are placed in safer areas.

Tables C1 and C2 below provide important guidelines on flood recurrence intervals for design purposes.

Table C1: Design flood frequencies for major stormwater systems

Land use	Design flood recurrence interval
Residential	50 years
Institutional (e.g. schools)	50 years
General commercial and industrial	50 years
High value central business districts	50 – 100 years

Table C2: Design flood frequencies for minor stormwater systems

Land use	Design flood recurrence interval
Residential	1 – 5 years
Institutional (e.g. schools)	2 – 5 years
General commercial and industrial	5 years
High value central business districts	5 – 10 years

3.2.3 Environmental management

Stormwater management and environmental management go hand in hand, and it is thus important for Mohokare LM to take note of the following:

(a) Principles of the National Environmental Management Act (Act 107 of 1998):

- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option [2(4b)].
- Sensitive, vulnerable, highly dynamic or stressed ecosystems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure [2(4r)].

(b) Principles of the Development Facilitation Act (Act 67 of 1995):

- Policies and administrative practices should promote efficient and integrated land development in that they encourage environmentally sustainable land development practices and processes [3(1c)(viii)].
- Each proposed land development area should be judged on its own merits and no particular use of land, such as residential, commercial, conservational, industrial, community facility, mining, agricultural and public use, should in advance or in general be regarded as being less important or desirable than any other use of land [3(1j)].

3.3 Asset management

One of the important issues identified, as in the roads master plan above, is the lack of proper asset management programmes. This will inevitably lead to the deterioration of the

infrastructure and poor service provision. It is therefore of cardinal importance that asset management programmes be initiated as a matter of urgency. In all catchments, the watercourses and built stormwater infrastructure should be maintained in a clean state, free of any rubbish, debris and other matter likely to pose a pollution threat to the lower reaches of the watercourses.

No stormwater network can function optimally if the infrastructure is not maintained regularly. This requires adequate funds to be allocated to the maintenance budget. Maintenance is of particular importance in areas where there are no overland escape routes to carry surplus runoff when the underground system fails, such as kerb inlets, pipe conduits and box culverts. As described above, the general approach to urban stormwater management in South Africa is to accommodate minor events in the underground pipe network and to route the surplus runoff from major events overland – typically via the road network.

3.4 Priorities

Since good stormwater drainage and proper road construction are complementary and inseparable, reference should be made to section 2.4 of the Roads Master Plan above.

It is proposed that, as far as possible, stormwater drainage be facilitated by the use of open channels, as these are seen to work well where they have been implemented. Only road crossings should be piped underground. Channels should be constructed and shaped integrally with the roads in order to derive full benefit. It is recommended that channels be lined in order to facilitate efficient drainage and to reduce maintenance. Priority should be given to improving the drainage in the townships where gravel roads, poor drainage conditions and erosion predominate. Upgrading of the low-level crossing of Kerk Street over the Groenspruit should receive preference.

There is also an area west of President Hoffman Street (the N6) on the southern side of Smithfield, which is subject to periodic flooding. The tributary of the Groenspruit, which traverses this area, should be properly canalised and combined with a series of detention ponds. The area can then be developed into a park.

4. TECHNICAL CRITERIA

Reference should be made to chapter 6 of the CSIR publication *Guidelines for Human Settlement Planning and Design* (“Red Book”) for the consideration of all future collection, transport and disposal elements of stormwater in the municipality. This should encompass design options and design criteria, as well as management of the installed systems.

5. BACKLOGS AND FUTURE DELIVERY REQUIREMENTS

5.1 Community infrastructure needs and policy options

There are areas within Mohokare Municipality that do not have an acceptable level of service of stormwater drainage. Decisions regarding infrastructure development must be made within the framework of the IDP and the available resources. The appropriate service levels should

be selected and questions must be asked about affordability and sustainability. Infrastructure development has ongoing cost implications for municipalities and different infrastructure assets can have varying cost implications depending on the level of service. External funding is often available for infrastructure development, but ongoing operating and maintenance costs must be paid from the municipal budget.

Different policy options should be considered when deciding on infrastructure development, for example:

- Basic level of service : Open channel - earth
- Intermediate level of service : Open channel - lined
- Full level of service : Piped systems (if required).

Since National Government has a pro-poor policy, the poorest should be prioritised when resources are scarce. This also determines the type of infrastructure development the Council is willing to provide, and at what cost.

5.2 Community involvement

All infrastructure programs are important, but some may be more urgent than others. For example, water and proper sanitation facilities are basic needs, and may be more important for a community than improving the roads or stormwater drainage. It is important to involve the community in setting the priorities and to keep communication channels such as ward committee meetings open and transparent in order to properly discuss programmes and priorities. In this manner, ownership of the infrastructure is taken by the communities. Awareness is also created about available financial resources, thus projects can be prioritised.

6. PROJECT LIST

6.1 General

The projects identified for prioritisation were drawn from the IDP as well as from discussions with the Technical Department of Mohokare LM. A technical analysis was used to propose projects that would contribute to solving the key issues identified in the IDP.

6.2 Service levels

Service level is a concept used to describe the level of infrastructure provision (see section 5.1 above). Within Mohokare LM the long term goal is to provide all citizens with the same level of service, irrespective of property value or levels of rates and taxes being paid. Due to imbalances inherited from the past, however, this will not be possible for the foreseeable future. As an interim measure, minimum levels of service should be adopted. In the prioritisation of projects, cognisance should be taken of wards where minimum service levels are not being met, and these should enjoy preference. Backlogs in terms of service levels, therefore, form part of the prioritisation method proposed.

6.3 Project list

This is shown in Annexure B.

7. CONCLUSIONS

The main focus of this abbreviated Stormwater Master Plan was to consolidate and coordinate all the planning actions of Mohokare LM. The purpose was to present an acceptable infrastructure development plan to the Municipality in order to assist with the implementation of projects that will ensure the improvement and sustainability of the current stormwater infrastructure.

The Master Plan should be seen as the first step in a continuous process consisting of:

- Project identification, normally based on an recognised problem or need;
- preliminary design of project solution;
- inclusion of project in database and on maps;
- prioritisation of projects;
- allocation of funding and project execution;
- updating of project status in database and on maps; and
- development of an asset management programme for all the infrastructure.

The above process should be integrated into the normal operation of the Technical Department of Mohokare LM.

ANNEXURE B

PROJECT LIST - STORMWATER