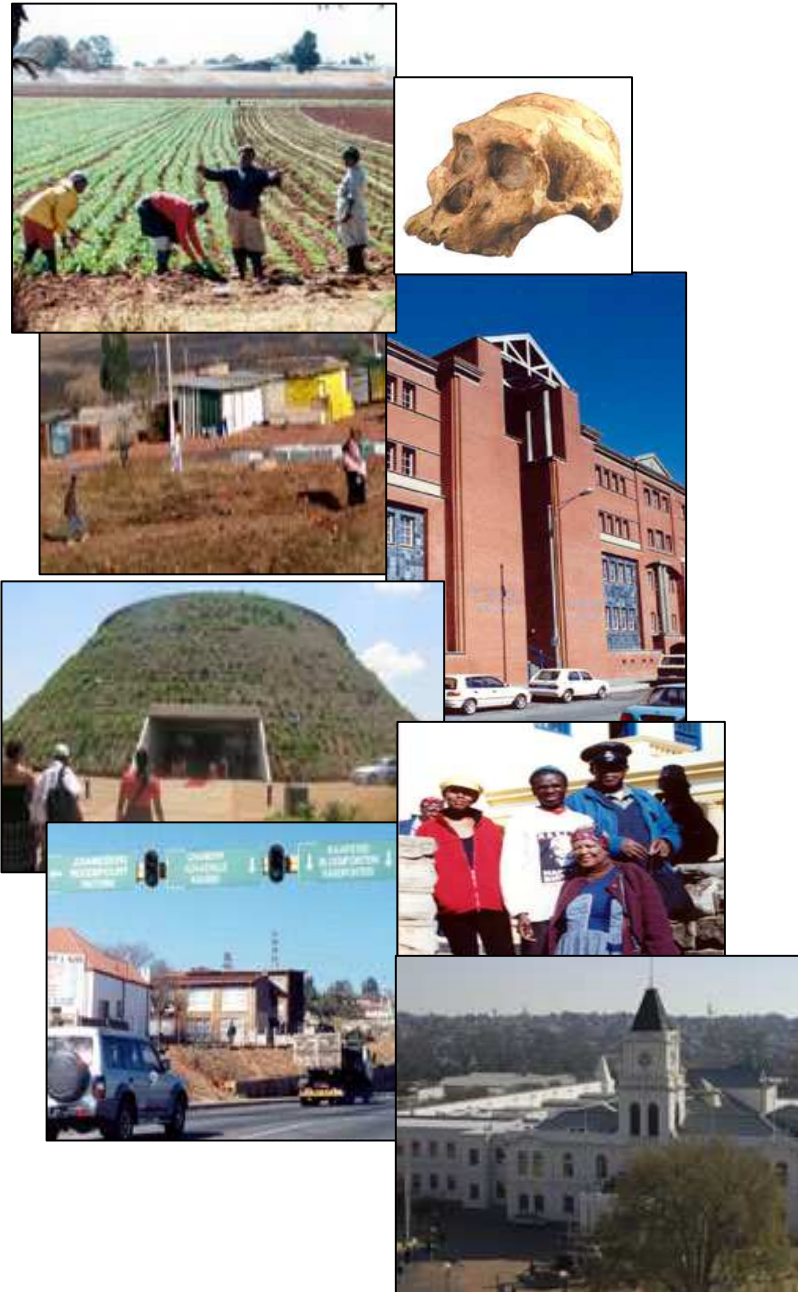


2011

DRAFT
PRECINCT PLAN FOR THE
MULDRSDRIFT DEVELOPMENT ZONE
“Vision 2025 and beyond”



DIRECTORATE: ECONOMIC SERVICES
DEVELOPMENT PLANNING



Prepared for:



Prepared by:



PREFACE:

Dr Leander Jameson was captured in Muldersdrift after the failed Jameson raid in 1896. The raid was an attempt to capture Johannesburg boers and allow Cecil John Rhodes to take over political power. Muldersdrift today is a peaceful suburb with outstanding accommodation facilities for tourists and business people alike.

Muldersdrift used to be true countryside, way outside of Johannesburg, for escapees of the city lifestyle. Whilst today the small farms and smallholdings still exist, Muldersdrift has now become somewhat of a village. Its borders literally melted with the outer suburbs around Northgate.

TABLE OF CONTENTS

PREFACE	i
1. INTRODUCTION	1
1.1 Study Area and Objective	3
1.2 Methodology	5
2. CONTEXT AND POLICY DIRECTIVES	6
2.1 National and Provincial Development Principles and Objectives	6
2.2 District and Municipal Policy Directives	10
2.3 Mogale City Municipality's Policy Directives	11
3. CURRENT STATE	12
3.1 Muldersdrift in Context	12
3.1.1 Movement and Accessibility	14
3.1.2 Socio- Economic	16
3.1.3 Housing and Settlements	16
3.1.4 Engineering Services	20
3.1.5 Environment	29
3.1.6 Social facilities	31
3.1.7 Land Use	33
3.1.7.1 Robustness	38
3.1.7.2 Variety of Built Form	38
4. GOAL GRID AND SWOT ANALYSIS	39
5. DEVELOPMENT INTENT	43
6. DEVELOPMENT FRAMEWORK	44
6.1 Defining the study area's development Zones	46
6.2 Defining the Movement system for efficiency of the area	47
6.3 Develop appropriate urban form and land use	49
6.5 Protected environmental sensitive areas	72

7. DEVELOPMENT PRINCIPLES AND STATEMENTS	74
7.1 Lanseria Aerotropolis	74
7.2 Land Use	76
7.2 Transportation Guidelines.....	85
7.3 Environmental Guidelines.....	90
8. IMPLEMENTATION	91
8.1 Land Use	91
8.2 Infrastructure.....	97
8.3 Urban Edge (Growth management Approach)	100
8.4 Institutional Arrangements.....	102
8.5 Performance Management	104

List of figures

Figure 1: Muldersdrift in Context	1
Figure 2: Ward 23, 28 (Source: Demarcation board)	3
Figure 3: Study area boundary.....	4
Figure 4: Methodology	5
Figure 5: Policy Directive	6
Figure 6 Location to nodes	13
Figure 7: Movement and Accessibility	15
Figure 8: Socio- economic analysis (Source: Stats SA & CSIR GAP Viewer)	16
Figure 9: Muldersdrift Settlements	17
Figure 10: Water pipe lines and service area	21
Figure 11: Sewer Lines and service area	24
Figure 12: Location of electrical substation and mini substation.....	27
Figure 13: Environmental sensitive areas.....	30
Figure 14: Location of social facilities.....	32
Figure 15: Land cover.....	34

Precinct Plan Muldersdrift Development Zone

Figure 16: Agriculture potential	37
Figure 17: Muldersdrift Precinct Plan	45
Figure 18 Proposed roads.	48
Figure 19 Development districts.....	50
Figure 20 Mixed use district.....	52
Figure 21 Eco-Tourism and Agri-Cooperation District.....	58
Figure 22 High density residential district.....	60
Figure 23 Medium density residential district.....	62
Figure 24 Commercial district	64
Figure 25 Offices district.....	66
Figure 26 Proposed positions for water reservoirs.....	69
Figure 27 High voltage electricity substation	71
Figure 28 Environmental sensitive areas and buffers	73
Figure 29: Proposed Lanseria Aerotropolis Precinct Area	75
Figure 30 Short – medium term development.....	101

List of tables:

Table 1: Districts Policy Directive	10
Table 2: Mogale City Policy Directive	11
Table 3: Settlements.....	19
Table 4: Existing Water Pipelines.....	22
Table 5: Existing Electricity Substation.....	26
Table 6: Goal Grid	40
Table 7: SWOT Analysis.....	40
Table 8 Objectives of development in Muldersdrift	43
Table 9 Road classification and hierarchy	85
Table 10 Applicable buffer zones per open space system	90
Table 11 Plan objectives.....	104

1. INTRODUCTION

Muldersdrift lies to the north of Krugersdorp. It is traversed by the R28/ N14 running from north-east to south-west. To the east it is bounded by urban development in the City of Johannesburg, while the Cradle of Humankind World Heritage site lies to the west (**figure 1**). While on the one hand this area lies in the path of urban development and as such shows the mixed-use typology of a typical urban-rural transition zone, parts of this area fall within areas earmarked for conservation or at least very limited development. Whilst today the small farms and smallholdings still exist, Muldersdrift has now become something of a village, its borders literally melded with the outer suburbs around Northgate. Muldersdrift is well known as an arts and crafts centre. There are numerous art galleries and studios. It is also part of the Crocodile Ramble; a tourist route that runs along the Crocodile River and while along this route many places of interest can be visited such as the Cradle of Human Kind- the place of important fossil discoveries which have cast light over our ancestry. Muldersdrift falls within the Mogale City Local Municipality, which is found within the West Rand District Municipality (WRDM). The study area falls under wards number 23 and 28. The district municipality borders in the east with the City of Johannesburg and north east with the City of Tshwane.

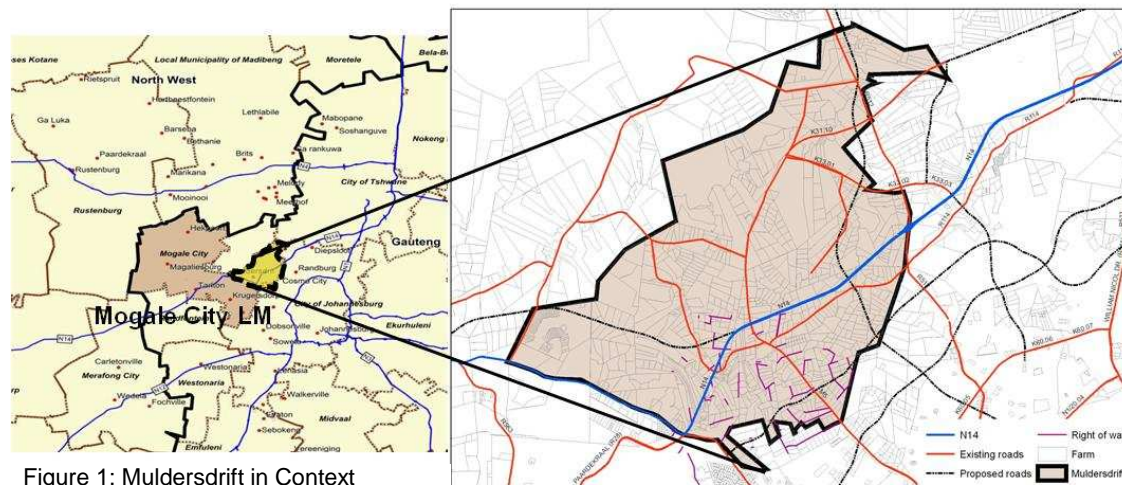


Figure 1: Muldersdrift in Context

Muldersdrift is also known for its many attractions in and around the area. It is also considered as a place of tourist attraction with its many landmarks and places of interests in and around Muldersdrift, such as The Wonder Caves, Cradle of Humankind, Rhino Reserve Wonder, Aloe Ridge, Lion Park, Shades of Ngwenya and many more.

Due to Mogale City's location on the edge of Gauteng's conurbation, the largest part of Mogale City is rural in nature, with a specific urban concentration in the south-eastern part of the municipality where the municipality interfaces with the Gauteng urban complex. The municipality also comprises the urban-rural transition zones typical of large urban areas. The spatial structure of Mogale City is made up of four major development/use zones, namely:

- The extensive rural environment;
- The urban area;
- Muldersdrift rural/urban transition zone and;
- The Cradle of Humankind World Heritage Site and Buffer Zone.

The Cradle of Humankind affects relatively small parts of Mogale city, and did not place a significant constraint on urban development and land use in Mogale City; however the proposed new buffer zone around the Cradle of Humankind covers a large part of Mogale City and therefore begins to pose developmental challenge on the development potential of the area.

The Muldersdrift area comprises of two nodes, namely the:

- The Pine haven Node at the intersection of R28, N14 and Hendrik Potgieter Road and;
- The Drift Node along the R28 in the central part of the Muldersdrift area.

These two nodes are important in the structure of the Mogale City Local Municipality, forming an Urban Growth Zone to the north of the municipality's jurisdiction area. The area between the M47 (Hendrik Potgieter Drive) and the M5 (Beyers Naude Drive) is under particular development pressure for mostly residential development. Whereas the area between the R512 and the Beyers Naude Drive has light industrial and commercial development pressures.

1.1 Study Area and Objective

The Greater Muldersdrift area is located within two distinctive wards of the Mogale City Local Municipality, namely ward 23 and ward 28. The determination of the study area considered a number of factors that will have an influence in the determination and demarcation of the study area boundary, these factors included the following:

- The existing municipal boundary to the east and to the north;
- The existing Muldersdrift area as defined in the Muldersdrift Development Strategy;
- The sphere of influence of the core area of Muldersdrift has on and by the adjacent areas;
- The physical features such as the Mountain range / watershed to the south and;
- Existing developments to the south and south-east of Muldersdrift (Cranbrook Estate and Ruimsig etc)

The area that is covered within the context of this Precinct Plan Muldersdrift Development Zone (PPMDZ) extends slightly beyond the R512 (Hans Strijdom Drive) to the east, The Cradle of Humankind to the north, N14/M47 (Hendrik Potgieter Road) to the west and the administrative boundary line between Mogale City and the City of Joburg to the south and south-east.

Figure 2 shows that the study area is defined as the area situated in Wards 23 and 28 and extends slightly beyond Ward 23 into the northern part of Ward 29 of the Mogale City Local Municipality. The study area is approximately 140.2km² and comprises mainly of rural land uses. However, the functional area extends beyond the ward administrative boundaries, and these administrative boundaries are only considered for the purposes of avoiding conflict of interests in planning for demarcated administrative areas (**figure 3**).

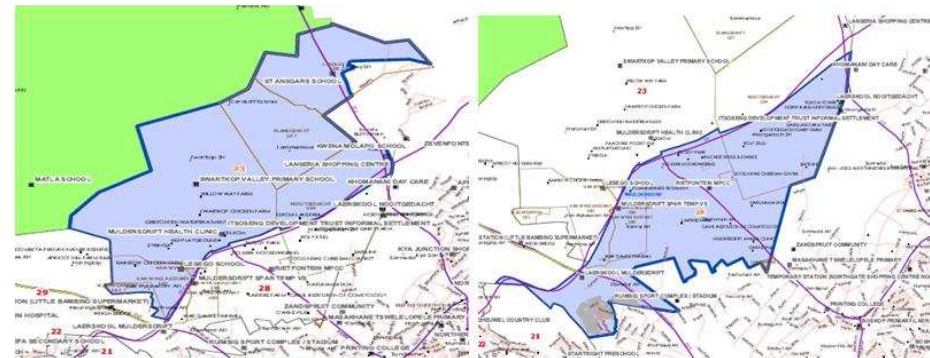


Figure 2: Ward 23, 28 (Source: Demarcation board)

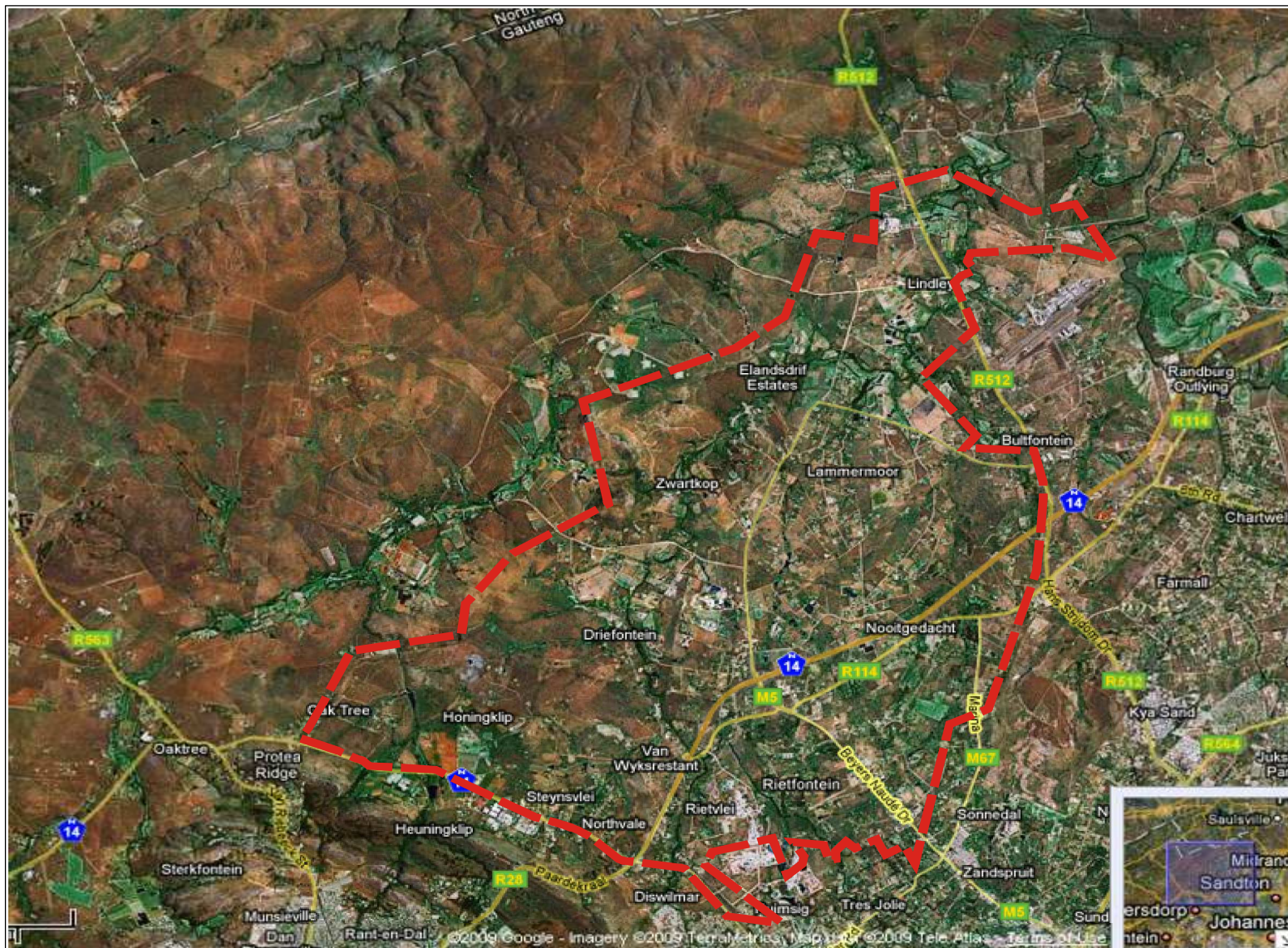


Figure 3: Study area boundary

The Precinct Plan for the Muldersdrift Development Zone objectives is as follows:

- To unravel spatially the sustained resources and latent potential that the Muldersdrift Development Zone has;
- To outline a set of applicable guidelines and interventions to enable the sustainable development of the Muldersdrift Development Zone as a whole;
- To expedite land development in an integrated and sustainable manner;
- To outline the Infrastructure Development Framework;
- To outline the Environmental Management framework;
- Draft guidelines and design criteria (building typologies, heights, densities, public-private interfaces, design of public spaces) to manage development of the node and;
- Define strategies for improvement of environmental quality and enhanced sustainability.

1.2 Methodology

Figure 4 show the high level methodology followed in the compilation of the Precinct Plan for the Muldersdrift Development Zone. The study area was defined, based on the urban morphology i.e. character, form, existing natural features and the existing municipal boundaries.

Existing development sector information was gathered and analysed. Based on the desired outcome of this Precinct Plan, the following project methodology was adopted focuses on:

- Strategically assessing regional and local conditions and policy requirements;
- Creating a comprehensive understanding through community and conditional surveys;
- Providing implementation guidelines and applications at a precinct level and;
- Ensuring a comprehensive engagement process.

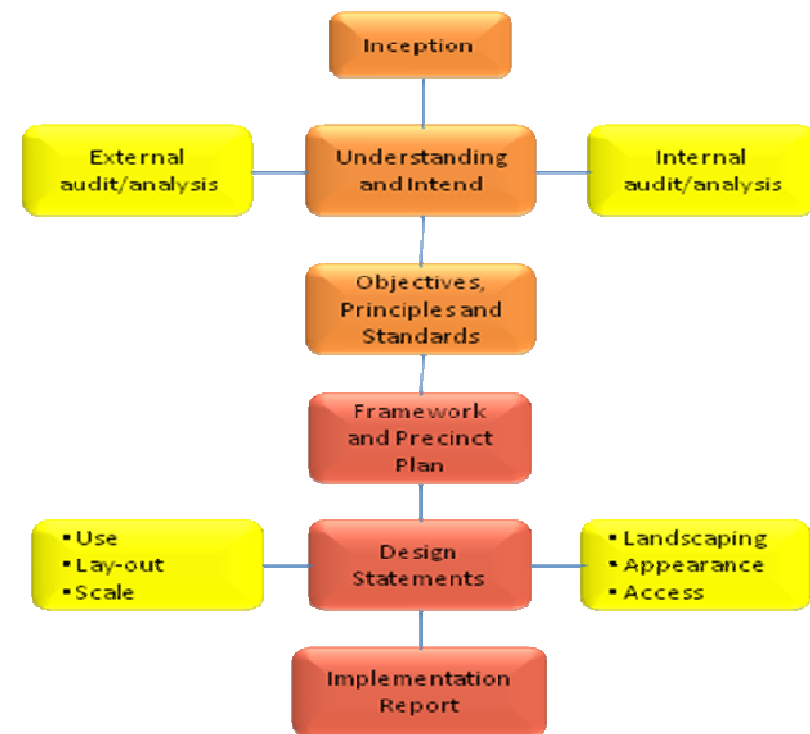


Figure 4: Methodology

2. CONTEXT AND POLICY DIRECTIVES

2.1 National and Provincial Development Principles and Objectives

The new planning paradigm enshrined in new legislation enacted since 1994, put emphasis on the restructuring and sustainable development of urban areas. In planning for the Muldersdrift area, it was necessary to reflect on needs to be met though the realisation of legislated and stated development principles. In addition, the need existed to focus on achieving the desired outcomes at national, provincial and municipal levels.

Figure 5 indicates a general legislative and policy framework within which spatial planning, municipal, regional and local-wide, ought to take place. This Precinct Plan for the Muldersdrift Development Zone should be seen in the broader context of development in the northern side of Mogale City and indeed the western side the Gauteng Province. This Precinct Plan should fulfil a specific function in the planning and development of Mogale City Local Municipality as a whole.

As part of the Mogale City's spatial planning package, the Precinct Plan for the Muldersdrift Development Zone should reflect the municipal's response to the principles, policies and strategies as charted by national, provincial and the City government to better the lives of communities, and at the same time, promote economic and social growth, development and environmental sustainability.

Various regulations and directives that guide the precinct plan in terms of what it should be and what it should accomplish give the Precinct Plan for the Muldersdrift Development Zone both form and responsibility. Its legitimacy, on the other hand, it derives from being part of the Municipal's IDP process.

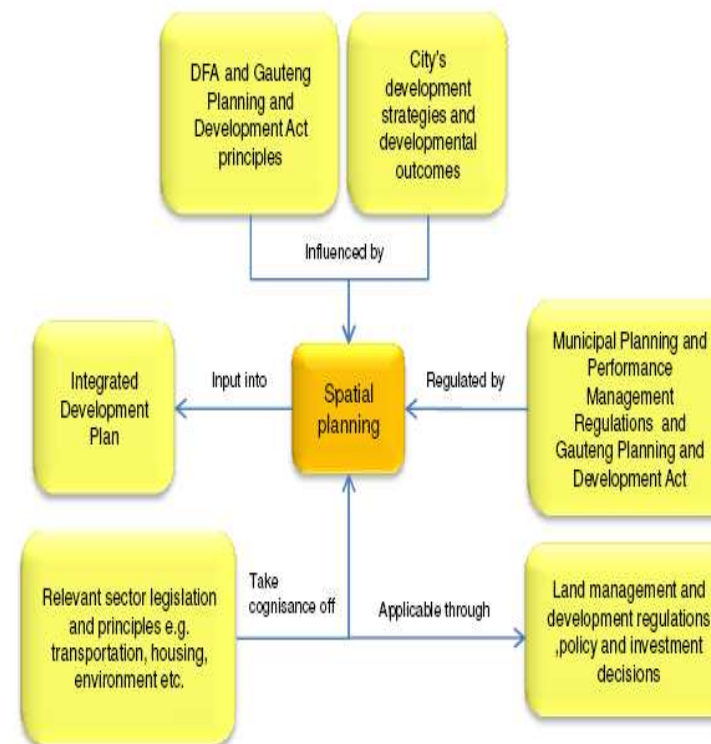


Figure 5: Policy Directive

In terms of this study, there are a number of acts and policies from National and Provincial Government stretching across a range of sectors that provide directives or guidelines for the spatial and functional restructuring of the country's cities. In summary, the key objectives that are pursued in the existing and proposed legal and policy framework are to:

- Integrate urban areas and overcome apartheid-induced segregation;
- Integrate land use and transport planning and ensure integration between public transport modes;
- Minimise urban sprawl and the adverse effects of transport and land development on the environment;
- Densify settlements and ensure filling in and mixing of landuses in all land development and redevelopment actions/interventions;
- Improve the quality of housing and public infrastructure;
- Ensure responsive, effective, efficient and collaborative governance of settlements;
- Develop and strengthen public transport-orientated activity corridors and;
- Increase economic efficiency and productivity of urban form and functions.

Within the urban planning environment, two acts are particularly important when addressing the issue of compaction and densification, namely the Development Facilitation Act, 1995 and the Gauteng Planning and Development Act, 2003.

The **Development Facilitation Act, 1995** stipulates that *“policy, administrative practice and laws should promote efficient and integrated development in that they ... discourage the phenomenon of urban sprawl in urban areas and contribute to the development of more compact towns and cities”*.

The **Gauteng Spatial Development Framework** identified five (5) critical factors for development in the province namely:

- Contained urban growth;
- Resource based economic development (resulting in the identification of the economic core);
- Re-direction of urban growth (stabilise/limit growth in economically non-viable areas, achieve growth on the land within the economic growth sphere);
- Protection of rural areas and enhancement of tourism and agricultural related activities and;
- Increased access and mobility

The **Gauteng Planning and Development Act, 2003** provides a number of principles to promote spatial restructuring and development. Key amongst these is that the Province shall encourage development and land use *which “... promotes the more compact development of urban areas and the limitation of urban sprawl and the protection of agricultural resources” and development that “results in the use and development of land that optimises the use of existing resources such as engineering services and social facilities...”*.

The **National Spatial Development Perspective (NSDP)** was developed by the National Government to stimulate national investment and development programmes that will:

- Addressing the distortions of the past apartheid spatial economy and;
- To aligned between various spheres of government.

The aim of the NSDP is twofold:

- Provide a better understanding of the South African spatial economy and;
- To provide normative principles for the reconfiguration of apartheid spatial relations through investment and development programmes.

The **National Strategy for Sustainable Development (NSSD)** provides strategies to promote sustainable development in land development areas.

The NSSD sets the following principles for development:

- People Centered Development;
- A Sense of Place;
- Cultural Diversity, Self Improvement and Enterprise;
- Holistic Approach to Planning and Development;
- Alignment of Global, National and Local linkages;
- Sustainable use of Natural Resources;
- Improved Access to Opportunities;
- Democratic, Efficient Governance and;
- Biodiversity Preservation

The **National Environmental Management Act, 1998 (NEMA)** provides principles for decision-making when dealing with development issues directly affecting the environment.

The NEMA sets the following principles for development:

- Socially, environmentally and economically sustainable development
- All factors to be considered in permitting “Greenfield” and “Brownfield” developments to avoid “harmful” activities
- Ensuring that all inhabitants have access to the available environmental resources
- Ensuring that proper Integrated Environmental Management (IEM) procedures are followed

The **National Environmental Management: Protected Areas Act, 2003** provides principles for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity.

The objectives of the Act that are relevant to the development of the Muldersdrift are:

- To promote sustainable utilisation of protected areas for the benefit of people

The **Extension of Security of Tenure Act, 1997** (ESTA) provides security of tenure to vulnerable occupants of land outside of urban areas. The Act therefore contains provisions aimed at creating and supporting long-term security for the vulnerable occupants and, at the same time, to protect them from unfair eviction.

The Act also contains provisions whereby the relationship between landowners and vulnerable occupants are regulated.

In terms of the Act 'occupiers' are

- persons who, with consent, currently reside on land which belongs to another; or
- persons who, on 4 February 1997, resided on land without consent because such consent had lawfully been withdrawn before this date and provided the person had remained in such occupation; or
- persons who currently reside on land without consent, but who on 4 February 1997 or any time thereafter had consent.

(However, if the monthly income of the occupier exceeds a certain amount then the person can no longer qualify as an 'occupier'.

Squatters are not included in the definition because they, per definition, occupy land without permission. Note further that consent by an owner to someone to reside on land is, in terms of this Act, binding on his successors in law.

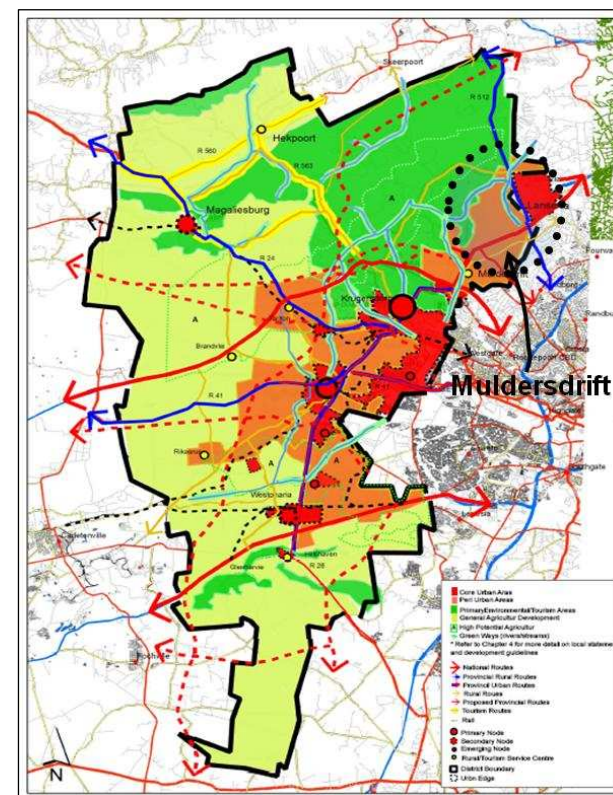
2.2 District and Municipal Policy Directives

The WRDM's Spatial Development Framework, 2008 has identified five (5) key Peri-Urban Management Areas that will need continued attention, and Muldersdrift forms part of the five. Each of these peri-urban management areas has a number of management principles and these principles as listed in table 1 below play a key role of monitoring and managing the development prospects of Muldersdrift even in the context of this precinct plan.

Table 1: Districts Policy Directive

Area	Principles
P1: Muldersdrift	<ul style="list-style-type: none"> • Manage existing transition uses • Investigate future development potential in relation with the Lanseria Airport developments and the potential accessibility of the N14 • Prevent invasions of informal housing and settlement • Monitor development trends and infrastructure capacities • Promote and support tourism related activities in line with the provincial urban edge policy, 2007
P2;Tarlton	<ul style="list-style-type: none"> • Manage existing transition uses • Prevent invasions of informal housing and settlement • Monitor development trends and infrastructure capacities • Promote and support agriculture related activities in line with the provincial urban edge policy, 2007. The zone has high potential agriculture land and more detailed investigations is need to develop agriculture activities optimally
P3:	<ul style="list-style-type: none"> • Manage existing transition uses • Investigate future development potential of mining land • Prevent invasions of informal housing and settlement • Monitor development trends and infrastructure capacities • Monitor environmental issues related to air pollution and soil contamination
P4: Rikassrus	<ul style="list-style-type: none"> • Manage existing transition uses • Prevent invasions of informal housing and settlement • Monitor development trends and infrastructure capacities • Promote and support agriculture related activities on small holdings in line with the provincial urban edge policy, 2007. • Monitor safety and security issues and promote community policing initiatives • Maintain exiting infrastructure

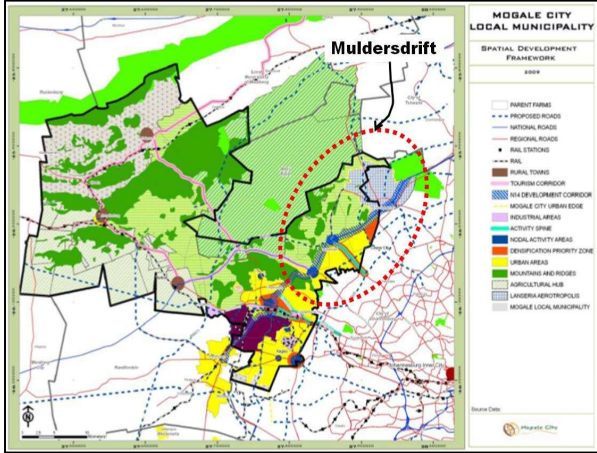
Source WRDM RSDF 2009



The WRDM RSDF has identified Mogale City is part of the Gauteng City Region as it forms part of the Polycentric city regions. This is a multi-centred approach which is characterized by many different centres that should complement each other.

2.3 Mogale City Municipality's Policy Directives

Table 2: Mogale City Policy Directive

Residential Settlement Area	Strategy
<p>Muldersdrift future development area</p> 	<p>The Muldersdrift area constitutes a greenfields development area, which provides numerous opportunities for integrated and sustainable development. The proposed Muldersdrift Spatial Development Framework should address the following issues –</p> <ul style="list-style-type: none"> • Utilise the principles of Sustainable Human Settlements and design an area that can be a model for sustainable human settlement development. • Integration of the settlement with the N14 corridor and Beyers Naudé Drive Activity Spine. • Appropriate residential densities depending on the urban morphology • Integration with Johannesburg urban development patterns (current and proposed). • Look at integration of affordable housing with the Cosmo City development in the area to the north of Beyers Naudé Drive and the provision of higher income housing to the south of Beyers Naudé Drive.

Source: Mogale City Draft SDF 2009

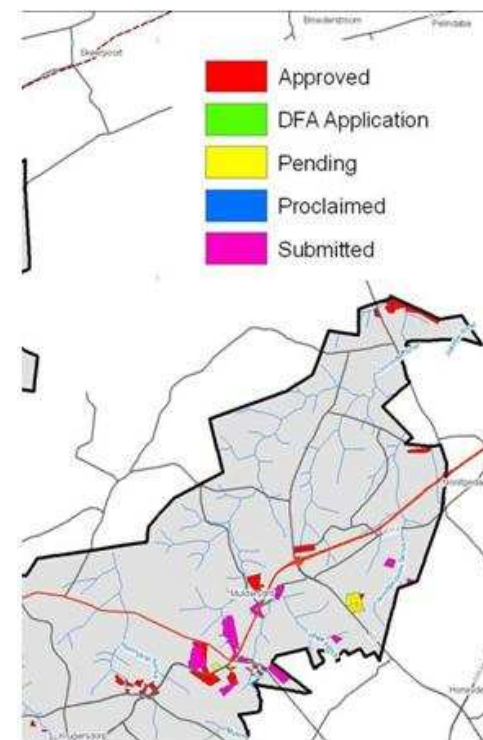
3. CURRENT STATE

3.1 Muldersdrift in Context

The Muldersdrift area is currently experiencing enormous development pressure, for the development of different residential, commercial and industrial development, especially to the south, along the N14. The development pressure is further exerted by the existing development from the City of Johannesburg towards the city's west boundary in a form of Lanseria Airport.

In an effort to respond to the development pressure in the Muldersdrift area, Mogale City developed a 'Muldersdrift Spatial Development Strategy' of 1997. The Muldersdrift Spatial Development Strategy identified various land use zones in an attempt to address the development pressure. The Muldersdrift Spatial Development Strategy's major proposals were to preserve the rural character and to protect the environmental sensitive areas.

Notwithstanding the location of the area, its regional accessibility and desirability for development of various land uses, Muldersdrift present a challenging scenario in that there is a clear conflict between the desired urbanization and the environmental issues. The interest from various planning authorities and development agencies throughout the Gauteng Province, poses institutional challenge. The proposed buffer zone around the Cradle of Humankind World Heritage site also adds to the development challenges of this area. In the planning and development of Muldersdrift, the regional functionality needs to be critically examined. Figure 6 shows that Muldersdrift is located within a well-developed regional nodes and proposed nodal development. This in fact places Muldersdrift in a different light as far as the desired urban form. It is clear that the development of Muldersdrift should not be that of a regional node. However, due to its accessibility through the National and Provincial roads, a more compact 'smart' growth approach that will fulfil the developmental potential of the area.



Development Pressure :
applications

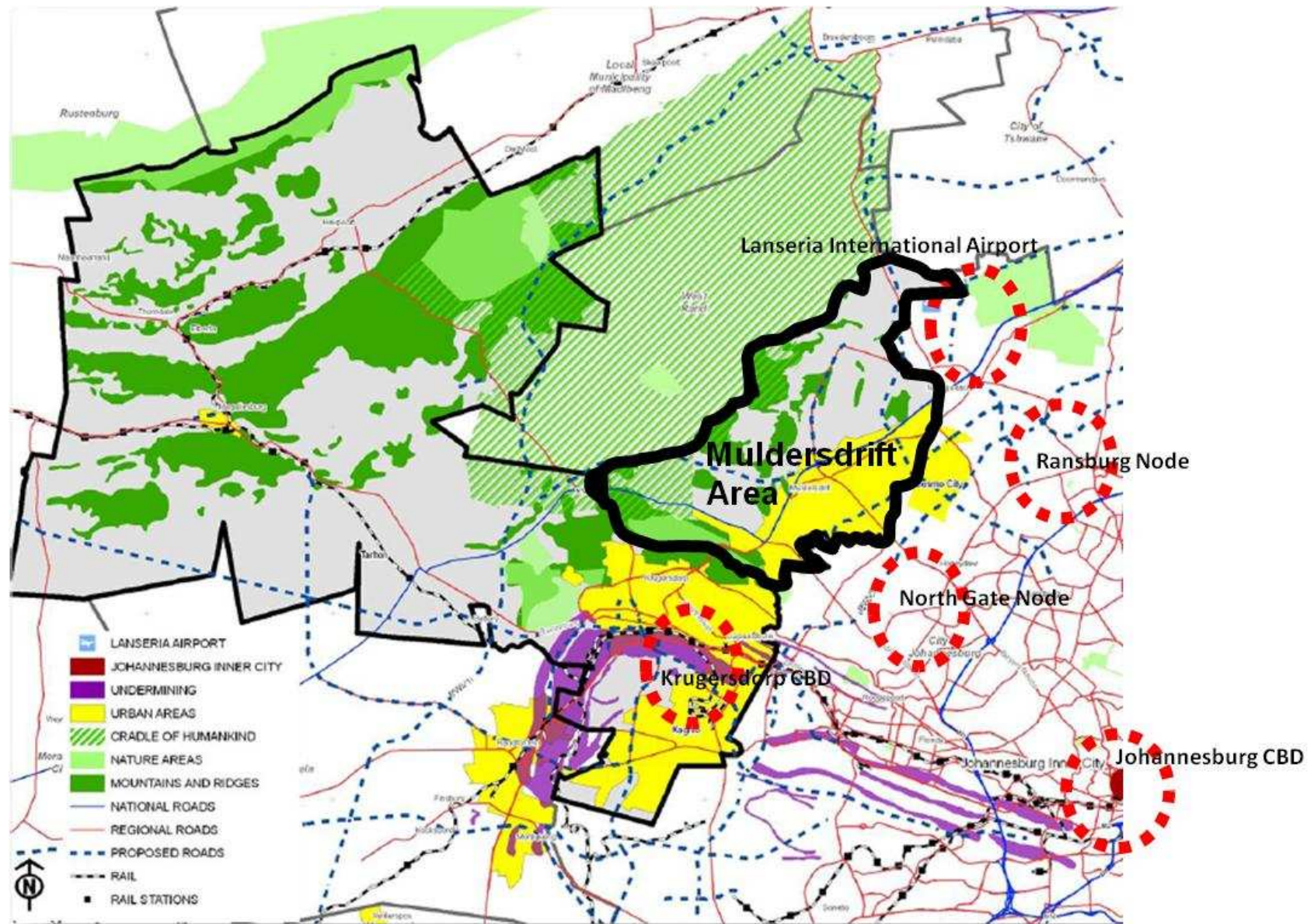


Figure 6 Location to nodes

This section examines the existing development sectors in the area.

3.1.1 Movement and Accessibility

Muldersdrift can be described as a 'gate way' to Mogale City from the northern side. It is bordered by the two economically significant Metropolitan Municipalities in the Country, the City of Johannesburg and the City of Tshwane, making it a significant expansion area of these two Metropolitan Municipalities.

Figure 6 shows that Muldersdrift's accessibility is mainly defined by the National, Provincial and metropolitan road network. It is traversed by the R28/ N14 which forms a strong north-south movement line, linking Mogale City to the south and the City of Tshwane to the north. The strongest east-west movement linkages between Mogale City and Johannesburg are along the R512 (Malibongwe Road), Beyers Naude Drive and Hendrik Potgieter Road. These roads are also all major public transport routes.

The Cradle of Humankind World Heritage Site to the west is linked through the extension of the Beyers Naude and Hendrik Potgieter roads and other local roads. There are however very weak local road networks within the study area. This could be attributed to the rural nature of the areas. Although mentioned that the R28/ N14 forms a strong north-south linkage, there is generally very weak north- south linkage both to the east and west of the study area. However, the proposed Provincial road network will indeed open up the study area and provide the road network needed to facilitate development. Detailed local road master planning is needed and should take into consideration the proposed Provincial road network. Care should be given to the phasing of the road network based on the desired spatial form and phasing proposed by this Precinct plan.

There is no rail network in the study area. However, the existing rail line is located on the south of Krugersdorp linking to the City of Johannesburg network.

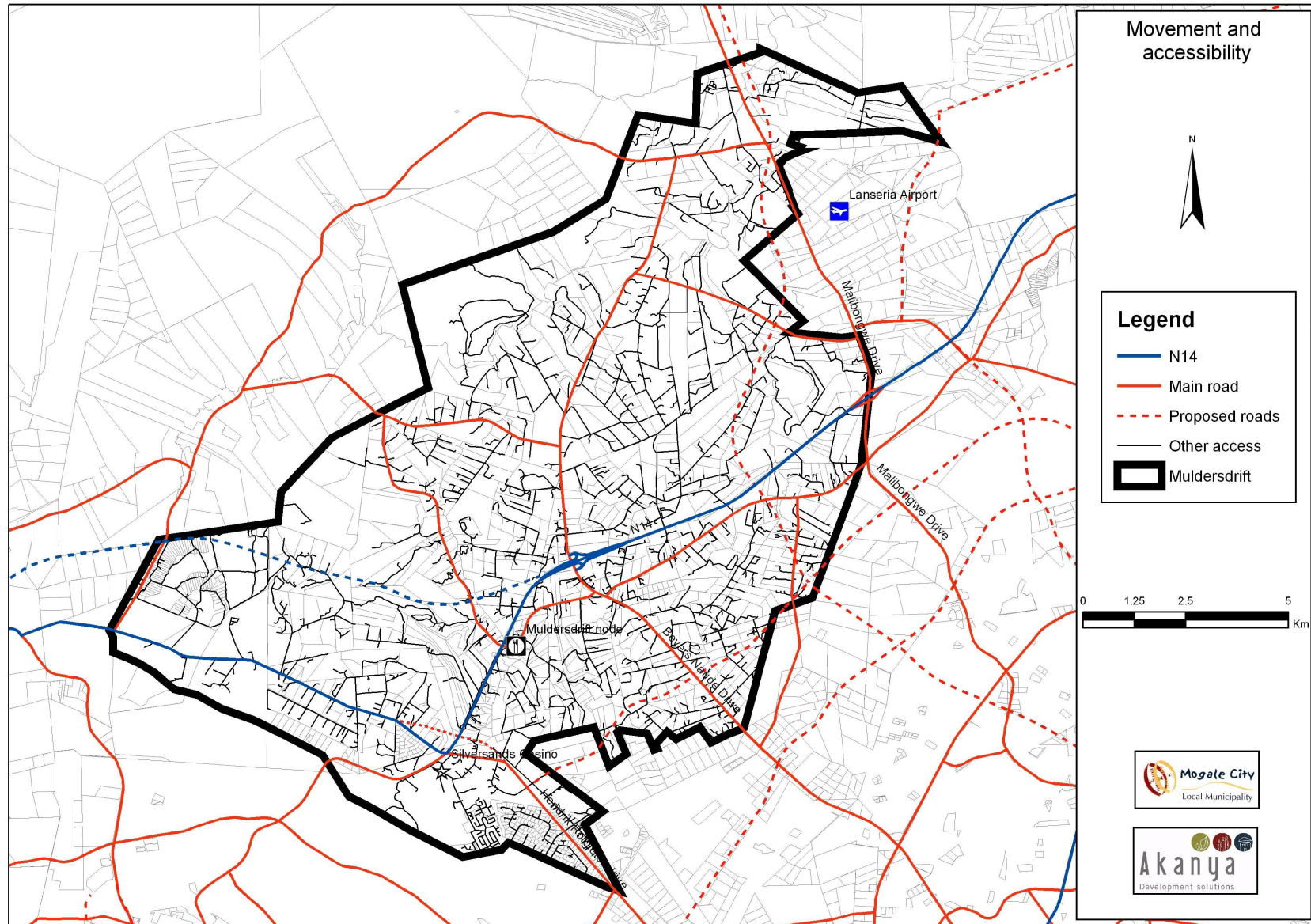


Figure 7: Movement and Accessibility

3.1.2 Socio- Economic

Although the study area extends beyond wards 23 and 28, these wards information was used to analyse the socio-economic status of the study area.

The total population of the study area is estimated to be 19 959ha. The majority of people living in Muldersdrift are young people of the age group of between 20 and 34 years of age. This age group is classified as an economically active group. The study further shows that the majority of residents have obtained some level of secondary schooling.

Figure 8 shows to what extent each economic sector contributes towards the economy of Muldersdrift. Manufacturing is the highest contributor in the area, generating R167.7 million (39%). The manufacturing sector is then followed by Information services (17%), Retail (15%) and Community services (15%) respectively. The area

is characterised by high car ownership, hence private car usage is relatively high with very limited public transport modes and facilities.

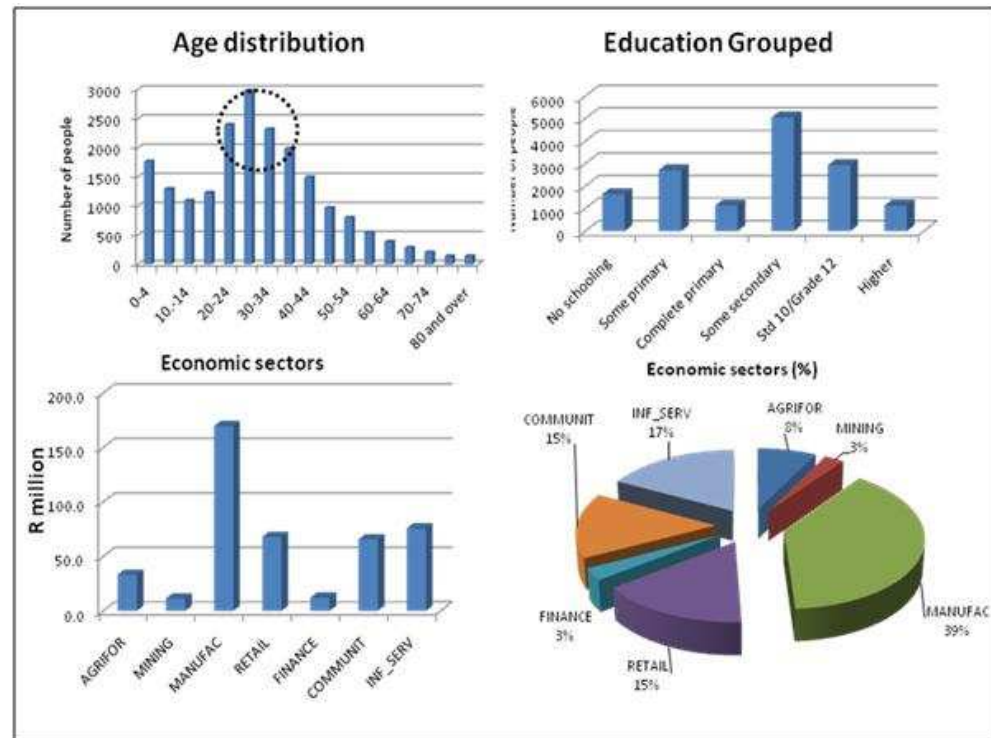


Figure 8: Socio- economic analysis (Source: Stats SA & CSIR GAP Viewer)

3.1.3 Housing and Settlements

The study area is characterized by rural residential areas with the urban housing development occurring on the southern boundary of the study area. The informal settlements are scattered throughout the study area, with different development intensities.

These informal settlements include Cranbrooke, Ruimsig, Ethembalethu, Rietvlei and Rietfontein. Some of these informal settlements are very densely populated and not suitable for human settlement as the living conditions pose both environmental and health hazards. A number of these settlements



Group Housing: Higher density to the south of Muldersdrift



Informal Settlements: poor infrastructure and living conditions

are not necessarily informal in terms of the township establishment process, however although there are approved township layouts for them, the nature of the existing settlements do not reflect the township layouts as approved. **Table 3** outlines the informal settlements and its characteristics:

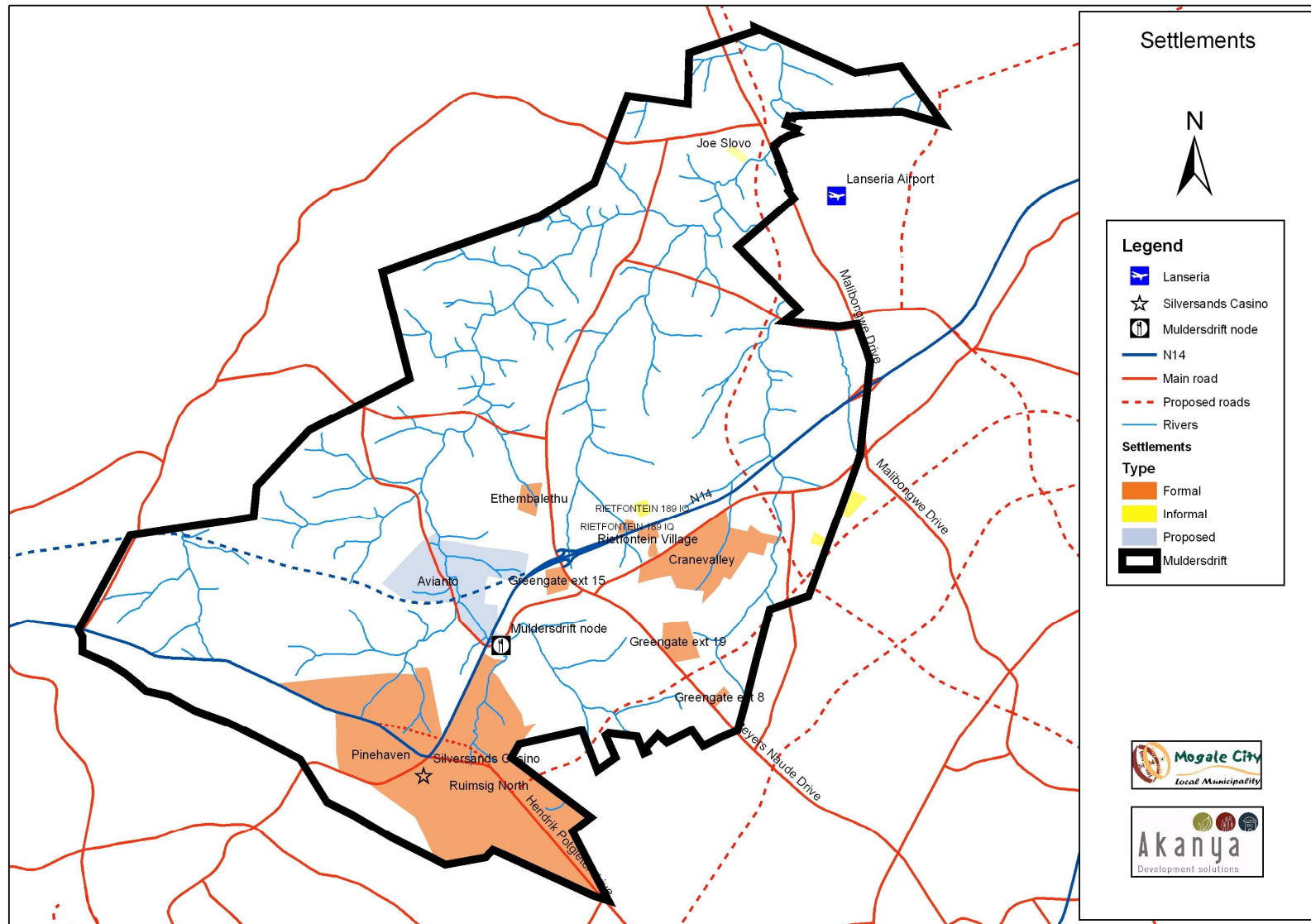









Figure 9: Muldersdrift Settlements

Name of the informal settlement	Location	Characteristics	Formal	Informal
Ruimsig Country Estate	Located on the most south-eastern side of the study area, adjacent to Hendrik Potgieter Drive.	The areas is an established residential settlement with a range of amenities such as shopping, and medical facilities within close reach and caters for the medium-high income earners. The settlement has a projected 416 number of households and is spreads over an area of 51.14 Ha.		
Ruimsig Informal Settlement	The Ruimsig informal settlement is located on the most south-eastern side of the study area near the Ruimsig residential area	The informal settlement traverses the municipal boundary of Mogale City and the City of Johannesburg. This informal settlement is currently serviced by water and the City of Johannesburg. It is a challenge to count the informal dwelling as they are located in the tow municipal areas.		
Cranbrook	It is located opposite the Cranbrook residential estate	This informal settlements developed as a result of labourers' housing demands		
Rietfontein Village	This settlement is situated in the southern half of the study area, to the south of the N14 highway and east of Beyers Naude drive	Whilst there is an approved and proclaimed township layout, the current settlement patterns and infrastructure status do not reflect the ideal service standards. The settlement is also characterised by shack housing. The planning phase for housing development has commenced and the project is at the implementation stage.		
Rietfontein (Plot 84)	This settlement lies adjacent to Rietfontein Plot 81, also to the north of the N14 highway (lies almost next to the highway)	Located on privately owned land.		
Rietfontein (2)	West of N14/R28 in Ward 23. It is located on the North-eastern boundary of Ethembalethu Eco - Village	Located on privately owned land. The city has installed a bulk water line connecting to the settlement.		
Rietfontein (Plot 81)	Situated just north of the N14 highway, between Malibongwe Drive and Beyers Naude Drive.	Located on municipal owned land. Although the plot is partially informally settled, the predominant zoning as per the proposed township is Cemetery. Due to the proposed predominant land use for the site, human settlement is highly discouraged in the area.		

Precinct Plan Muldersdrift Development Zone







Nooitgedacht	Far north of Beyers Naude and occupies the eastern side of the N14/R28 in ward 28	Has a projected 1060 households spread over a 27.59 Ha area of land Plot 89 – the settlement is on municipal owned land. Plot 42 – approved as a township although informally settled. The settlement is on municipal owned land and housing development is at the implementation stage. The site is planned for formalisation		
Joe Slovo	Plot 84 Lindley 528 JQ located to the northern parts of the study area, north of the N14 highway and east of Malibongwe Drive in Ward 23	Located on privately owned land. The city has installed a bulk water line connecting to the settlement. The settlement has a total number of 573 households and is spreads over an area of 15.48 Ha.		
Rietvlei	Plot 79 Rietvlei located on the eastern side of the N14/R28 in ward 28	Located on privately owned land.		
Ethembaletu Eco Village	West of the N14/R28 and Beyers Naude in Ward 23. Located to the North west of the N14 highway and to the west of the Beyers Naude road. It is also situated north-east of the Avianto Residential Estate	Located on municipal owned land. There is an approved and proclaimed township layout, however the township is partially informally settled. The settlement is also characterised by shack housing.		
Pinehaven Residential Area	Located opposite the Silverstar Casino west of the R28 as one drives up the mountain towards Krugersdorp	This is an established medium density residential development that caters for the medium-high income earners. The settlement has a projected 509 number of households and is spreads over an area of 71.03 Ha.		
Featherbrooke Estate		The settlement has a projected 914 number of households and is spreads over an area of 147.06 Ha.		
Avianto Residential Estate	Situated north-west of the Muldersdrift service node within 5km of the proposed N14 re-aligned route	The proposed residential development is a private initiative, which will encompass various typologies of residential units as well as the existing conferencing and overnight accommodation facilities. A DFA application for the township establishment was submitted to Gauteng Development Tribunal	In process	

Table 3: Settlements

The characteristics of the formal housing in the study area are defined by 'gated' development with high quality housing stock. The formal housing areas are afforded high quality civil services infrastructure. However it is noticeable that social infrastructure such as schools, health facilities etc are lacking. Care should be given in the provision of these social facilities as this will require long distance commuting to access these facilities.



Gated' Development: High Quality housing stock with high infrastructure

The formal settlements can also be seen as the factors that contribute to the increase in population in the study areas. The table below shows the new developments and the projected number of households in these areas.

3.1.4 Engineering Services

Infrastructure plays an important role in the development, particularly the influence of urban development. Access to bulk infrastructure, such as water, electricity, sanitation and roads, determines the direction and intensity of development in a particular desired development area. Infrastructure is used as one of the important criterion to evaluate the possibility and readiness of a particular proposed development area.

Any proposed land development area should not be addressed in isolation with regards to infrastructure, but should be addressed in the broader developmental context. The non-availability of engineering services in the Muldersdrift area will prevent any development in the short to medium term, depending on when major engineering infrastructure investment take place in this area. Bulk infrastructure in the Muldersdrift area is particularly important due to the vastness and environmental sensitivity nature of the area. This section looks in detail the infrastructural situation of Muldersdrift.

3.1.4.1 Water Services

There are no direct Rand Water supplies in the Muldersdrift area. **Figure 9** shows that the water supply distribution network in the study area concentrates to the southern side and eastern side of the study area. The areas to the south- western and north were served with minimum distribution pipes and Department of Water Affairs and Forestry (DWAF) boreholes. The figure below also indicates the Joburg/Mogale City water connection points "water meters" which serve a critical role of servicing both ends of the jurisdictional areas. The two are Ruimsig Water Metre and Zonedl Water Metre respectively.

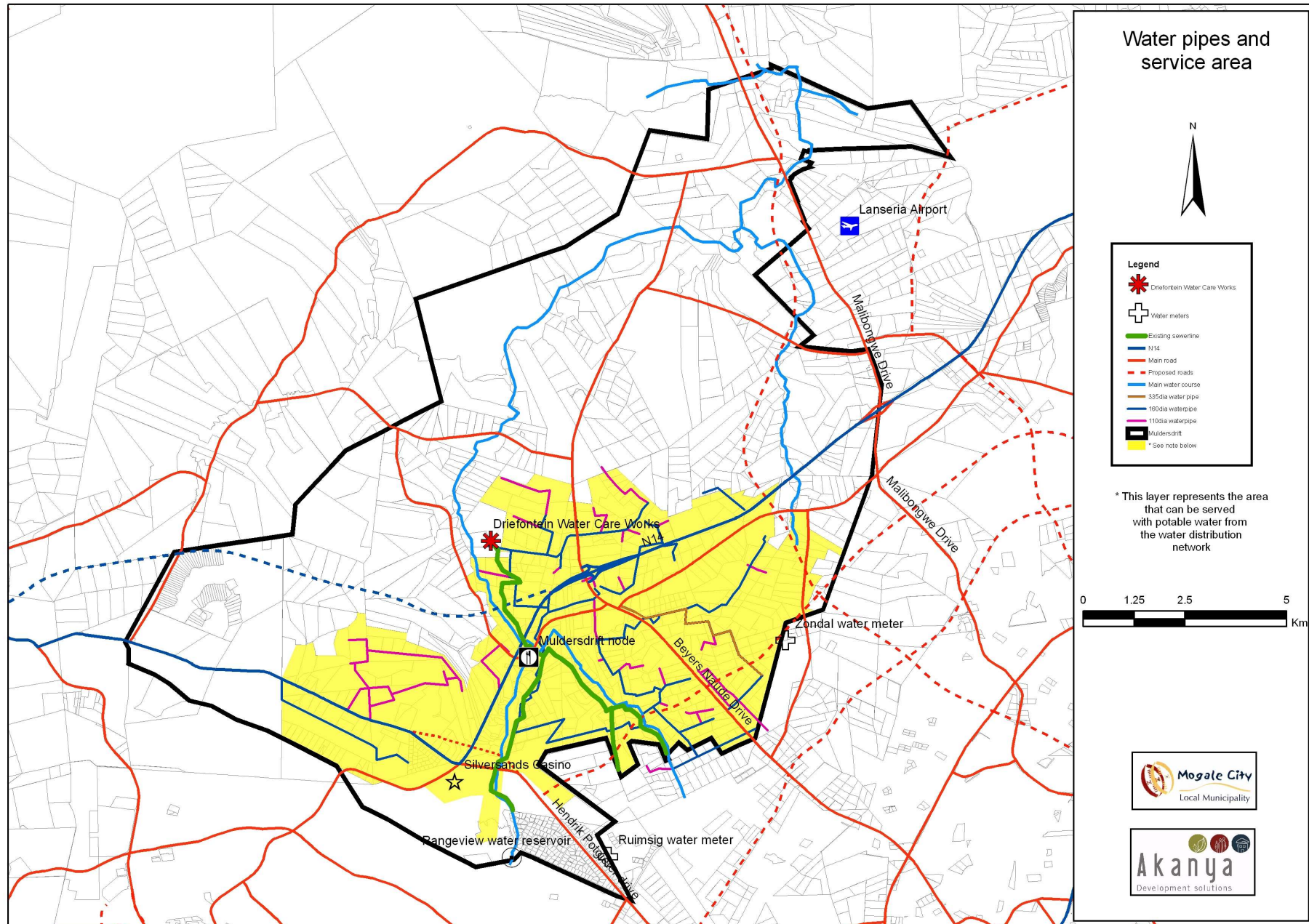


Figure 10: Water pipe lines and service area

There are indications of the prevalence of private boreholes in the study area. The following **Table 4** depicts the existing water supply lines in the study area:

Table 4: Existing Water Pipelines

Pipe Line	Diameter of pipe	Supply Yield	Flow at 2,5 m/s (realistic supply volume)	Supply area
Rangeview Supply line	200 mm	5650 m ³ /day	24 hrs	This supply line is depressurized through 2 pressure valves installation, reducing the pressure for connection to the Featherbrooke network
Honeydew Supply line	355 mm	17 800 m ³ /day	20 hrs	This pipeline takes water from the 600 mm pipeline out of the Honeydew reservoir. This pipeline supplies the areas to the north of Honeydew
Ruimsig Supply line	160 mm	2900 m ³ /day	20 hrs	This pipe line could be seen as an extension of the Ruimsig network. This is a selected supply to the users of the Ruimsig and immediate areas. It cannot be seen as a supply to other areas including Muldersdrift.

There are no formal municipal storage facilities in the Muldersdrift supply scheme. This could be attributed to the rural nature of the areas consisting of rural communities, agricultural holdings etc. most of these communities and establishments have their own storage facilities and relies on unsecured groundwater extraction systems and overhead storage tanks. There are plans to extend a 310 mm diameter pipe line from a 12 ml Munsieville reservoir to augment and supply the existing water network to the west of the study area in the short to medium term. Most of these pipe lines are technically owned by the communities as they were developed by the communities themselves.

With the development pressures emanating from the Muldersdrift area and with external pressures and demand from areas like Lanseria International airport and its associated land uses, Cosmo City, Zandspruit, Diepsloot and the informal settlement within and around the study area which all compete and require water resources, requires a robust and sustainable water supply. Based on this analysis, it is envisaged that the rand Water supply should be extended to the study area.

3.1.4.2 Sanitation Services

The minimum acceptable basic level of sanitation is set out in the Water Services Act of 1998. This Act inter alia direct that each house hold should have a basic sanitation facility that adheres and promotes the appropriate health and hygiene behavior. A lower sanitation system is in use in the Muldersdrift area. Due to the rural nature of the Muldersdrift area, the sanitation is mostly on site treatment ranging from package plants to conservancy tanks. Considering the associated pollution threats associated with the package plants, conservancy sewer tank system is the preferred option from the environmental point of view.

There is no gravitational system in the Muldersdrift area. The gravitational system is located on the southern side of the study area. This gravitational system gravitates toward the Driefontein waste water treatment works covering the communities of Rangeview, Kemare, Ruimsig, Silverfields, Breunanda, Factoria, Greengate, Homeshaven, Muldersway, Pinehaven, Noordheuwel and the Drift. These areas discharge approximately 207 Ml/month to the Driefontein waste water treatment works. The current capacity of the Driefontein waste water treatment works is at 35 Ml/day.

The Driefontein waste water treatment works is owned by the City of Johannesburg. There exists an agreement where Mogale City discharges waste water into the Driefontein waste water treatment works. **Figure 10** show that the areas on the northern side of the study do not have access to gravitational sanitation system. Only the areas to the south of the study area have access to waterborne sanitation. The City of Johannesburg's Joburg water has made provision for the expansion and upgrading of the Driefontein waste water treatment works to accommodate a 30 ml/day flow. This upgrading is primarily to cater for the development within the Johannesburg municipal areas. Therefore, there is still a need to provide the waste water treatment works in the Mogale area and in Muldersdrift area.

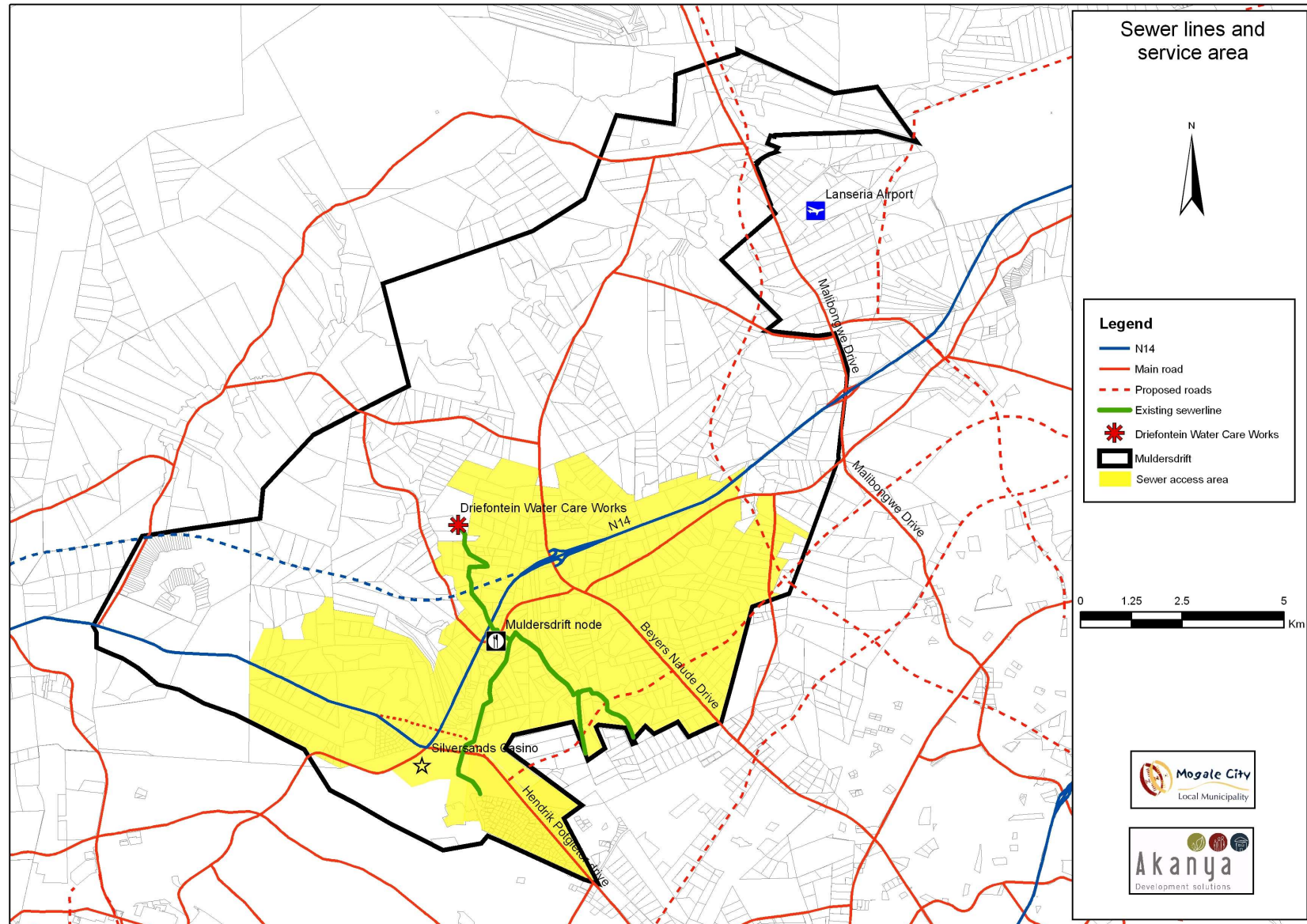


Figure 11: Sewer Lines and service area

3.1.4.3 Roads and Storm Water

As discussed in the movement and accessibility section above, Muldersdrift area is well located within the existing and planned national and provincial road network. However, the internal road network is not well defined with the majority of the roads in the rural areas being gravel roads. This could be attributed to the rural nature of the areas. It is characterized by right of ways (RoW) servitudes giving access to the individual properties.

Muldersdrift area is traversed by natural water courses in an east to north easterly direction, making the area prone to runoff. During rainy seasons the surface water causes substantial volume of grit on the gravel roads that will quickly silt up and reduce the effluent of underground water. Only the built up areas on the southern side have surfaced roads and storm water management facilities. The responsibility of upstream and downstream along the watercourses lies with the owners of properties in those areas.

The internal roads can be classified into two, namely the gravel roads and surfaced (tarred roads). The rural gravel roads do not have storm water management facilities. Some of the urban tarred roads in the south have good storm water management facilities; whereas some tarred roads do not have storm water management facilities. Both the rural and urban roads without storm water management facilities contribute to the volume of runoff causing flooding, soil erosion and grit. The provision of sidewalks alongside the roads contributes to pedestrian safety and defines the movement lines.



3.1.4.4 Electricity

The supply authority in the Muldersdrift area is Eskom. Mogale City is responsible to supply public lighting. There is currently a moratorium on the electrical connection for the industrial and commercial development in the area. ESKOM is in a process to draft a policy dealing with the applications for connections in the area. There are two major electrical substations in the

Muldersdrift area, and one that supplies the area from outside the study area. The following table depicts the substation characteristics:

Table 5: Existing Electricity Substation

Substation	Capacity	Remarks
Crocodile	88/11 kV	
Sandpit	88/11 kV	
Dalkeith	88/11 kV	Although outside the study area the substation also supplies the northern areas of Muldersdrift. This substation doesn't have spare capacity for any new development/ connections

The Muldersdrift area is subsequently supplied by a network of link supply to the area by means of an 11kV overhead feeder lines located throughout the study area. **Figure 11** shows the location of the substations and the mini-substation within the Muldersdrift areas.

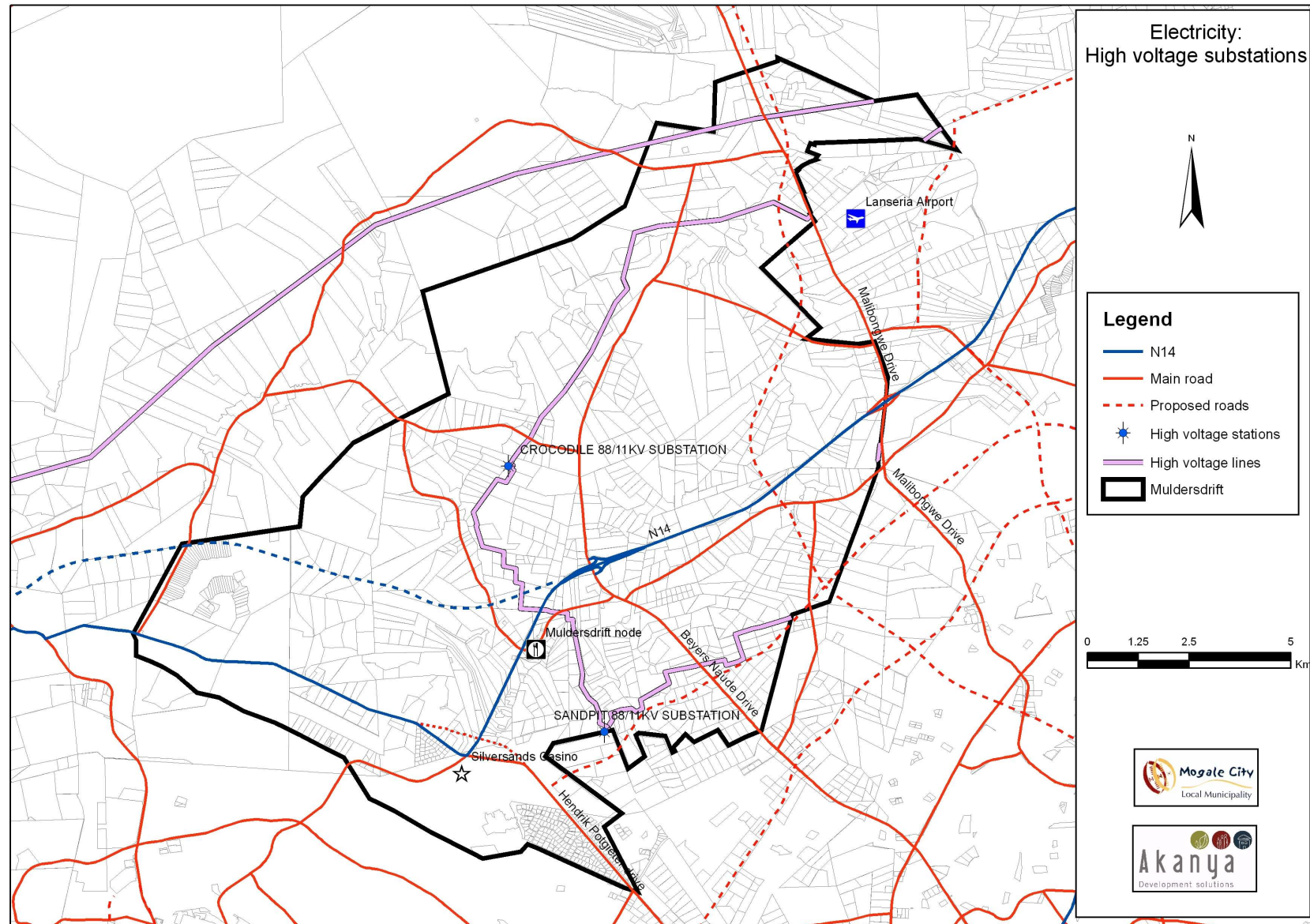
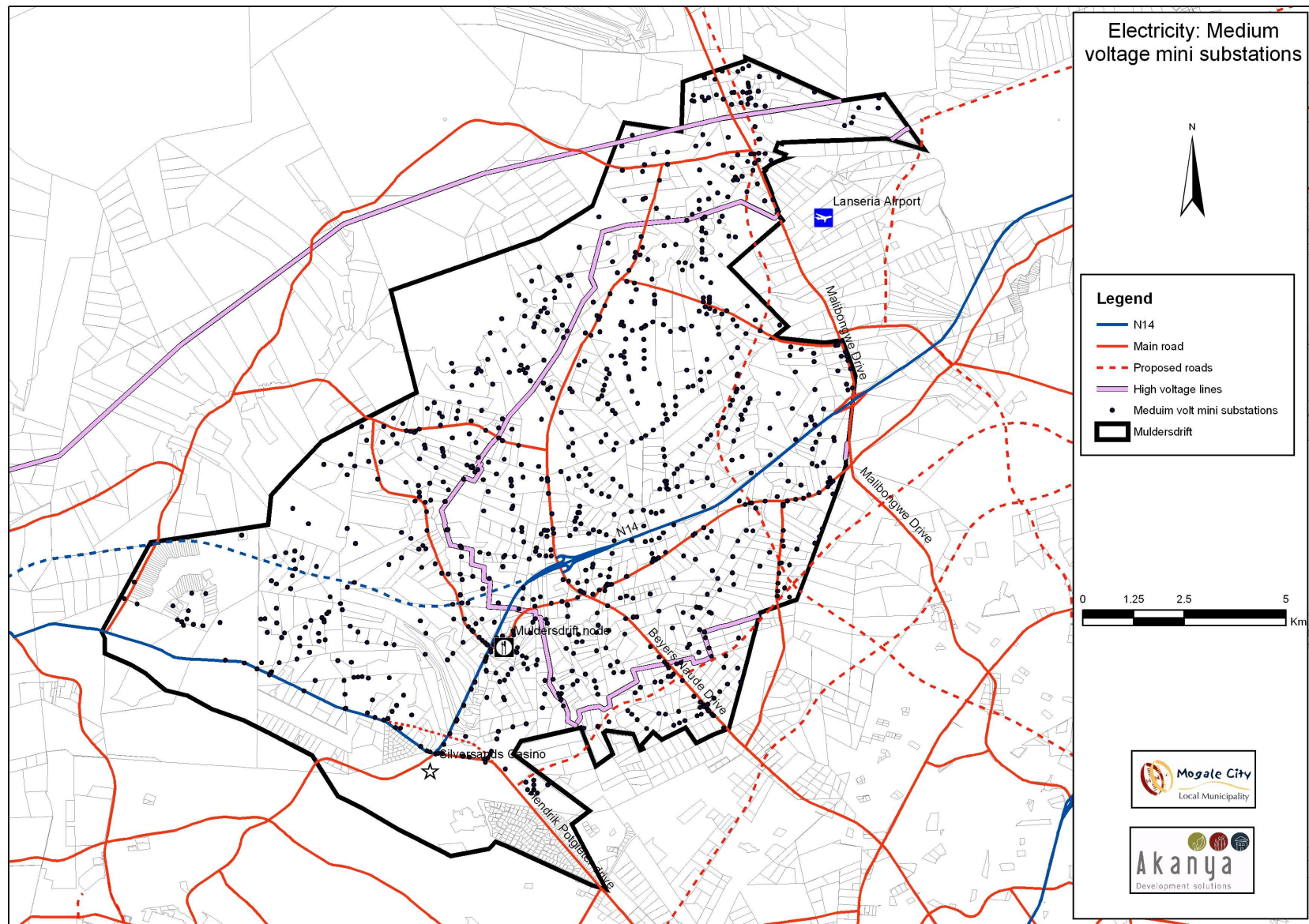


Figure 12: Location of electrical substation and mini substation



3.1.4.5 Solid Waste Management

Just like the whole of South Africa, Mogale City's capacity to treat, store and dispose of high volumes of solid waste are limited. It has been reported that municipalities will run out of landfill sites. The Mogale City's IDP has identified that there is a risk and vulnerability of industrial and commercial activities generating large quantities of waste, including hazardous waste.

There is no formal refuse removal in the rural areas of Muldersdrift, whereas the urban areas to the south receive a weekly service. The formal settlements do not receive any refuse removal. The rural areas use private solid waste methods. However, due to the fact that there is no proper waste management policies in Mogale City, improper practices occur. These practices result in the pollution of fresh water systems, underground water and subsequently disrupt the ecosystems and eventually affect people's lives. There is no recorded recycling or composting areas.



Illegal dumping in the rural areas

3.1.5 Environment

Muldersdrift is an important area with regards to the environment. Due to its rural nature, the state of Muldersdrift environment area can be said to be of high quality. It is therefore important to preserve and protect this area. This could be addressed by balancing the development and environmentally sustainable practices.

There are a host of environmental issues that puts pressure on any development. For the purpose of this precinct plan we will be analyzing what could be seen as the most significant environmental challenges in Muldersdrift, these are:

- *Geomorphology;*
- *Open space system and;*
- *Heritage*

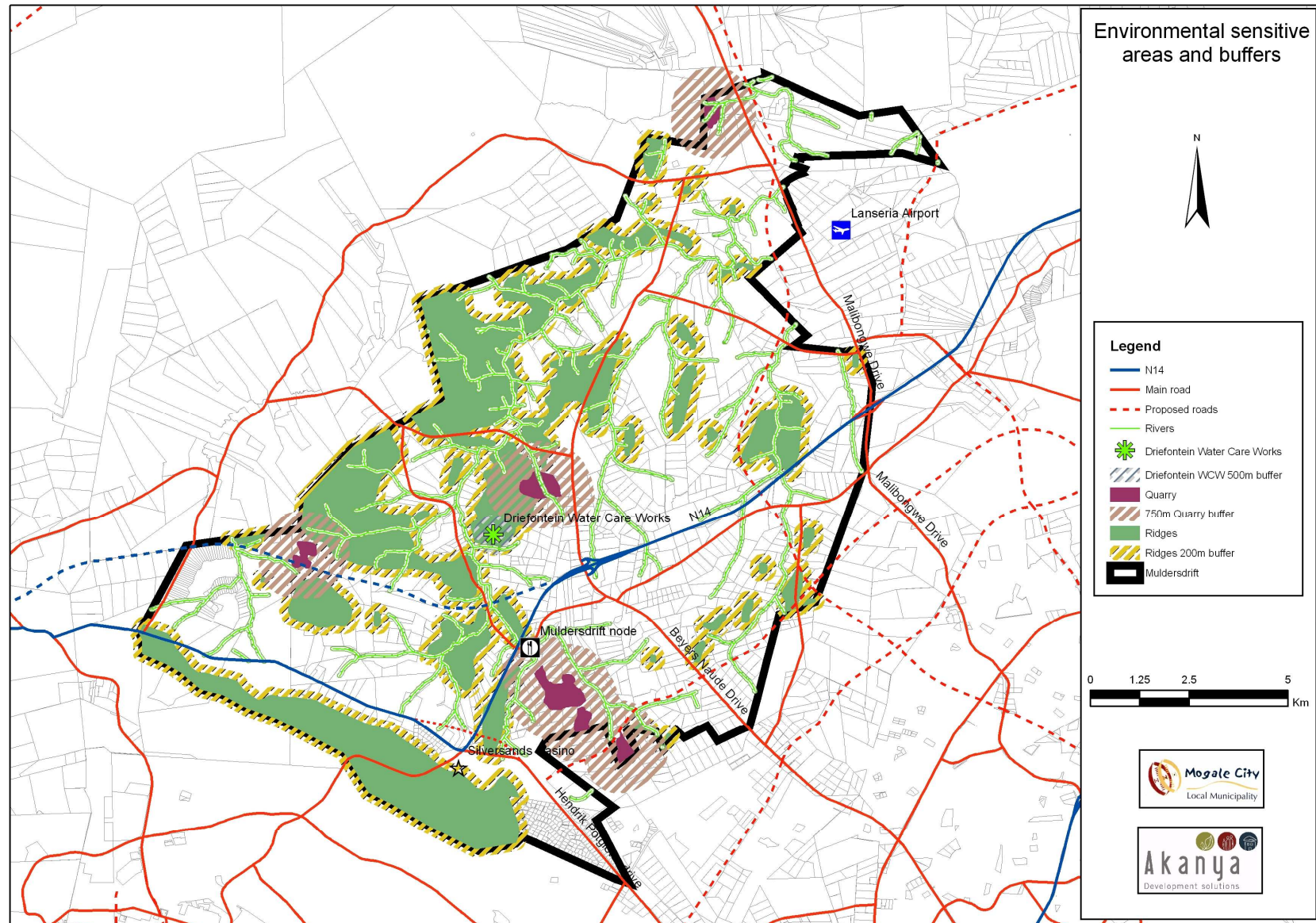


Figure 13: Environmental sensitive areas

3.1.5.1 Geomorphology

The topography of Muldersdrift rises in the south peaks in the southern boundary of the study area. The Crocodile River traverses the area which ultimately drains into the Limpopo drainage system. The undulating topography yields many microhabitats. Soil structures in the Muldersdrift area have varied types that translate to low risk rock formation. There are fluctuations in the water table due to ground water usage particularly in the northern side of the study area. There are no reported dolomite formations which could cause sinkhole.

The ridges of the Witwatersberg in the Muldersdrift area form a watershed dividing Muldersdrift from the southern areas of Mogale City. This physical situation poses a challenge in the provision of bulk services.



Developed Open space system in the urban areas

3.1.5.2 Open Space System

It could be argued that the Muldersdrift area is one of the most natural areas within the Mogale City with conserved natural areas and recreational open space network. The area is characterized by river systems and ridges. There is a general shortage of active open space. The protected areas are linked to the Cradle of Human Kind Heritage site. The undeveloped ridges enhance the aesthetic looks of the areas. The tourism land uses across the study area also provides for open space. In many cases these open spaces are used as private open spaces and as such these open spaces are not accessible to the general public.

3.1.5.3 Heritage

Located on the eastern side of the Cradle of Humankind world heritage site, the Muldersdrift area has attracted and developed places of interest and historical monuments. These are located on the western side of the study area.

Heritage information was obtained from the Mogale City's SoER (MCLM, 2003a) and from GOSP 3 (GDACEL, 2003). The SoER indicated the heritage data comprising various monuments, museums and natural sites, such as the

Sterkfontein Caves, heritage farms and the World Heritage Site (WHS).



3.1.6 Social facilities

Heri



Muldersdrift Police Station



Monash University

The rural nature of and low population thresholds Muldersdrift area lack social facilities. The development of this area from a rural land uses to an urban land uses would necessitate the development of social facilities in accordance to the required standard. However, there are facilities such as schools, police stations.

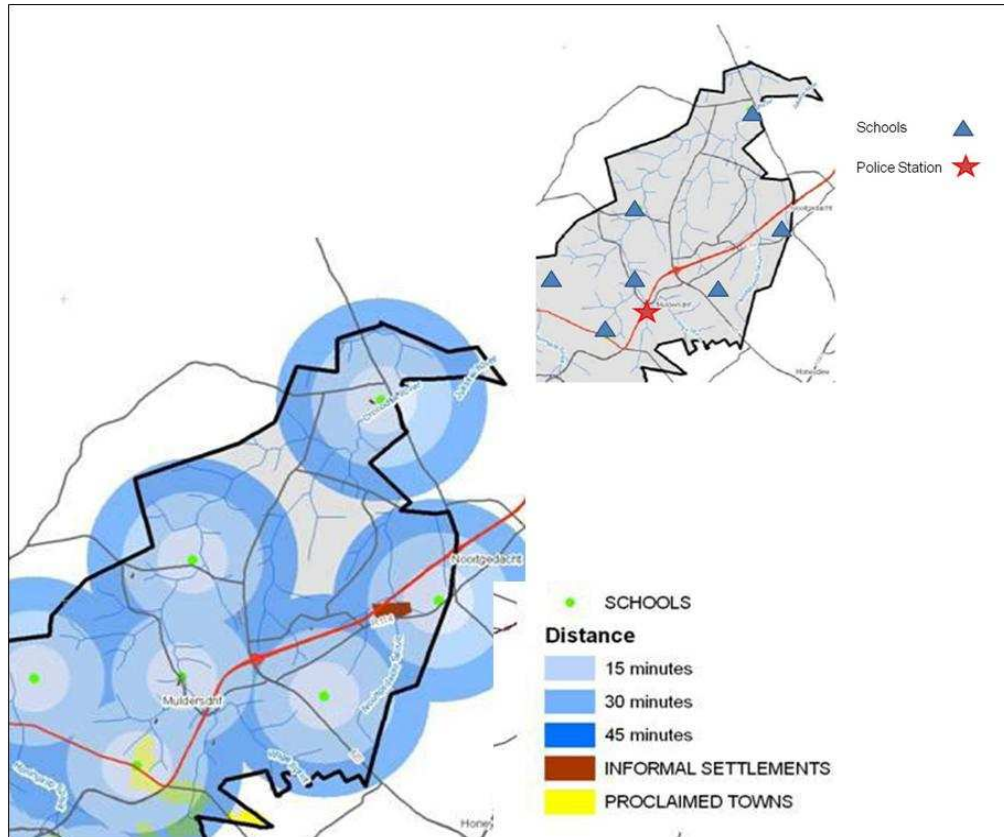


Figure 14: Location of social facilities

Figure 13 shows the location of social facilities in Muldersdrift. Social facilities such as hospitals and clinics are located in Krugersdorp and further south. Otherwise, these services are provided by the City of Johannesburg to the east.

3.1.7 Land Use

There are very limited land uses in the Muldersdrift area. This is due to the rural nature of the area. **Figure 14** shows that the study area comprises of a cluster of the land uses with specific significantly identifiable land uses. During the land uses survey, these identifiable land uses were regarded as land marks in the area. The land uses in the area comprise of residential (informal, formal and rural residential), community facilities, transport related activities, formal businesses and informal trading. It is evident from the haphazard land use that little or no consideration has been given to land use management issues by those using the space.

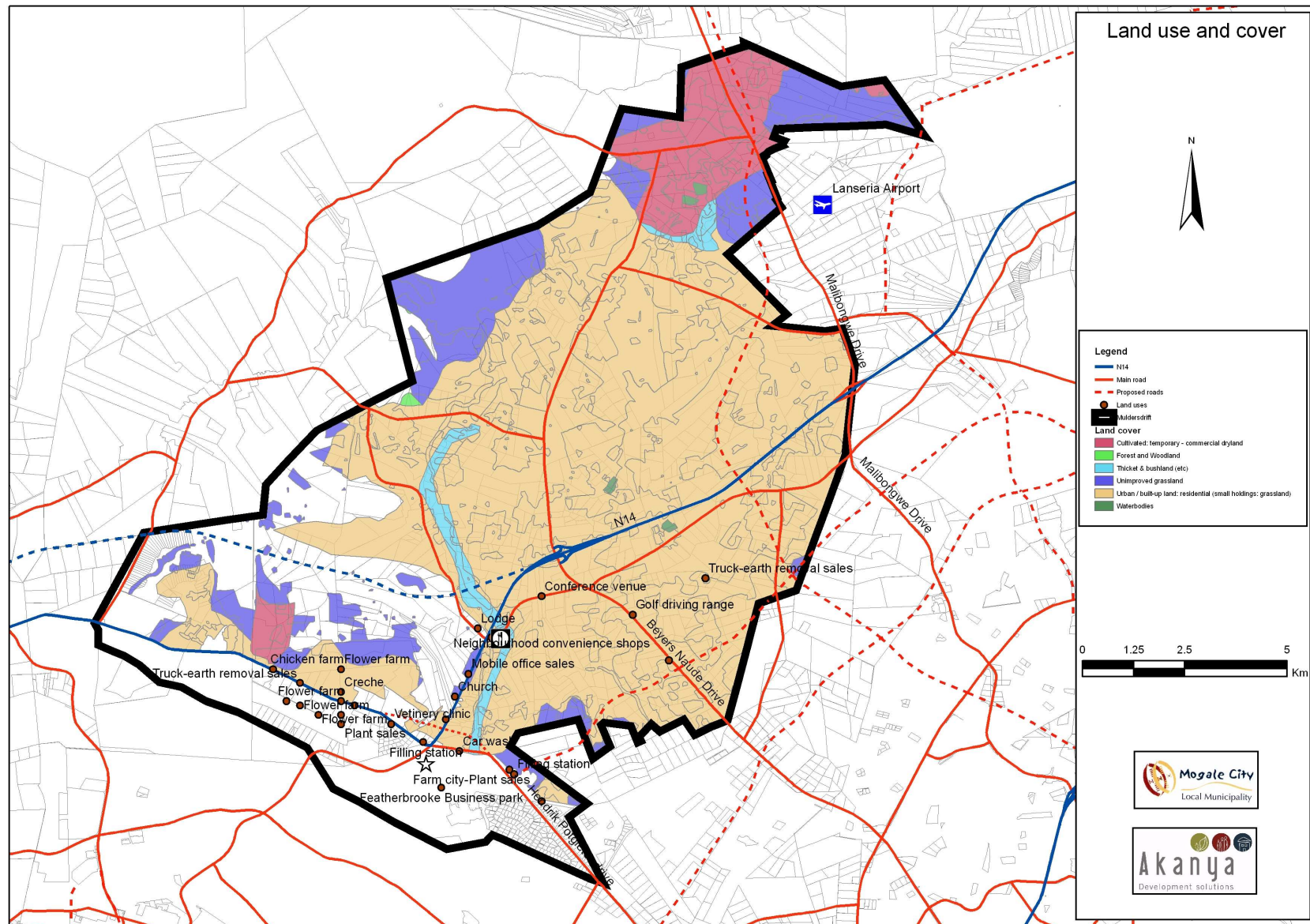
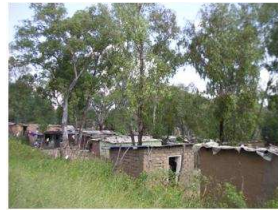


Figure 15: Land cover

The broader Muldersdrift area is characterised by the following broad land-uses:

- **Residential:**

The residential land uses range from low density residential zones in the rural area to the north of the study area to high density residential to the far south of the study area. The informal Settlements provided another dimension of residential areas. These informal settlements are scattered throughout the study area.



Informal Housing: Mud and zinc



Formal Housing: Brick and Tile roof



Rural formal Housing: Brick and Tile/zinc roof

- **Vacant Land:**

The vacant land is located sporadically throughout the study area. The vacant land in many cases is not maintained and is prone to invasion and illegal dumping.



Vacant Land

- **Open Space:**

There are two open space categories in the study area namely, the passive open spaces and active open space. The concern in the study area is that there is a lack of public open spaces. The open spaces are provided along power lines and river system.



Active Open Space: Private



Passive Open Space: Private

- **Shops formal and informal:**

The study area is characterised by isolated business activities. These activities include nodal area (Muldersdrift Node) located at the intersection of the N14/R28 and Beyers Naude drive. Isolated business activities are throughout the study area.



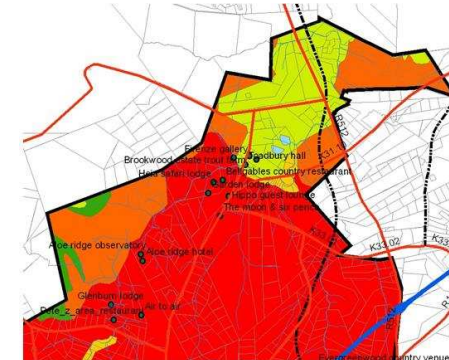
Muldersdrift Business_shops



Informal Business_ Located on vacant land

- **Conference centres (Tourism related)**

There is a cluster of tourism related land uses to the western side of the R28/N14. This could be attributed to the close proximity of these tourism related land uses to the Cradle of Human Kind heritage site.



Tourism related Land uses

- **Agriculture:**

Although the study has high agricultural potential, very little agriculture takes place. The areas to the northern and southern side of the study area are used for agricultural area. Figure 15 shows the agricultural potential in the area.

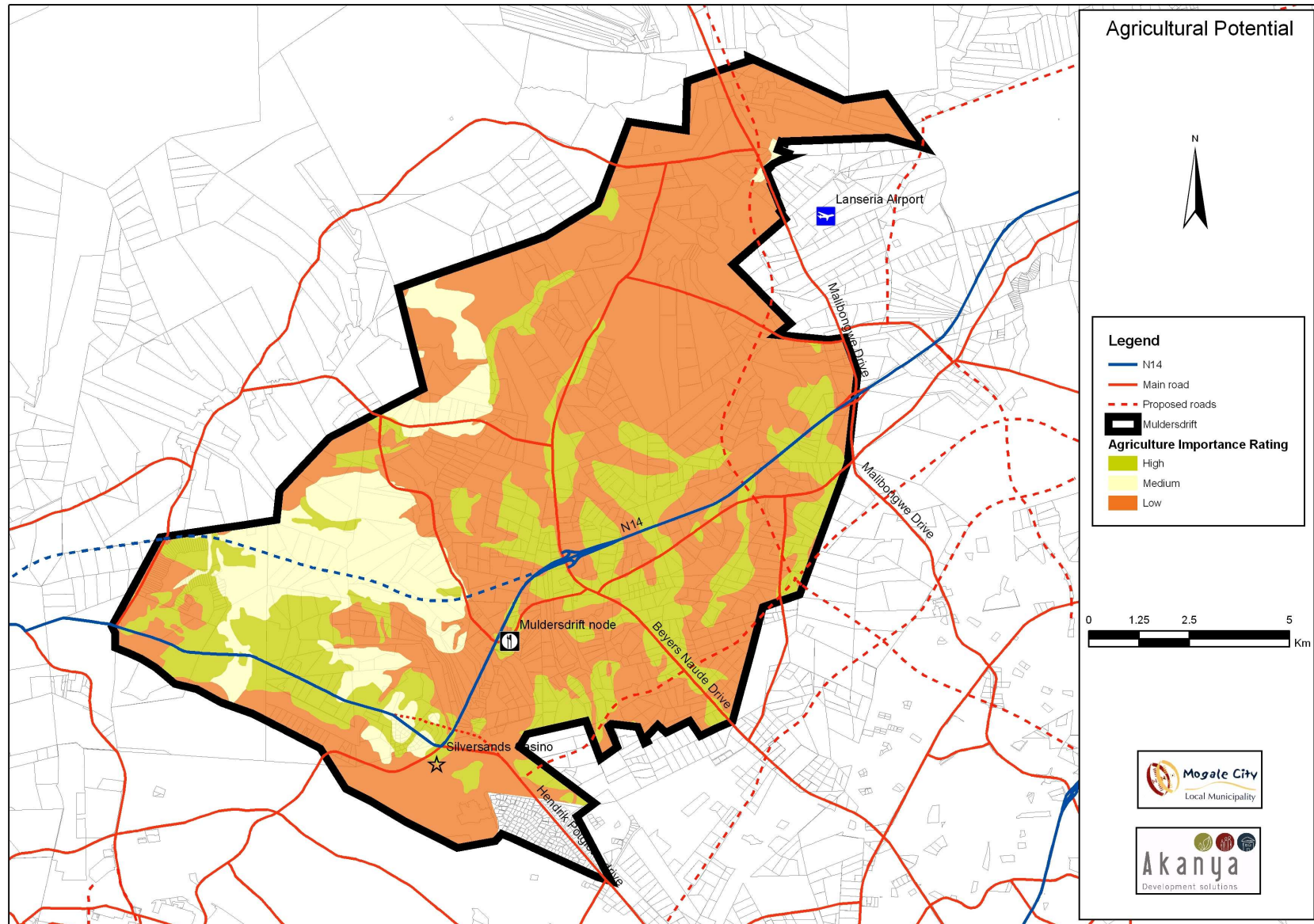


Figure 16: Agriculture potential

- **Industrial:**

There are truck stops along Malibongwe Drive and at the intersection of Malibongwe and the R28/ N14. There are isolated industrial activities throughout the rural residential area.

3.1.7.1 Robustness

In the Muldersdrift Precinct, there are underutilised or unused parcels of land that should find further use in accordance to their individual potential. Three types of areas were identified where interventions require different levels of negotiations.

The first: The agricultural potential areas that is currently devoid of any use, i.e. the areas to the western side of the R28/N14 and north of the study area which are currently vacant.

The second: The open spaces along the river system and ridges. These areas could be used as recreational and passive open spaces.

The third: The opportunities around the existing nodal points i.e. at the intersection of Malibongwe drive and R28/N14 and at the existing Muldersdrift retail node. These areas along the R28/ N14 proposed corridor development (Draft Mogale City SDF, 2009) need to be carefully considered in the short term as there is lack of engineering infrastructure to support a corridor development. However, the areas within the proposed development corridor could be used based on the current potential i.e. tourism related uses and for agriculture purposes in the short term.

3.1.7.2 Variety of Built Form

Variety in a place is that which offers experiential choices. It can be measured by (i) the variety of buildings (ii) the variety of people coming and going from and within a place (iii) the different interpretations or meanings that people relate to a place.

This particular analysis is of built form variety. Contrasted are:

- **Non-thematic buildings** – these are buildings of unique design or appearance. They stand out from the ordinary buildings. They tend to be public building offering services to all. Non-thematic buildings in the Muldersdrift study area are very few and far apart from each other. This could be attributed to the rural nature and the low densities in the study area. The tourism related buildings, the police station and the Monash University and local schools are examples in the area.

- **Thematic buildings** – these are buildings of recurring design themes. They tend to be of a single design and mass produced. Thematic buildings often render a monotonous visual landscape unless personalisation is encouraged and undertaken by their owners/occupants. Examples of thematic buildings in the study area are the high density development in the south of the study area.

4. GOAL GRID AND SWOT ANALYSIS

The development of a credible and implementable precinct plan for Muldersdrift must be based on a response to the current situation, which can be captured by in terms of the goal grid and assessing its strengths, weaknesses, opportunities and threats. The findings of the status quo analysis have resulted in a thorough understanding of the circumstances surrounding the study area. The challenge of the precinct is to respond to these circumstances in the form of a strategy that maximises the strengths, minimises the weaknesses, embraces the opportunities and overcomes the threats surrounding development in the Muldersdrift precinct. **Table 6** below outline the goal grid and **Table 7** overleaf shows the analysis of Muldersdrift presented in terms of the strengths, weaknesses, opportunities and threats (SWOT) for each of the five planning environments (socio-economic, movement, environment, land use and infrastructure, in order to help us identify those strength elements that need to be maintained, those weaknesses and challenges that need to be removed, the opportunities that need to be embraced and all the threats that ought to be avoided.

Does Muldersdrift have it?	No	Achieve	Avoid
		<ul style="list-style-type: none"> • Quality public environment • Ensure adequate service and infrastructure provision • Viable public transport • Appropriate land management mechanisms • Better pedestrian links • The development and management of green spaces • Promote and develop the identity of the area and surrounding areas • Land use and transportation integration • Appropriate mix of uses • Appropriate movement planning and management mechanisms • Create a recognizable nodal centre • Adequate community facilities 	<ul style="list-style-type: none"> • Environmental degradation • Strain on existing infrastructure • Current residential development prohibiting the creation of a quality open spaces and pedestrian environment • Unchecked development

Precinct Plan Muldersdrift Development Zone

	Yes	Preserve or Review <ul style="list-style-type: none"> Economic growth – agriculture Good regional accessibility Tourist attractions Existing educational facilities 	Remove <ul style="list-style-type: none"> Degeneration Separated parts Congestion Maintenance hotspots
		Yes	No
	Must it be in Muldersdrift?		

Table 6: Goal Grid

Table 7: SWOT Analysis

SWOT ANALYSIS					
	SOCIO-ECONOMIC	MOVEMENT	ENVIRONMENT	INFRASTRUCTURE	TOWN PLANNING
STRENGTHS	<ul style="list-style-type: none"> MAJORITY OF POPULATION BETWEEN AGE OF 15 & 34 FAIR PRESENCE OF EDUCATION FACILITIES HIGHER INCOME DISTRIBUTION PER HOUSEHOLDS HIGHER EDUCATION LEVELS 	<ul style="list-style-type: none"> GOOD REGIONAL ACCESS AND MOBILITY 	<ul style="list-style-type: none"> HIGH ANNUAL RAINFALL SURROUNDED BY ECOLOGICAL SENSITIVE AND SENSITIVE AREAS ACCESS TO REGIONAL OPEN SPACE NETWORK 	<ul style="list-style-type: none"> EXISTING ELECTRICAL NETWORK AND INFRASTRUCTURE 	<ul style="list-style-type: none"> WELL DEFINED ESTABLISHED RESIDENTIAL ZONES RISING NUMBER OF BUSINESS LAND USES TO THE SOUTH OF MULDERSDRIFT
WEAKNESSES	SOCIO-ECONOMIC	MOVEMENT	ENVIRONMENT	INFRASTRUCTURE	TOWN PLANNING

	<ul style="list-style-type: none"> ▮ HUGE OUTFLOW OF EXPENDITURE TO OTHER NODES ▮ LACK OF SOCIAL FACILITIES ▮ NO PUBLIC HEALTH FACILITIES ▮ NO SPORTS OR RECREATION FACILITIES ▮ LOW POPULATION DENSITY 	<ul style="list-style-type: none"> ▮ VEHICLE PEDESTRIAN CONFLICT ALONG THE R28/N14 ▮ LACK OF AND POOR MAINTENANCE OF SIDEWALKS ▮ LACK OF PUBLIC TRANSPORT FACILITIES ▮ NO PEDESTRIAN ACCESS ▮ LIMITED/ POOR INTERNAL MOVEMENT LINES 	<ul style="list-style-type: none"> ▮ LACK OF QUALITY PUBLIC OPEN SPACE ▮ POOR MAINTENANCE OF OPEN SPACE 	<ul style="list-style-type: none"> ▮ LIMITED WATER SUPPLY ▮ NO GRAVITATIONAL SEWER CONNECT ▮ ADEQUATE ELECTRICITY SUB-STATION – LIMITED CAPACITY ▮ POOR INTERNAL ROADS SYSTEM ▮ POOR STORM WATER MANAGEMENT- ESPECIALLY IN RURAL ROADS 	<ul style="list-style-type: none"> ▮ ZONING COMPLICATIONS ▮ UNREGISTERED INFORMAL SETTLEMENT
	SOCIO-ECONOMIC	MOVEMENT	ENVIRONMENT	INFRASTRUCTURE	TOWN PLANNING
OPPORTUNITIES	<ul style="list-style-type: none"> ▮ POTENTIAL WORKFORCE THAT CAN BE GENERATED FROM DEVELOPMENT ▮ IMPROVED EDUCATION LEADS TO BETTER LIVING STANDARDS ▮ UNTAPPED MARKET POTENTIAL RESULTING IN OUTFLOW ▮ BETTER LIVING STANDARDS FOR RESIDENTS ▮ PROVIDING BETTER SOCIAL FACILITIES ▮ PROVIDING SPORTS & RECREATION FACILITIES ▮ IDENTIFIED DEVELOPMENT CORRIDOR ALONG THE R 28/N14 ▮ PLANNED LANSERIA DEVELOPMENT (BY CITY OF JOHANNESBURG) 	<ul style="list-style-type: none"> ▮ PROPOSED PROVINCIAL ROAD NETWORK- TO TIE IN WITH MUNICIPAL ROAD MASTER PLANNING 	<ul style="list-style-type: none"> ▮ EXISTING RIVER SYSTEM ▮ EXISTING RIDGES ▮ SEVERAL POCKETS OF VACANT LAND ▮ AGRICULTURAL POTENTIAL 	<ul style="list-style-type: none"> ▮ PLANNED WATER RESERVOIRS 	<ul style="list-style-type: none"> ▮ UNDERUTILISED LAND ▮ DEVELOPING RETAIL & BUSINESS NODE ▮ COMMERCIAL DEVELOPMENT POTENTIAL ▮ DEVELOPMENT PRESSURE
	SOCIO-ECONOMIC	MOVEMENT	ENVIRONMENT	INFRASTRUCTURE	TOWN PLANNING
THREATS	<ul style="list-style-type: none"> ▮ UNEMPLOYMENT ▮ EDUCATION GAPS AMONGST POPULATION ▮ REGIONAL ECONOMIC COMPETITION ▮ CoJ and CoT AS EMPLOYMENT HUBS ATTRACTING WORK FORCE ▮ NEW RETAIL DEVELOPMENT IN SURROUNDING AREAS ▮ LACK OF RETAIL SERVICES ▮ LACK OF PUBLIC HEALTH FACILITIES 	<ul style="list-style-type: none"> ▮ TRAFFIC CONGESTION AT MAJOR INTERSECTIONS MALIBONGWE DRIVE / N14 AND BEYERS NAUDE AND N14 ▮ HOSTILE PEDESTRIAN ENVIRONMENT 	<ul style="list-style-type: none"> ▮ GROUND WATER POLLUTION ▮ INVASION OF RIDGES ▮ ILLEGAL DUMPING ▮ LACK OF VEGETATION, TREES, ETC. ▮ NO PUBLIC OPEN SPACE, RECREATIONAL FACILITIES 	<ul style="list-style-type: none"> ▮ FUNDING FOR THE PROPOSED INTERVENTION – EXPENSIVE 	<ul style="list-style-type: none"> ▮ ILLEGAL LAND USE ▮ VACANT LAND

	IN THE STUDY AREA CLOSE TO PUBLIC TRANSPORT				
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5. DEVELOPMENT INTENT

The Objectives are identified predominantly to deliver on the issues identified in the Goals Grid. The Objectives are not necessarily linked to a specific goal and will in some instances result in the achievement of a number of the goals. The Objectives that are relevant to the development of Muldersdrift are the following (in no specific order):

The approach of arriving at spatially referenced development Objectives in the development in Muldersdrift is through the identification of cross cutting Objectives. The substance of these Objectives will strongly be influenced by the strategies contained in the national, provincial and local policies. **Table 8** depicts the Objectives and the description of each in relation to the Muldersdrift area:

Table 8 Objectives of development in Muldersdrift

OBJECTIVES	DESCRIPTION
Pro- active absorption of the poor, particularly in the informal settlement throughout Muldersdrift	Muldersdrift could not be planned on the bases that the poor, venerable are excluded and eventually will go elsewhere. Rather it will be planned and developed to include the poor and the venerable so as to access the opportunities presented by the area
The promotion and facilitation of balanced and shared growth/economic development	Muldersdrift will promote economic growth by seeking to change structural dynamics in the space economy that prevent all residents in enjoying the 'fruits' of economic development and growth.
Facilitated Social Mobility and Equality	Muldersdrift is characterized by various areas of spatial conflict in that there are urban areas within rural areas and formal and informal settlements. Muldersdrift has an obligation to absorb the poor. This however, does not mean that it has to carry a bigger welfare burden. This will help people out of poverty rather than helping people in poverty.
The development of sustainable human settlements and urban renewal of existing settlements	Muldersdrift must accelerate the spatial restructuring of human settlements, by bringing work opportunities closer to the people, improve settlements designs to ensure sustainable liveable settlements. The plans must not respond to the spatial development requirements but also direct development.
The sustainable management of the natural environmental assets and heritage	Due to its nature, Muldersdrift must become sustainable by anticipating environmental shocks and managing the environmental impacts of its own processes of urban development. It must also promote environmental justice by ensuring that poorer communities do not suffer most from the effects of urban environmental risks and disasters, and that quality of life is enhanced by extending "green infrastructure" to grey, featureless dormitory low income human settlements.
Equitable and sustainable provision of engineering services	The use of ground water for the purposes of urban development should be discouraged together with the extension of existing engineering infrastructure for the development of Muldersdrift. The development of Muldersdrift must support the optimally use of available infrastructure in the short term and the extension in the medium and long term.
Facilitate Mobility and access to amenities	Muldersdrift will promote mobility and access to amenities through a grid like pattern road system on all possible road hierarchy.

The promotion of tourism development	Identify tourism development opportunities in or within close proximity to the Cradle of Humankind. Ensure linkages to tourism development areas.
The promotion of sustainable rural development.	Identify and protect high potential agricultural land, in particular those areas that form part of the Gauteng Agricultural Hub. Identify suitable locations for rural service centres. Identify suitable locations for rural housing development. Identify suitable locations and guidelines for the development of rural and resource based industries

The development **principles** supporting the above Strategic Objectives are:

- Increased Density,
- Provide diversified employment opportunity area,
- Increase the average income levels of residents,
- Provide appropriate infrastructure and services
- Provide efficient transportation as the key mechanism to ensure that goods are transported and that communities have access to opportunities and amenities.
- Open spaces are protected and conserved
- Enhance the residential components by allowing non residential land uses along major routes and in nodes

6. DEVELOPMENT FRAMEWORK

The development objectives and principles in the previous sections lead us to the development of Muldersdrift key strategies have been developed to facilitate their realisation and ultimately, the objectives. The strategies are:

- Defining the development zones
- Defining the movement system for efficiency in the area
- Develop appropriate urban form, land use and urban design guidelines
- Define the required infrastructure and services provision to support the development area
- Protected environmental sensitive areas
- Develop a monitoring and evaluation system.

These strategies are articulated in detail in the following sub-section. These strategies further articulate spaces that would ignite and encourage undertakings of self worth and development. These spaces have manifested themselves through structural elements that defined Muldersdrift as we know it. In this respect, the concept offers opportunities for the principles to be spatially defined and understood. The Precinct Plan as in **Figure 16** specifically identified:

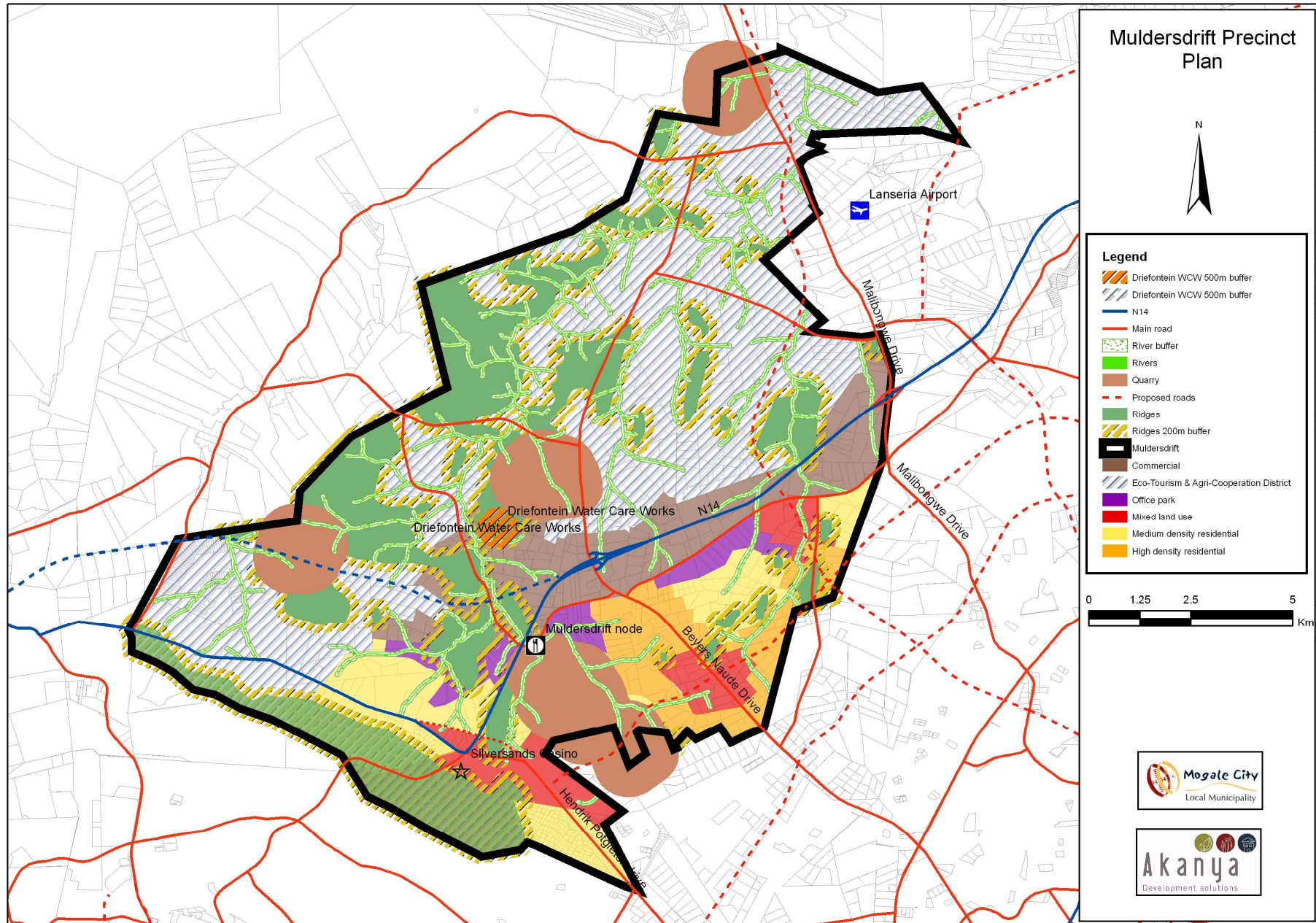


Figure 17: Muldersdrift Precinct Plan

6.1 Defining the study area's development Zones:

There are two distinct development zones i.e. the eastern zone 1 and the western zone 2. These zones are defined by the proposed buffer zone of the Cradle of Humankind (WHS). Zone 1 of the study area lies on the western part of the study area, and falls within the proposed buffer zone. The development within the buffer zone will be compatible with the activities of the Cradle of Human Kind WHS. Zone 2 of the study area falls outside the buffer zone. Development in zone 2 could be compatible with urban development. The development responses of the two areas, although different, will have to complement each other rather than have conflicting development rationales. The demarcation of the proposed dividing line has been largely influenced by:

- The N14/ R28 freeway which acts as a major movement line through the study area
- The logical and desired land use patterns along the development corridor. For reasons of legibility from a freeway, it is proposed that development should be encouraged on both sides of the freeway.

6.2 Defining the Movement system for efficiency of the area:

Rigorous transportation planning evaluation resulted in the proposed movement system and network. A number of considerations were made, these included:

- The evaluation of the topography of the study area
- Evaluation and consideration of the river system and ridges
- Existing and planned provincial road network
- Guidelines for the spacing and intersection distances of the different road hierarchy.

The proposed road network and road hierarchy provide many possible movement choices. This creates democratic and sustainable environments through easy access to public open space, amenities and retail activities in Muldersdrift. Consideration is given to how residents from different districts within the study area and beyond would be able to access what the area could offer, as well as to ways in which pedestrian priority and choice can improve patronage of the area. The aim is to propose ways in which access into and across the area can be improved on a global scale. This must open up the area and create a vibrant, cosmopolitan character.

Accessibility to and from Muldersdrift is also important for the sustainable development of the area. Proposals are therefore also made in terms of collector and feeder roads. These roads are also public transport routes. The road interventions should be seen within the context of a phased approach.

It is also important that the N14/ R28 interchanges at Malibongwe Drive and Bayers Naude roads be monitored to ensure easy regional accessibility to the area. From a transportation planning point of view, the functional road hierarchy of Muldersdrift precinct was examined and re-evaluated based on the principles mentioned in section 5 of this document. **Figure 17** shows the proposed functional road hierarchy and the proposed public transport routes.

The urban form advocated for the development of Muldersdrift is that of a compact city. On the bases of this approach, a more pedestrian based movement lines is proposed. The required pedestrian linkages are proposed between and in the different districts. The detail development of these routes should be analysed based on the shortest and most convenient routes in the design of the detail townships in these districts.

These pedestrian movements should interact and not compete with the mobility requirements for vehicular traffic. The mobility requirements within the Muldersdrift reside on the N14/ R28. Once Muldersdrift have been penetrated, the need for mobility diminishes and taken over by the pro-pedestrian movement lines. It is, however, important that some mobility routes do exist within Muldersdrift to service the road-based public transport and also to accommodate the ingress and egress of private

vehicles. These internal mobility routes do not need to be continuous. The lack of continuity will be beneficial in that it will discourage thoroughfare

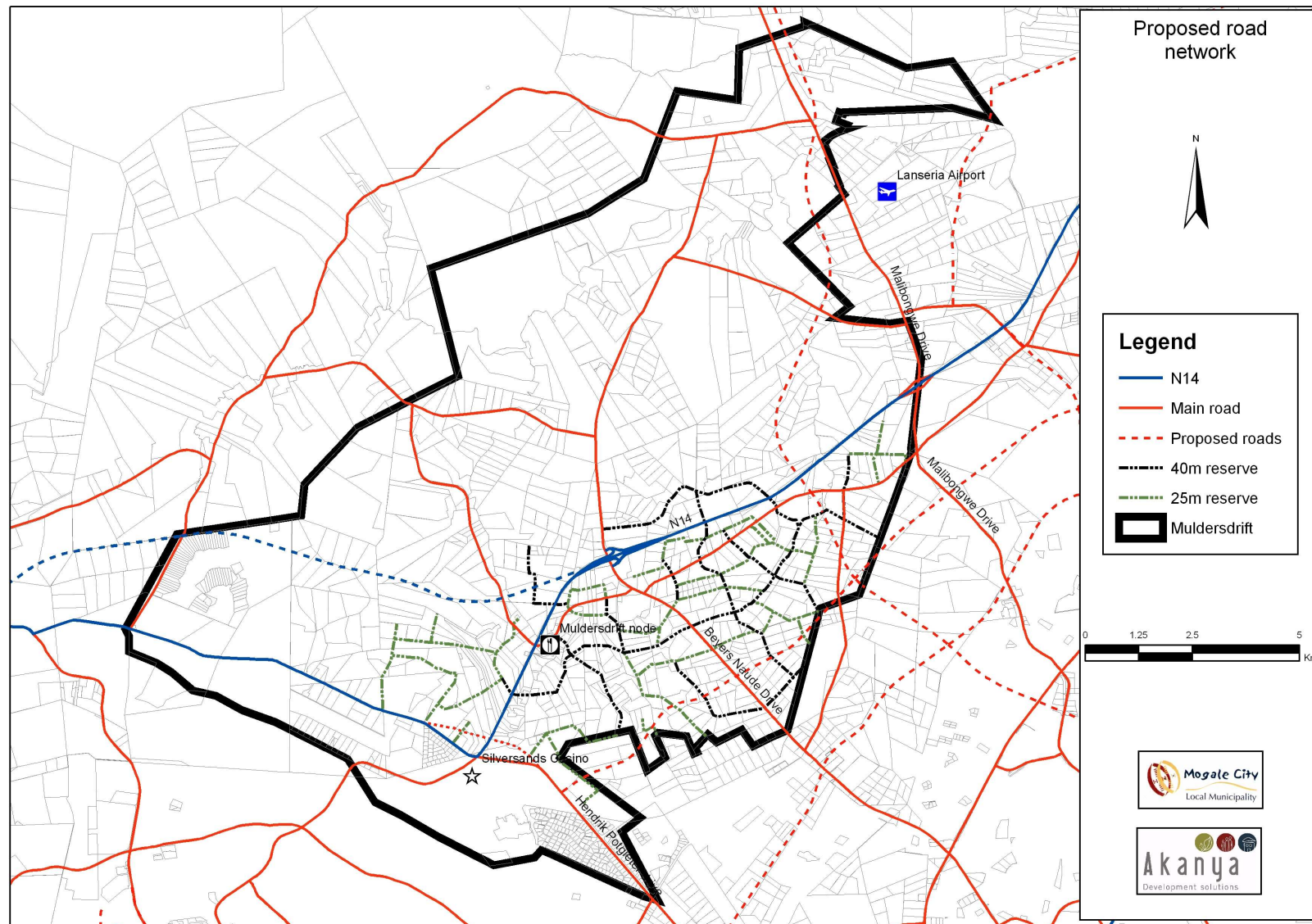


Figure 18 Proposed roads.

The assessment of the road network and the proposed road linkages in the Muldersdrift areas emphasizes an urgent need for the development of a roads master plan for the Muldersdrift area. The proposed roads master plan for the Muldersdrift area should be developed within the framework as provided by this document. The roads master plan will be used for the development of a traffic impact assessment as well as for the development of a travel plan. Such a master plan should protect the existing and future functions of each road and span the entire road reserve to include all modes. It should highlight the areas where upgrades are required and where restrictions should be imposed. Furthermore, it should take cognisance of the proposed BRT system in the City of Johannesburg. The master plan should also address the estimated carrying capacity of all modes of transport, pedestrian walking contours, and access management strategies.

The road master plan should be developed in the context of the proposed land-uses. The proposed roads as illustrated in **Figure 17** functional road hierarchy should also serve as primary input, although it may be revised as part of the master plan development process. The master plan should furthermore take cognisance of estimated carrying capacity of all modes (spare capacity), pedestrian walking contours, and access management strategies, planned road upgrades and planned public transport upgrades.

The Gauteng Policy for Traffic Impact Assessments allows for a prospective developer to undertake such a study on behalf of the municipality in its absence. The fees for this study would be deductible from the developer's bulk contribution. It is therefore prudent that the Mogale City takes control of this process pro-actively, before development pressures catch up on this requirement.

6.3 Develop appropriate urban form and land use

In order to develop appropriate urban form and land use in Muldersdrift the study area has been divided into districts as illustrated in **Figure 18**. The dividing of the study area into districts makes development decisions predictable, fair and cost-effective. By creating the distinct districts and guidelines for the development within these districts also encourage citizen and stakeholder participation in development decisions.

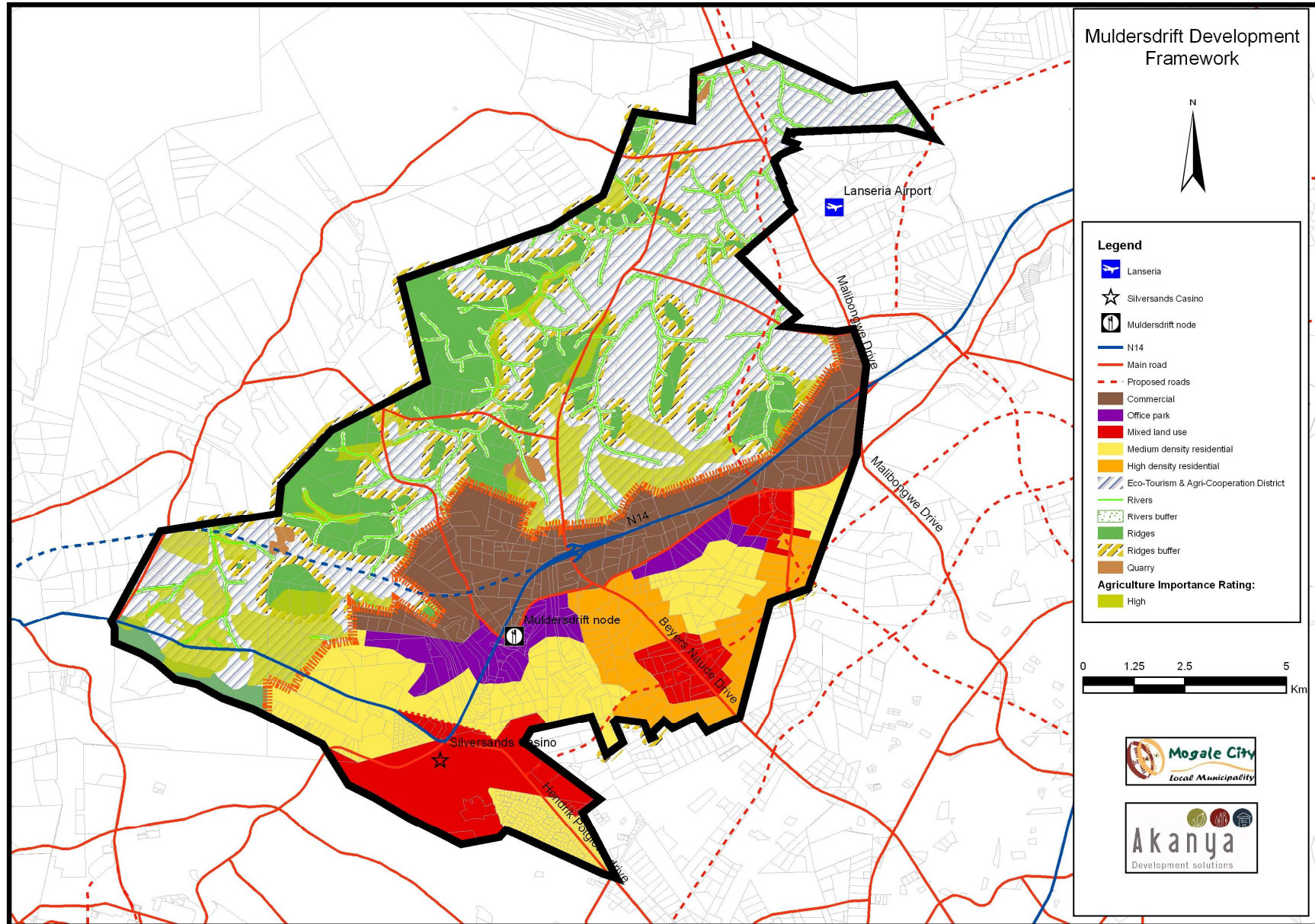


Figure 19 Development districts

There is an opportunity created by the National Route N14/R28, Provincial routes Malibongwe and Beyers Naude, which clearly points towards the establishment of a TOD around and in close proximity to these major roads. These districts form a string of development connected by an efficient transport system. These districts provide a platform in which various transit systems can be integrated to service the wider community, while strongly focusing on pedestrian movement to and from public transport facilities.

- **Mixed Land Use District:** This strategy aims to cluster activities that will achieve economies of scale in the district. This allocation of mix land uses takes advantage of Transit Oriented Development (TOD) Principles. These TOD principles will realize and implement the compact city. The district creates housing opportunities and choices for a range of household types, family size and incomes groups. This compact city principle should create walkable neighborhoods, foster distinctive, attractive communities with a strong sense of place. The mixed land use district will invest in and strengthen existing communities and achieve more balanced regional development and facilitate the provision of a variety of transportation choices. The compactness of the area will also make the civil and social infrastructure provision more affordable. These mixed land use district should not compete with other regional nodes such as North gate and Manlyne centre, but should be developed as areas that serves the sub-region and at local level. The mixed land use area should have a strong pedestrian focus and pedestrian connectivity. Accessibility via private transport should be convenient but must not dominate movement within the area. Public transport is integral to the design and functioning of the district. The mixed use district is shown in **Figure 19**.

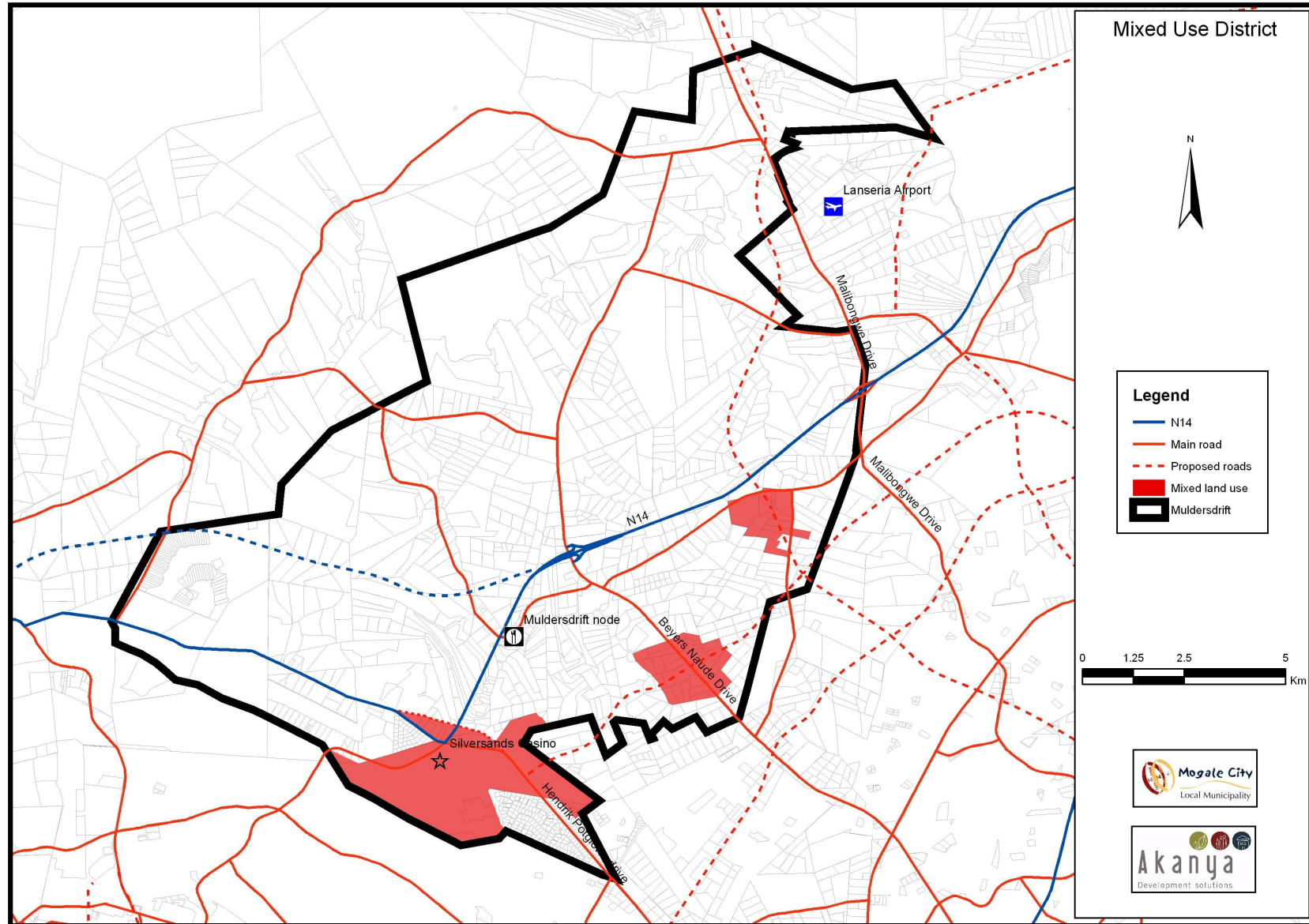


Figure 20 Mixed use district

- **Eco-Tourism & Agri-Cooperation District:** Muldersdrift is characterized by environmental areas of ridges and river systems. The proposed Cradle of Humankind world heritage site's buffer zone prohibits urban development in the area. This will also preserve open space, farmland, natural beauty, and critical environmental areas. This district could be seen as a transition area between the CoH WHS and the proposed urban core of the Muldersdrift Development Zone.

The transition areas in their nature have different and diverse forms. Depending on the intensity of land uses on 'both' sides of the transition areas. These areas could be characterized by large tracts of natural vegetation to highly modified man-made (cultural) landscapes, where the most intensive land-uses such as urban settlement and its associated human activities occur on one side and the most rural areas on the other side. A primary role of the transition area is that it represents the urban-rural interface, which largely affects the sustainability of both the rural and the urban environments. These zones could accommodate a wide range of land-uses, such as agriculture, tourism related land uses, forestry, art galleries, conference facilities etc.

It is proposed that the transition zones in the Muldersdrift area and the Cradle of Humankind World Heritage Site includes the 'cultural areas' that will complement the CoH WHS. In this area local communities, management agencies, scientists, NGO's, cultural groups, economic interest groups and other stakeholders would work together to manage and develop the area's resources in a sustainable manner.

The management of the rural and urban interface is the most critical part of the Muldersdrift Development Zone planning exercise. The creeping in of the urban uses in the rural area will indeed threaten the COH WHS. The clear land use proposal and management of the areas is very critical. International experience and literature indicate those clear developmental guidelines need to be developed for such areas. The table below depicts the development guidelines for the rural area district:

Performance Criteria (Required)	Guidelines
<i>Usage of Existing opportunities</i> Developments are located in order to make best use of existing infrastructure and to preserve naturally vulnerable areas	<ul style="list-style-type: none"> • Locate development in close proximity to existing services, access roads, etc.
<i>Development corridor</i>	<ul style="list-style-type: none"> • Residential buildings are not erected within 200m of a designated commercial/transport corridor; and • Non-residential buildings (within the Eco-Tourism and Agri-Cooperation District) are not erected within 100m of a designated transport corridor.
<i>Permitted Land uses</i>	
Division	<ul style="list-style-type: none"> • 'Estate' townships establishment permitted, subject to special conditions and environmental considerations. • Divisions only on special merit; e.g. where a division is motivated because of a road, river or servitude physically severing the land.

Density	Permitted density should not exceed 0,5 dwelling units per hectare. No second dwellings are allowed. Where the densities go up to 0,5 dwelling units per hectare, it should be on areas outside the ridge, rivers and quarry buffers (essentially on the hatched areas of Figure 20)
Proposed Land/Open Space Typologies	Range of uses on merit related to agriculture, conservation, tourism, recreation, arts and crafts, home industries, estates, multipurpose service centre. The TOSF Open Space typologies are also applicable.
Development Standards (Compliance Required)	
<ul style="list-style-type: none"> Dwellings and other buildings are set-back a minimum of 150m from the property boundaries; Residential buildings are not erected within 200m of a designated transport corridor; and Non- residential buildings are not erected within 100m of a designated transport corridor. 	
Land Use	Recommended Buffer
Diesel irrigation pumps	1km
Intensive horticulture (fruits , nuts, vegetables)	500m
Dairies (intensive agriculture)	300m
Hot houses	200m
Cattle dips and cattle yards	200m
Cropping (maize, soybeans etc)	200m
Grazing	0-20m
Performance Criteria (Required)	Guidelines
<i>Water supply</i> Water supply capable of serving the needs of the proposed development in terms of domestic, stock, fire-fighting and other needs, need to be accurately calculated and made available.	<ul style="list-style-type: none"> By providing each dwelling with at least 45,000 litre portable water storage if supplemented by an alternative supply; By having ready access to a minimum water supply of 10,000 litres (for dwellings) – exclusively for fire-fighting pumps and water tanks and trailers should be readily available; Using alternative water supplies such as bores and wells for uses other than domestic consumption; and Using other building as catchments for fresh water tanks and connecting to water reticulation.
<i>Electricity</i> Access to power supply capable of serving the proposed development need to be calculated and made available.	<ul style="list-style-type: none"> Locate development where ready access to a power supply is available; and By demonstrating self sufficiency with alternative power sources such as wind and/or solar power generation systems.

Telecommunications Access to telecommunication capable of servicing the proposed development need to be made available.	<ul style="list-style-type: none"> • Locating proposed developments where they can be serviced by a telecommunication provider; and • By demonstrating self sufficiency with alternative telecommunication equipment (e.g. Satellite technology).
Development Standards (Compliance Required)	
<p>1) Developers must demonstrate to council the ability to service a site with electricity, water, telecommunications and effluent disposal and</p> <p>2) Rural dwellings to have a minimum storage of 10,000 litres of water exclusively for firefighting purposes.</p> <p>Water supply storage may be in-ground or above-ground provided that, with respect to the 10,000 litres reserved for firefighting purposes, the following must be observed:</p> <p>(a) Where in-ground (including farm dams) or below-ground storage is provided, access for firefighting should enable draughting of water onto a fire fighting unit, with said unit's own draughting equipment;</p> <p>(b) Where above-ground storage is provided;</p> <p>(i) The outlet for domestic supplies be located at a level above that of the 10,00 litres reserved for fire; and</p> <p>(ii) The man-hole access to the tank above should be located so that it is accessible by fire fighting units and personnel.</p> <p>Note: The accessibility of water storage by rural fire fighting units is primarily determined by the reach of their draughting hose, which is standard 6m in length.</p> <p>Note: The accessibility to above-ground storage tanks can be increased by the provision of a 38mm BSP threaded outlet and gate valve at the bottom of the tank.</p>	
Performance Criteria (Required)	Guidelines
Domestic solid waste The amount of domestic solid waste disposed of to landfill is minimized; and	<ul style="list-style-type: none"> • Organic waste is composted; • Waste such as paper, plastic, glass and aluminium are recycled; • Reuse of waste such as timber.
Domestic solid waste is disposed of in an environmentally responsible and legal manner.	<ul style="list-style-type: none"> • A waste collection transportation disposal service is used to collect and dispose of waste; and • Waste is disposed of at the communal Waste Disposal Depot
Domestic Liquid Waste Domestic liquid waste is disposed of in an environmentally and legally acceptable manner;	<ul style="list-style-type: none"> • An approved system of on-site sewage management is installed; and • Locate approved system of on-site sewage management so it is not: <ul style="list-style-type: none"> - Located upon flood affected land; - Within or adjacent to permanent or ephemeral drainage lines; and - Likely to contaminate any surface or aquifer water supplies.

The amount of liquid waste generated is minimized; and	<ul style="list-style-type: none"> Dual-flush toilet systems and water saving fittings and appliances are used; and Composting toilets are used.
Performance Criteria (Required)	Guidelines
The ability to reuse treated waste water is maximized where there is minimal risk of contamination to the aquifer or ground water supplies.	<ul style="list-style-type: none"> Installation of an approved Aerated Waste Water Treatment System (AWTS) which enables treated effluent to be used to water non-edible tree and gardens be utilised where environmental conditions allow. <p>Note: AWTS enables treated effluent to be irrigated onto trees, gardens and lawns etc. Treated effluent must not be used to irrigate passive or active recreation areas or used to grow vegetables or fruit for human consumption.</p>
Development Standards (Compliance Required)	
<p>No waste is to be disposed of on-site , by burial, burning or any other means without the lawful authority of Mogale City Local Municipality and</p> <p>Details of the proposed means of disposing of all forms of waste are to be submitted to Council with a development application.</p>	
Performance Criteria (Required)	Guidelines
<i>Amenity</i>	<ul style="list-style-type: none"> Ensure the scale and character of non-residential buildings are compatible with the nature of the locality; Ensure the level of noise and volume of traffic etc do not exceed those normally relating to the urban rural buffer area; and Restrict hours of operation to normal business hours.
<i>Advertising structures</i>	<p>Advertising associated with home industries, home occupations are home businesses relate to the premises situated on the site and specify one or more of the following:</p> <ul style="list-style-type: none"> The purpose of which the land or premises is or are to be used; Describe the occupation or business; Describe particulars of the goods or services dealt with or provided on the land.
<i>Noise management</i> The hours of operation of noise generating activities are restricted to avoid any noise nuisance upon surrounding properties	<ul style="list-style-type: none"> The hours of operation of non-residential activities in the Urban-Rural Buffer zone are to be determined by the residence association in conjunction with the Mogale City Local Municipality.
Developments are designed to minimize the potential for	<ul style="list-style-type: none"> Proponents must refer to the EMP noise Control. Noise levels for

offensive noise to be generated.	proposed developments will be determined on an individual site basis.
<i>Siting of noise generating activities</i>	<ul style="list-style-type: none"> Sources of noise such as garbage collection, machinery, parking areas and air conditioning plants should, where practicable, be sited away from adjoining properties and where necessary, be screened by walls or other acoustical treatment.
<i>Home industries and home businesses</i> Home industries and home businesses ensure the low density residential appearance of the property is maintained and continues to provide a positive contribution to the locality.	

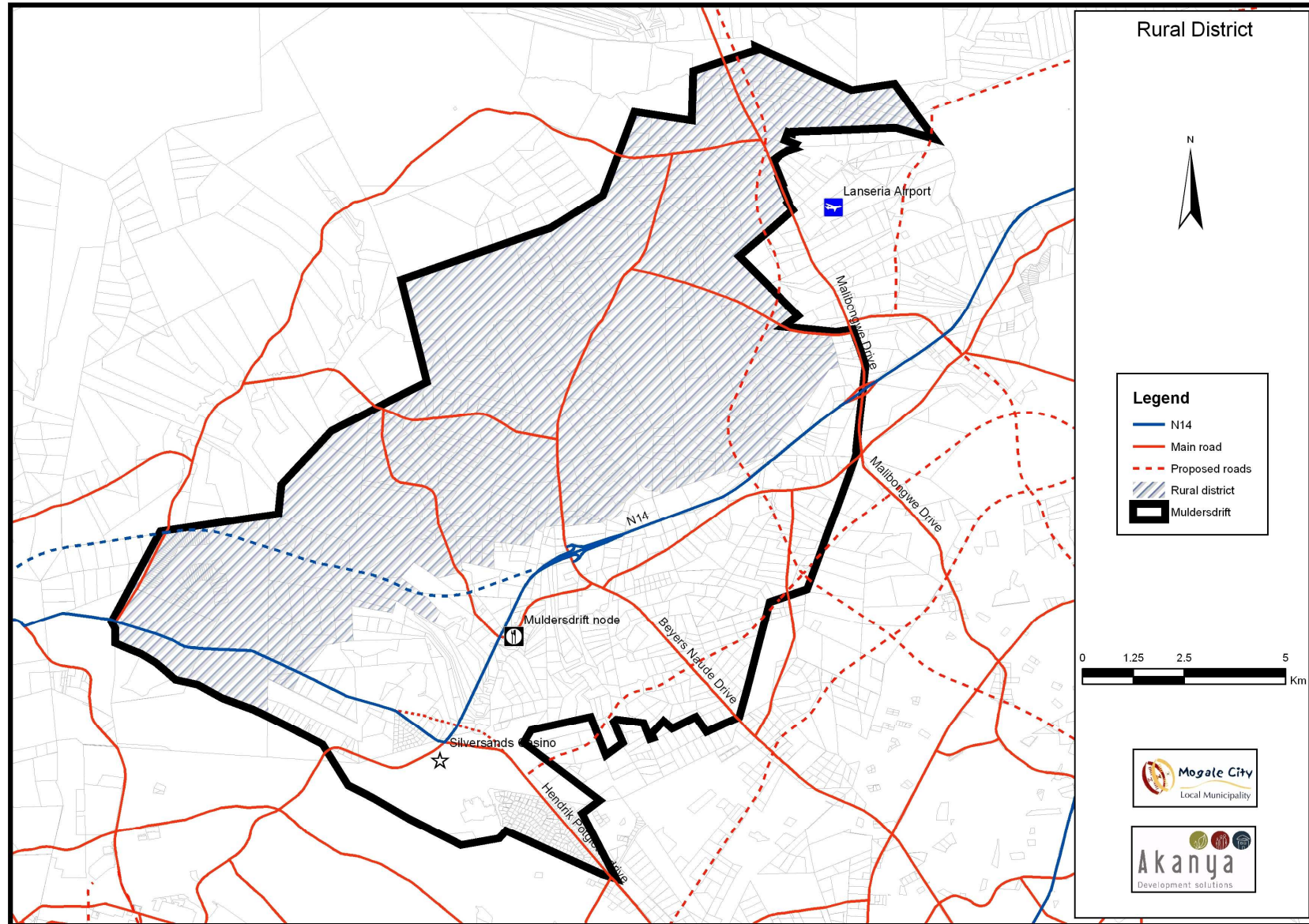


Figure 21 Eco-Tourism and Agri-Cooperation District

- **High Density Residential District:** Movement overlaps with retail opportunities and subsequently, a TOD is a catalyst for economic growth due to their higher densities and diversity of uses in this district. Although predominantly residential, vertical and horizontal mixed use is encouraged. Public space and retail facilities are limited to ground floors, whilst higher storeys are reserved for residential use. Active street edges on ground level include public and some localized retail activities and should be transparent so that there are enough eyes on the street, thereby improving user safety through passive policing of public space. It is important to allow for some mixed uses along the street level to attract pedestrians to the edges of buildings.

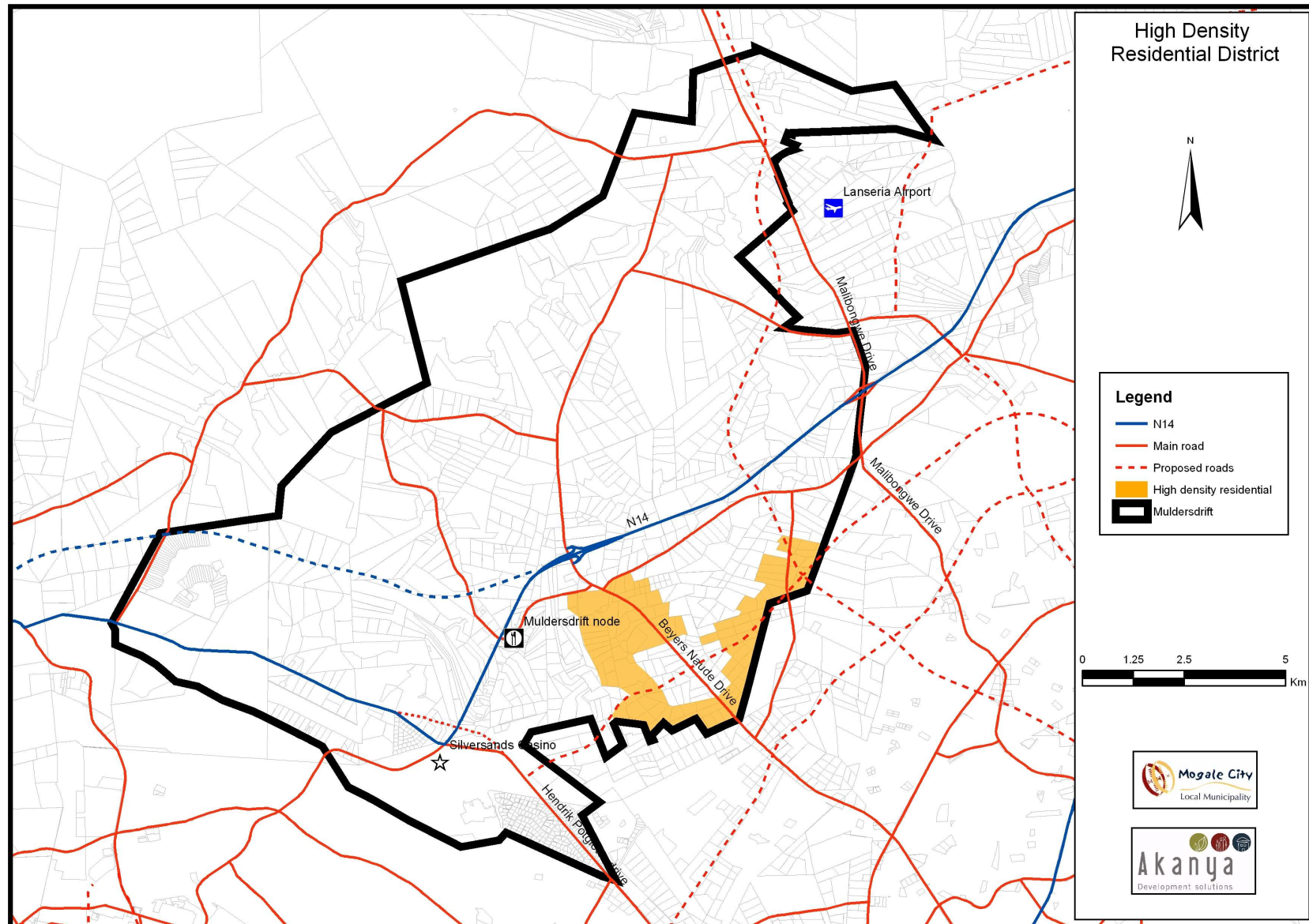


Figure 22 High density residential district

- **Medium Density Residential District:** Medium density residential district offers the variance in the urban form. These districts are located slightly way from the public transport routes. Like the high density residential districts, these will allow limited retail facilities at strategic road intersections at a neighborhood level. Active street edges on ground level include public and some localized retail activities and should be transparent so that there are enough eyes on the street, thereby improving user safety through passive policing of public space. It is important to allow for some mixed uses along the street level to attract pedestrians to the edges of buildings.

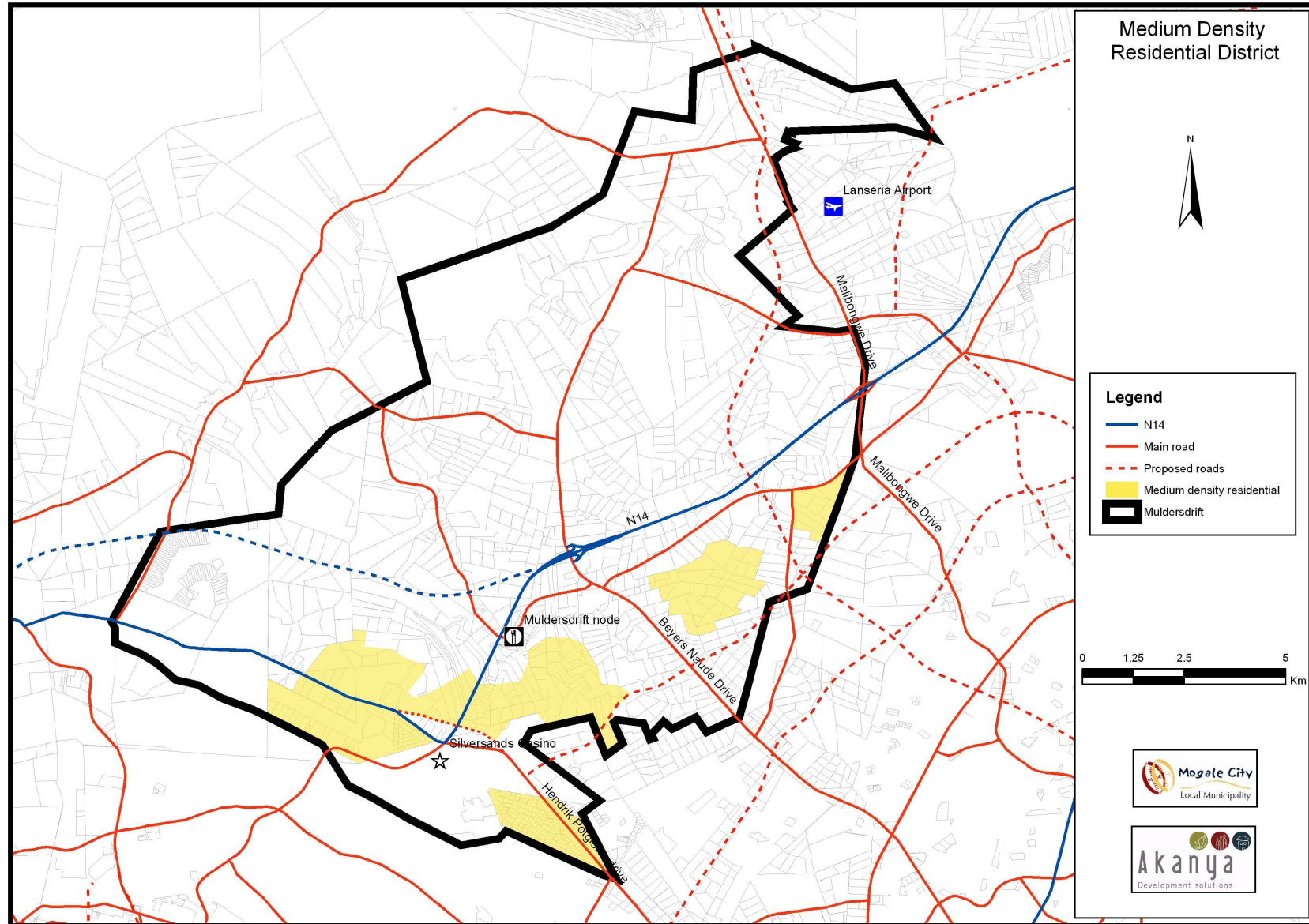


Figure 23 Medium density residential district

- **Commercial District:** The commercial district is mainly reliant on the visibility and high mobility because of its international, national and regional significance as such the location of this district along the N14 is strategic. It is proposed that the district extends on both sides of the N14. These concepts will complete the symmetry of land uses along the N14.

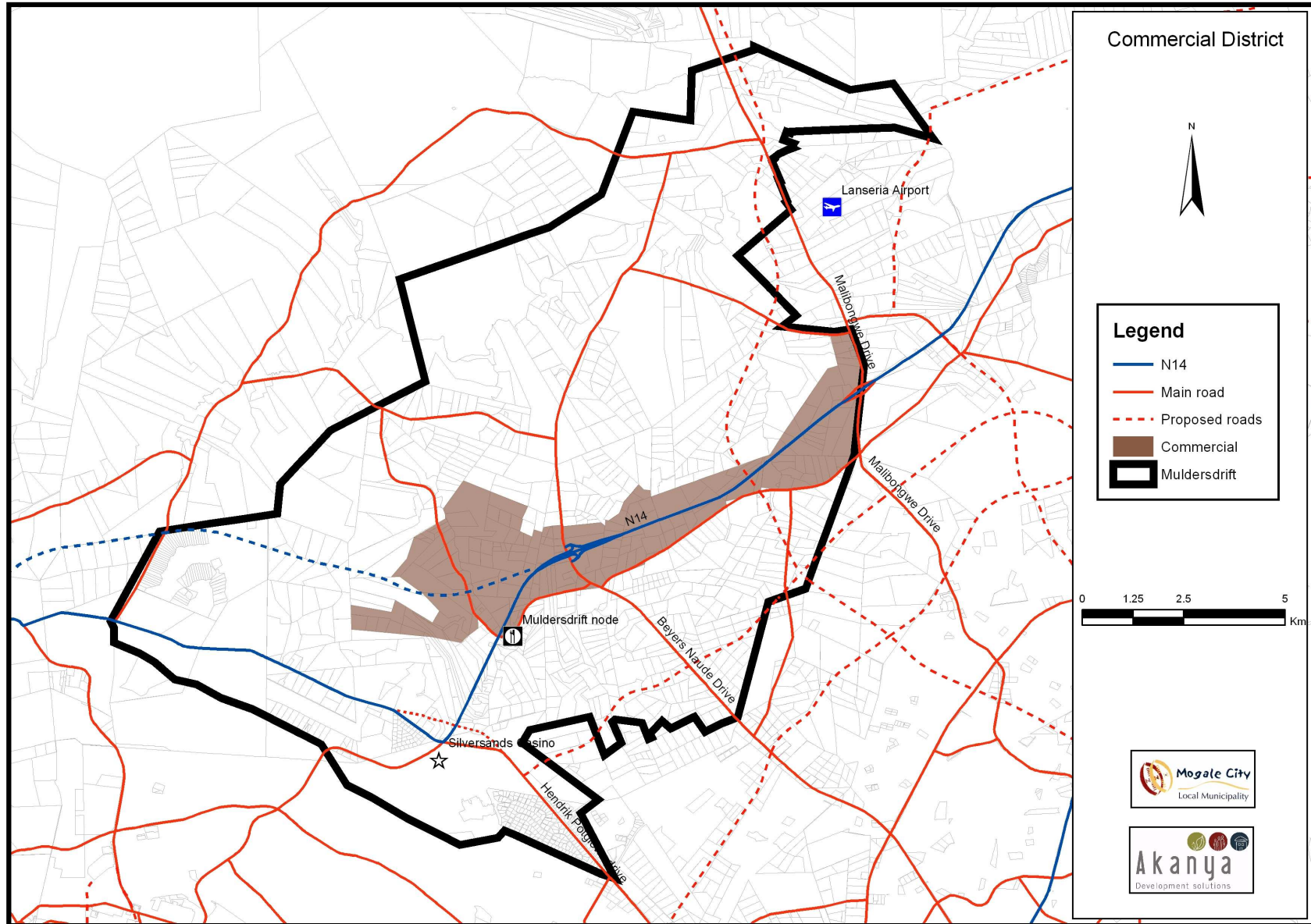


Figure 24 Commercial district

- **Offices District:** Like the commercial District, the Offices district also is reliant on the visibility and high mobility. The offices district is abutting the class 3 lass 2 roads.

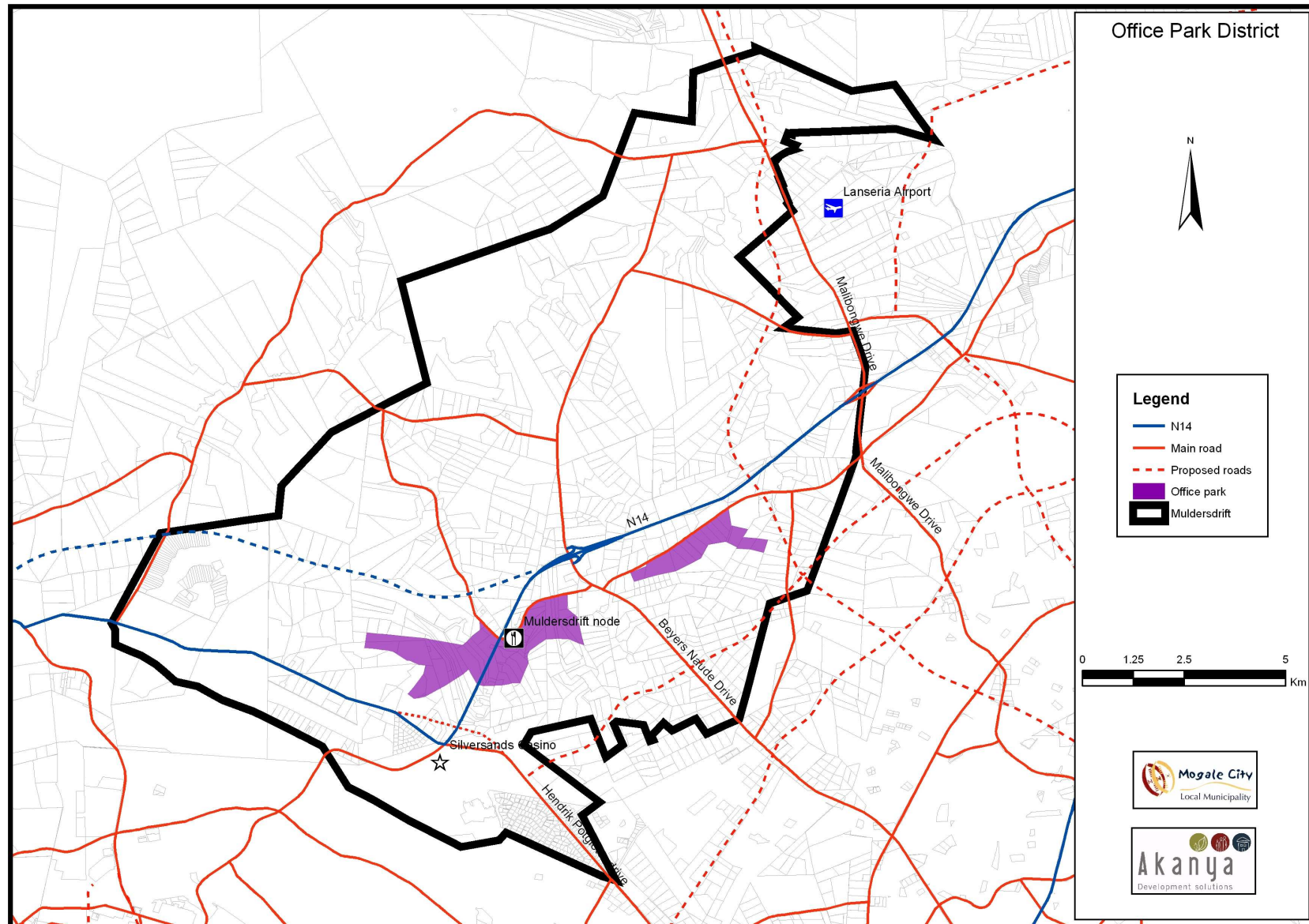


Figure 25 Offices district

6.4 Define the required infrastructure and services provision to support the development area

The infrastructure assessment of the Muldersdrift area has shows serious deficiencies in the availability of civil infrastructure both reticulation and bulk. In order to achieve any sustainable development and successful growth of Muldersdrift, to a large degree, depend on the level of infrastructure availability and maintenance of the public environment. The response of Mogale City Local Municipality and other government agencies in the provision of infrastructure in Muldersdrift will be critical in determining whether Muldersdrift will realise the vision or not.

Co-ordinating in the infrastructure provision by all those responsible will be for the good of the communities currently living there and those who will be attracted to this area. This will require leadership and direction from Mogale City. The different sphere of government, government agencies and developers involved need to work together to get the best value from their investments. This should avoid duplication work, speeds progress, brings a co-ordinated approach to solving problems and produces better outcomes.

Based on the assessment above and the fact that the study area has been divided into different zones and subsequently the zones were divided into districts which have been identified according to their physical relationship within their context as well as the future vision for the growth of Muldersdrift. In the identification of development districts, it is important to provide smaller block sizes and tighter street networks in order to achieve the characteristics of an urban TOD. It is also important to determine incremental development opportunities which occur collectively rather than haphazardly. The districts identified will therefore assist in structuring the phasing of development of Muldersdrift. It is also important to recognize that the different districts will comprise different levels and intensity of development. For this reason, different levels of infrastructure provision have to be taken into consideration in the development of any parcel of land.

In total, Muldersdrift covers an area of approximately 180 km². The proposed development consists of high density residential, medium density residential, nodal development with mixed land uses, commercial, office development and supporting social facilities. All these land uses will require

Water: The water supply in Muldersdrift can be defines in to three areas i.e. the supply, storage and distribution network:

- **Supply:** It is expected that Muldersdrift will require approximately 60 MI/day to supply the proposed development of the area the water demand. The current water supply is 25 MI/day. There is a shortfall of approximately 35 MI/day. Therefore the Rand Water supply points will have to be procured as a primary water supply in Muldersdrift. This intervention will also alleviate the demand on the 'Western Gauteng' and also the Driefontein waste water treatment works. The bulk water supply through the above proposed Rand Water supply pipe line will require storage facilities. The current distribution of reservoirs will need to be augmented throughout the Muldersdrift area. This will assist in shifting the present bulk water supply pipe lines into a larger and more direct bulk supply from the reservoirs

- **Storage:** There is a lack of dedicated bulk and intermediate storage reservoirs in Muldersdrift. In order to address this challenge, Mogale City LM will have to construct water reservoirs at location other than the proposed Rand Water pipeline. The proposed positions for new water reservoirs and their rounded areas of service are shown in **Figure 25**

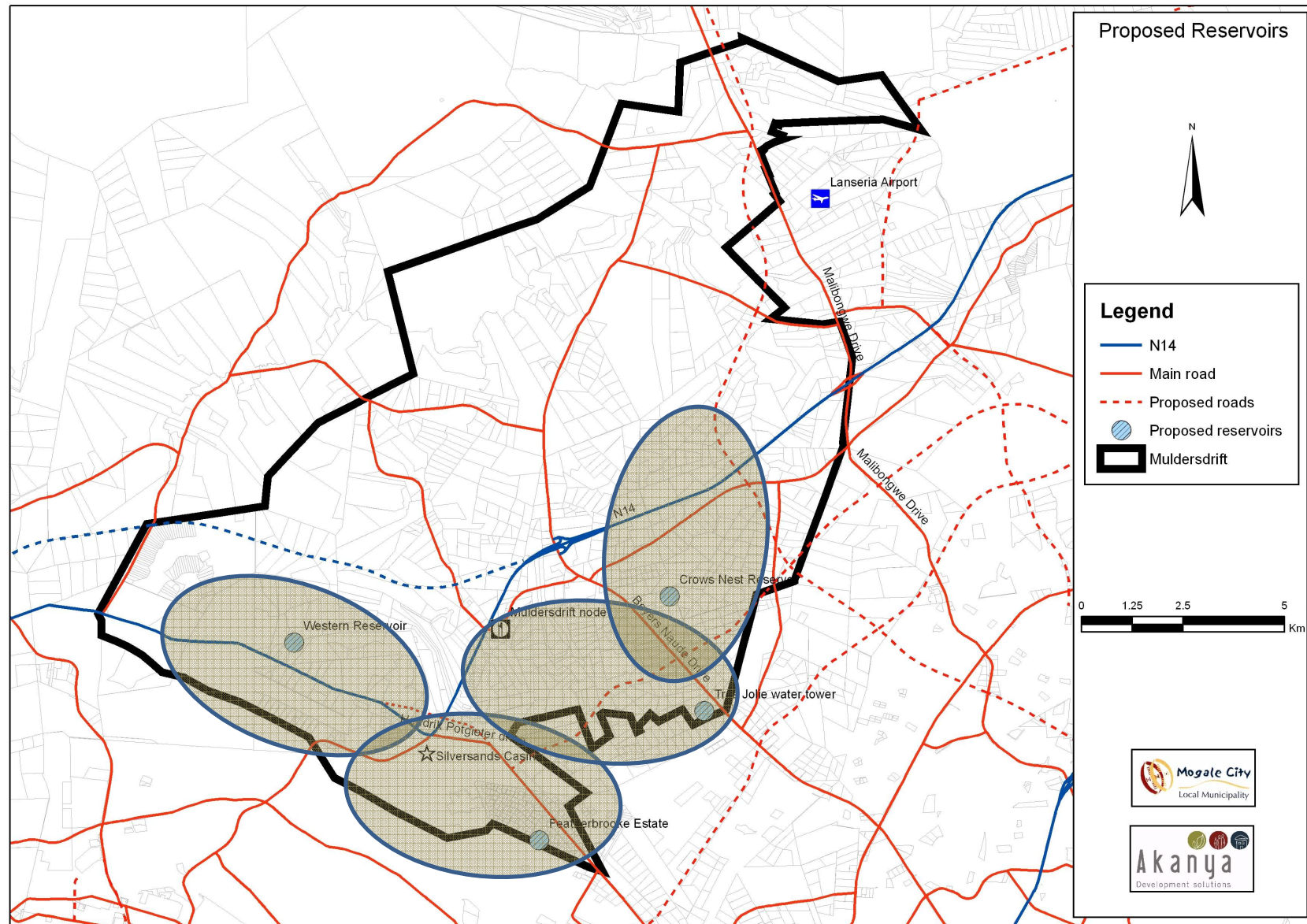


Figure 26 Proposed positions for water reservoirs

- **Distribution:** Water distribution is the most expensive part of water supply. The design of the water distribution systems will determine the ultimate access to water services by the consumers. The design of the distribution network varies and it's determined by the type of land use and the demand per day. It is proposed that the design guidelines from the 'Red Book' be used. The distribution network covers south of the study area, in the Featherbrooke area. It is proposed that the services be extended to the Nooitgedacht area east of the N14/R28.

The design guidelines should be in accordance to the Township's services for the any proposed development should be based on the design principles in the '*Guidelines for the Provision of Engineering Services in Residential Townships*'.

Sanitation: There are various sanitation systems available in South Africa. However, for the sustainable development of Muldersdrift, the full waterborne sanitation is proposed. The fact that there is no sewer treatment works operated by Mogale City LM in Muldersdrift poses a developmental challenge. Currently the Driefontein waste water treatment works is the only available treatment works in the Muldersdrift area and it's owned by the City of Johannesburg.

There is an existing memorandum of agreement between the City of Johannesburg and Mogale City, which allows Mogale City to use the Driefontein sewer treatment works. A study undertaken by the City of Johannesburg's, Joburg water revealed that should Muldersdrift develop beyond the current Gauteng Urban Edge, upgrading of the Driefontein sewer treatment works will be required. With the proposed development and residential densities, it is important that proper assessment of the capacity needs to carry the proposed development vision, be made. The current upgrading will require Mogale City and the City of Johannesburg to review the current user agreement. The proposed development will require an extension of the outfall sewer to the north- east of Muldersdrift towards the Nooitgedacht area east of the N14/R28

Electricity: There is a moratorium for the supply of commercial and industrial areas with electricity in Muldersdrift. From the existing bulk it would seem that there is a good supply of electricity. However, each development would need to assess the capacity of such services. This could be verified with ESKOM the supplier in the area. Public lighting is still the responsibility of Mogale City, therefore, it is important that the public lighting is supplied to the satisfactory of the municipality. **Figure 25** shows the location of high voltage electricity substations in the Muldersdrift area.

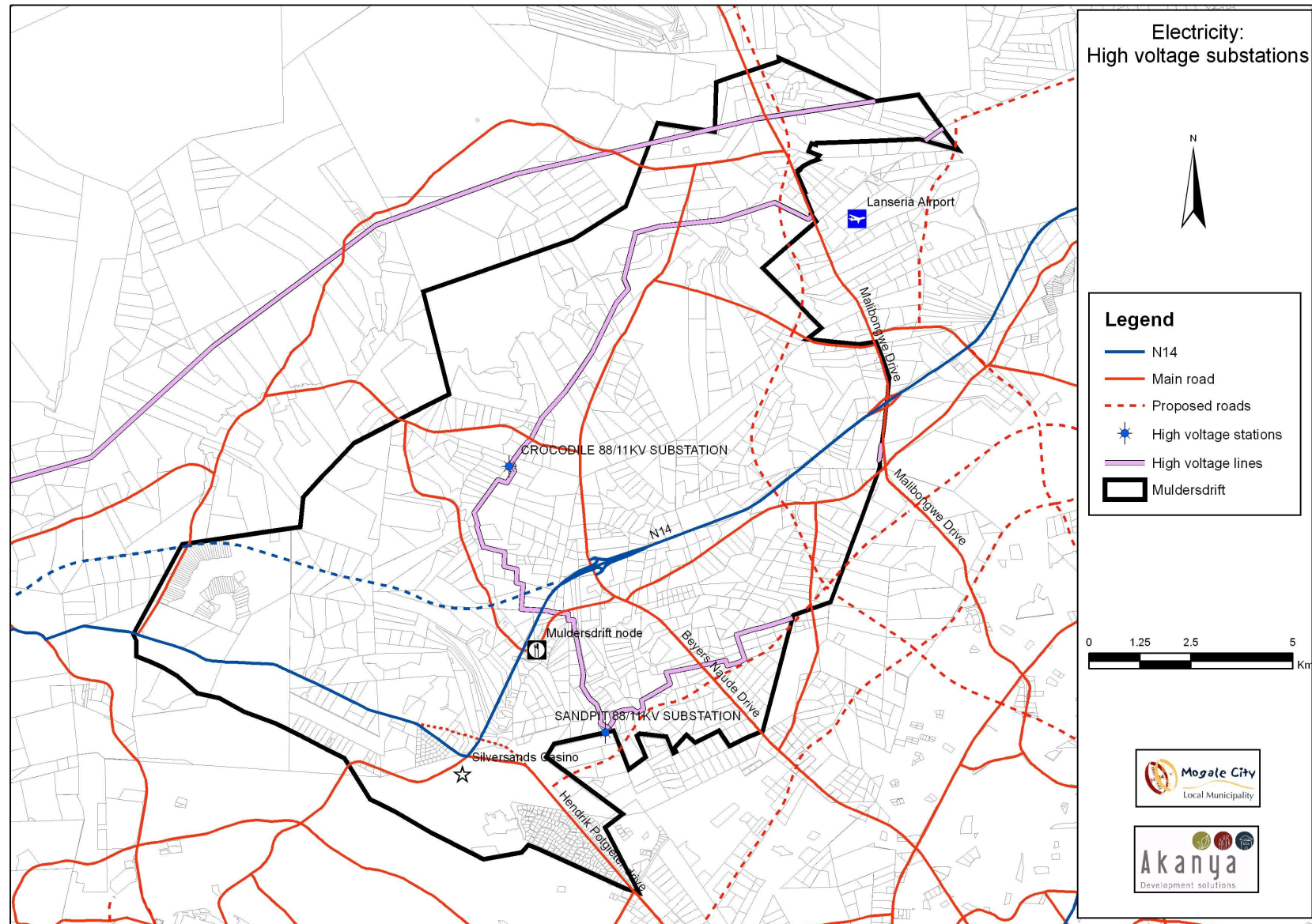


Figure 27 High voltage electricity substation

Roads and storm water: This plan proposed a number of roads and road hierarchy up to class 4 roads. The class 5 roads will have to 'fit' in with the higher order roads to facilitate the movement discussed herein. These class 5 roads will have to accommodate the design principle for workability in Muldersdrift. The design of the roads and intersection should include the design for pedestrians and they should form part of the building form.

Muldersdrift is traversed by natural watercourses. These watercourses need to be protected as far as possible. The proposed development will be indeed change the storm water management in this area. With the current climate changes throughout the world, planning should not only consider the typical draining methodologies but also plan for severe storms. This implies that all roads should be tarred and must have storm water management facilities.

6.5 Protected environmental sensitive areas

Muldersdrift is traversed by environmental areas of rivers and ridges. The rivers have tributaries that provide an opportunity for another powerful structural element to be established. Although the character of Muldersdrift will change once fully developed, these rivers and ridges should be protected through the 'buffer zones around them. There are two generic buffer zones identified for the area as per the requirements of GDACE. These are identified as the 'Best case buffer and the 'worst case buffer'. These buffer zones imply that no development should take within the buffer zones **Figure 27** shows the environmental areas with the proposed buffer zones around them.

Included in the protected area herein are the quarries. Although there are a number of instances wherein current settlements are within identified buffer zones, it should be bourn in mind that for sustainable human settlement and environmental conservation it is ideally not suitable to continue the occupation of these spaces. No future building activities should take place in these areas.

The environmental sensitive areas provide an opportunity to focus on pedestrians and form interlinked green belts. Pedestrian and cycling routes should be provided all along the river systems to provide an alternative pedestrian route linking the districts area.

The spaces should have a strong natural character and if developed to accommodate a recreational function. The green belt should provide a linear recreational space for all non-motorised transport and should thus include cycle ways.



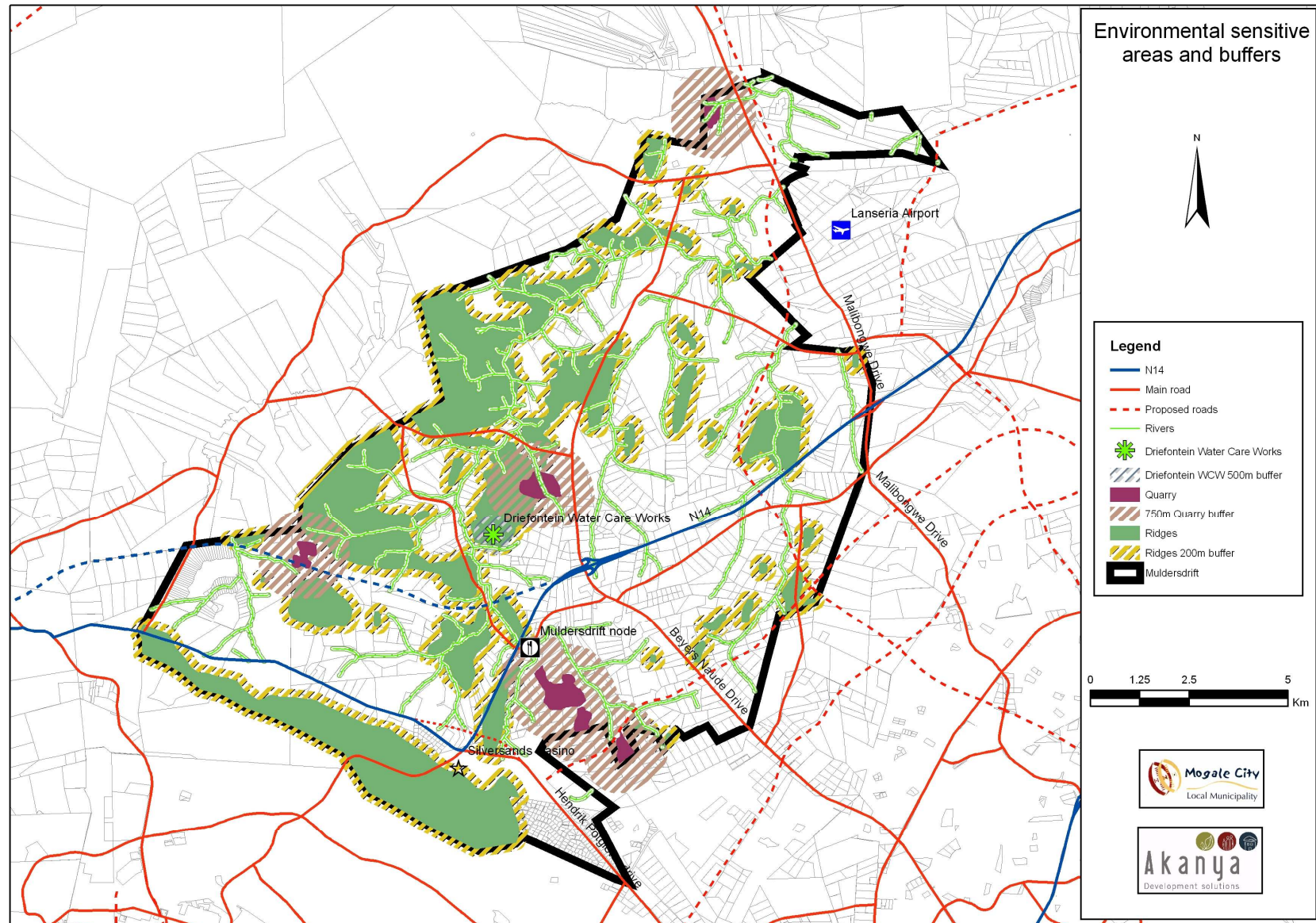
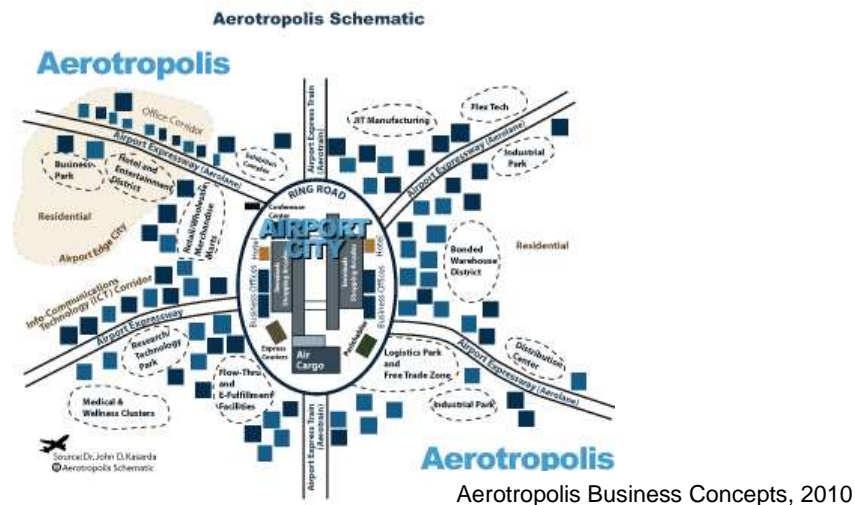


Figure 28 Environmental sensitive areas and buffers

7. DEVELOPMENT PRINCIPLES AND STATEMENTS

7.1 Lanseria Aerotropolis

Airports will shape business location and urban development in the 21st century as much as highways did in the 20th century, railroads in the 19th and seaports in the 18th" (Kasarda, 2010). Although it doesn't entirely form part of the Muldersdrift Development Zone however, the opportunity that exists for the establishment of an Airport City or an "Aerotropolis" around the Lanseria Airport is a course to be unpacked. Major airports have become key nodes in global production and enterprise systems offering them speed, agility, and connectivity. They are also powerful engines of local economic development, attracting aviation-linked businesses of all types to their environs. These include, among others, time-sensitive manufacturing and distribution; hotel, entertainment, retail, convention, trade and exhibition complexes; and office buildings that house air-travel intensive executives and professionals (Aerotropolis Business Concepts, 2010)



An in-depth feasibility study and urban development framework are proposed in order to investigate the possibility of both Mogale City in relation to the City of Joburg and the City of Tshwane pursuing the campaign for developing an aerotropolis around the Lanseria Airport.

The opportunity created by the accessibility of Muldersdrift and the fact that it is an almost green field development clearly points towards the establishment of a TOD around the movement lines, forming distinct development districts nodes, connected by an efficient transport system. The districts provide a platform in which various transit systems can be integrated to service the wider community, while strongly focussing on pedestrian movement to and from them. Movement overlaps with retail opportunities and subsequently, TODs are catalysts for economic growth due to their higher densities and diversity of uses. The proposed area of investigation for the development of the Lanseria Aerotropolis is the development corridor along Malibongwe Dr. from the N14 right up to the Kromdraai Rd an area that stretches approximately 6.5km. Due to the international, national and regional significance as well as the high-tech nature of industries often associated with Aerotropolis developments, signage and visibility of land uses becomes an important part of trade. Thus many of the industries as in the case of Midrand, will want to be located as closet to the movement corridor as possible, in this case being the R512. The average width of the development corridor leading towards the airport from both the northern and southern ends is envisaged to be $\pm 1\text{km} - 1.8\text{km}$.

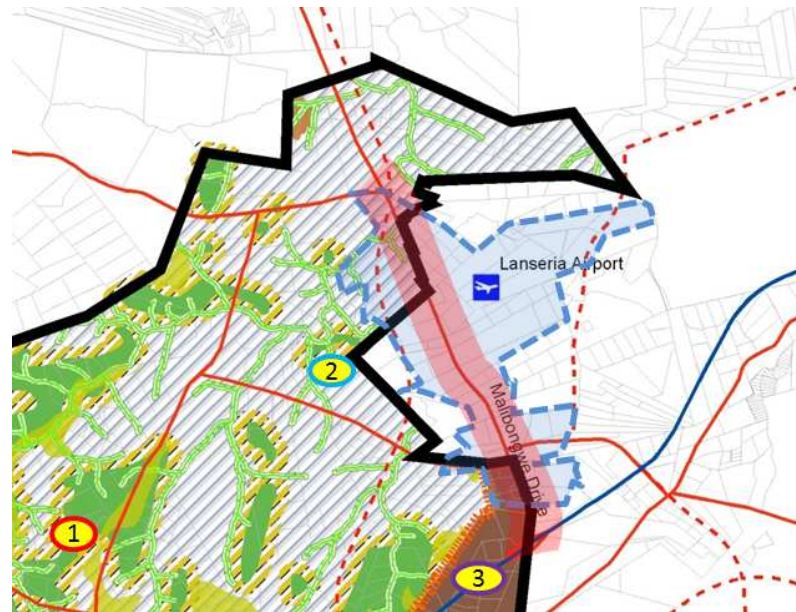
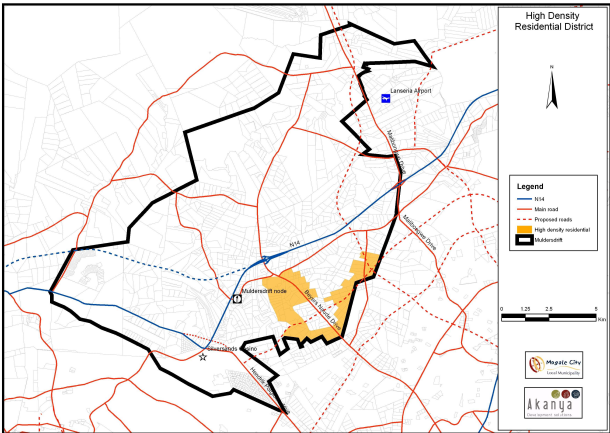
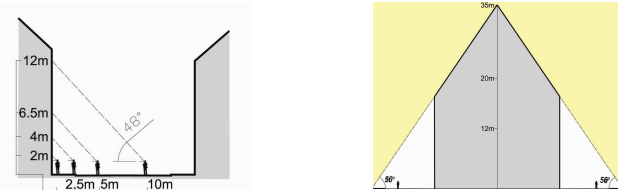



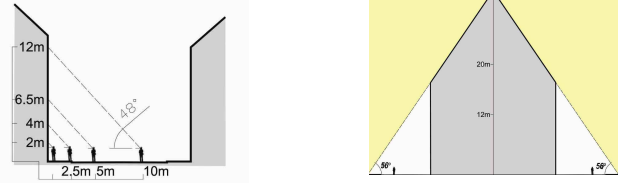
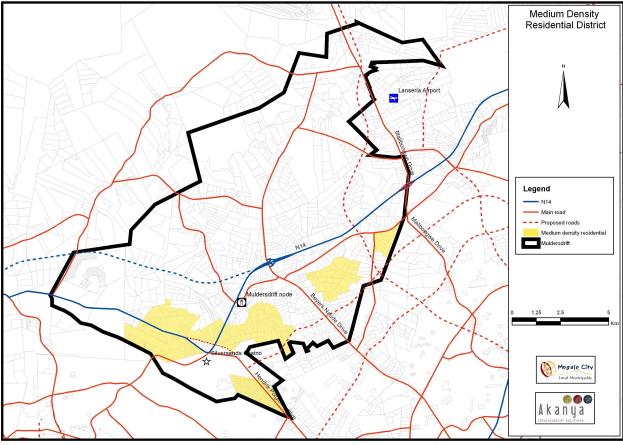
Figure 29: Proposed Lanseria Aerotropolis Precinct Area


7.2 Land Use

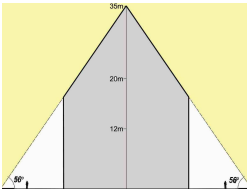
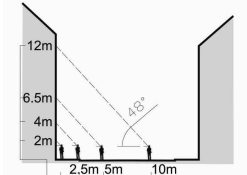
In the cases where a public authority such as the Mogale City Municipality or the Department of Human Settlements etc. seeks to expropriate land for future establishment of human settlements and the immediate supply of land for temporary residence, it is strongly advised that it be in accordance to the development proposals of this very framework. As a tool to try and tone down the mushrooming of informal settlements around the municipal area especially along the N14, it is proposed that the identified public authorities embark on sale of land only within 1 farm deep from the edge of the proposed Commercial District. The rationale here is that land in this area is more affordable than farm land closer to the Muldersdrift node, yet more sustainable to provide infrastructural services as enforced by ESTA.

The principles however, include, but are not exclusively based on a TOD approach due to the nature of the development framework, as discussed herein. In order to integrate and guide future developments, the following principles and policy statements apply per district:

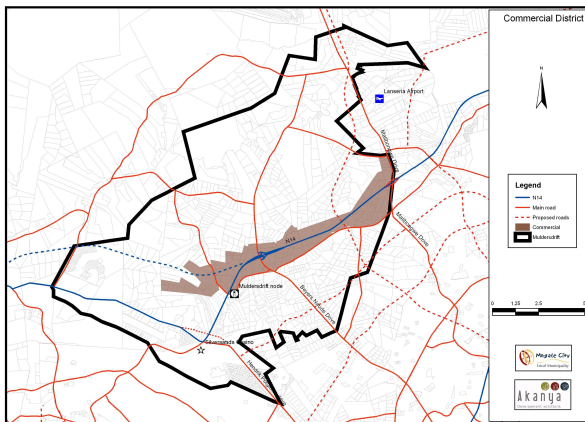
HIGH DENSITY RESIDENTIAL DISTRICT	DEVELOPMENT GUIDELINES			
Name	High Density Residential			
Maximum Storeys	5 - 7 storeys			
Building Line	As per scheme.			
Mix of Uses:	Predominantly residential, retail at the bottom, community facility and social facilities			
	Public	Employment	Housing	
	5% to 10%	10% to 20%	40% to 70%	
Predominant Use	Residential (50-70 du/ha)			
Vegetation	All street side walks to be planted with trees. All ingenious trees to be retained.			
Sun angles and viewing angles:				
Indicates how far people can see from inside the building and shadow the building will cast and the angle on the shadow.				
Design Guidelines & Principles	Develop around transit road system to promote compact communities. Create multiple rather than single uses, a pedestrian orientation, and attention to civic uses. Develop a new form of community building that not only supports and encourages transit use but also transforms the surrounding area into a place that is so special and irresistible that people will invest there, live there, and visit again and again.			

MEDIUM DENSITY RESIDENTIAL DISTRICT	DEVELOPMENT GUIDELINES		
Name	Medium Density Residential		
Maximum Storeys	3-5 storeys		
Mix of Uses:	Predominantly residential, retail at the road intersections, community facility and social facilities		
	Employment	Public	Housing
	5% to 10%	10% to 20%	20% to 60%
Predominant Use	Residential (40-60 du/ha)		
Vegetation	All street side walks to be planted with trees. All ingenious trees to be retained.		
Sun angles and viewing angles: Indicates how far people can see from inside the building and shadow the building will cast and the angle on the shadow.			
			

Design Guidelines & Principles	The District should define the uniqueness of the space by providing walkability open space through the location of buildings closer to the movement lines. The designs should define and celebrate the street intersections. The street level interface should be transparent (windows) and should promote activity on sidewalks (entrances to buildings- not hawkers)	
--------------------------------	--	---

COMMERCIAL DISTRICT	DEVELOPMENT GUIDELINES		
Name	Commercial		
Maximum Storeys	2- 3 storeys		
Coverage	80% may be increased with the consent of the Mogale City LM		
Building Lines	16m along the N14/ R28 and the Provincial Roads; 5m along the class 3 and 2m along class 4 and 5		
Mix of Uses:	Predominantly industrial and commercial and some retail		
	Housing	Public	Employment
	0- 5%	5-10%	Up to 80%
Predominant Use	Commercial		
Vegetation	All street side walks to be planted with trees. All ingenious trees to be retained.		
Sun angles and viewing angles:	<div></div>		

Commercial District

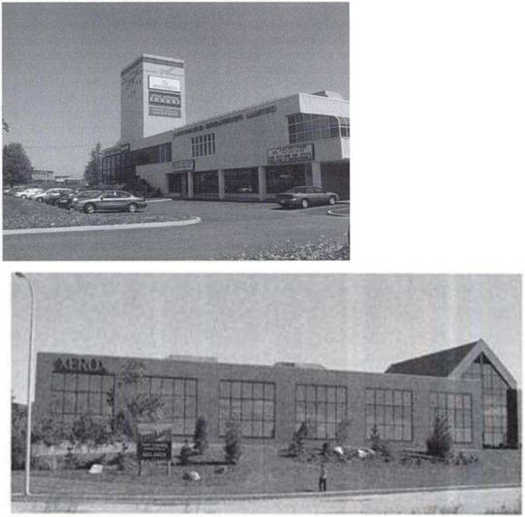


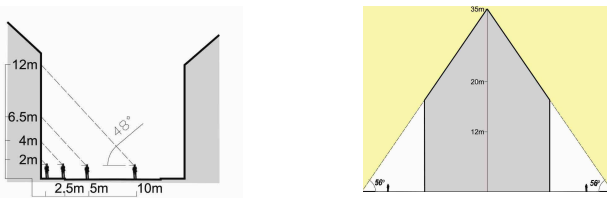
Legend

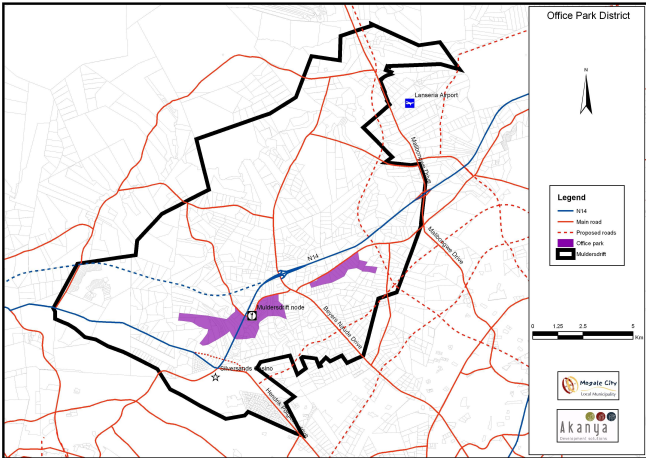
- N14
- Main road
- Provincial road
- Commercial
- Industrial


Mogale City
Local Municipality

akanya

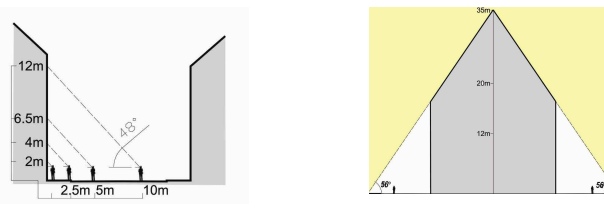
<p>cast and the angle on the shadow.</p>		
<p>Design Guidelines & Principles</p>	<p>Develop eco industrial building. The construction materials should define and celebrate the eco industrial concept. The street intersections should incorporate other land uses in support of the eco industrial district. The street level interface should promote walkability.</p> <p>Places commercial and office buildings right at the sidewalk, rather than behind acres of parking lot. The parking lot, in turn, is placed behind the building. The result is that pedestrians (and transit passengers) are more likely to walk between buildings rather than drive between buildings because they do not have to compete with cars to get through the parking lots that normally separate buildings from the street. Along the way, people have more opportunities to meet friends and acquaintances and experience enjoyable interactions.</p> <p>Buildings located at the sidewalk also create a more pleasing street scene because the focus is on architecture and human activity rather than on asphalt and parked cars</p>	 <p>Figure 10.5 <i>An example of a modern telecommunications company building in Burnside Industrial Park</i></p> <p>Photo: Eco-efficiency Centre, Burnside</p>

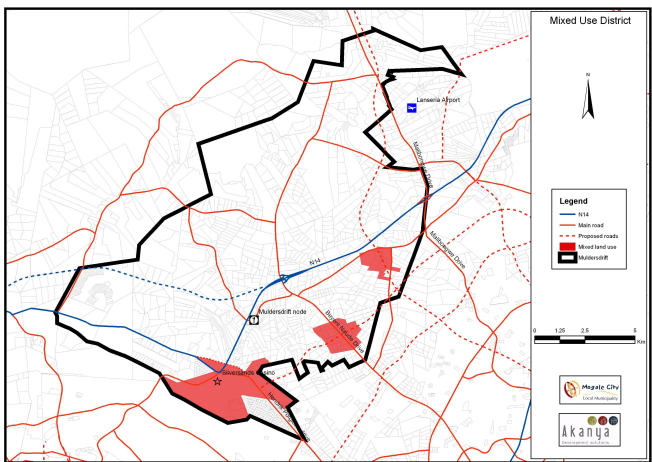
OFFICE PARK		DEVELOPMENT GUIDELINES	
Name	Office		
Maximum Storeys	3- 4 storeys		
Coverage	40% may be increased with the consent of the Mogale City LM		
Building Lines	16m along the Provincial Roads; 5m along the class 3 and 2m along class 4 and 5		
Mix of Uses:	Predominantly offices with retail , institutional, conference facilities, some community facility and some social facilities		
	Housing	Public	Employment
	0 -5%	5% to 10%	80%
Predominant Use	Office		
Vegetation	All street side walks to be planted with trees. All ingenious trees to be retained.		
Sun angles and viewing angles:	<div></div>		
Design Guidelines & Principles	<p>Places commercial and office buildings right at the sidewalk, rather than behind acres of parking lot. The parking lot, in turn, is placed behind the building. The result is that pedestrians (and transit passengers) are more likely to walk between buildings rather than drive between buildings because they do not have to compete with cars to get through the parking lots that normally separate buildings from the street. Along the way, people have more opportunities to meet friends and</p>		






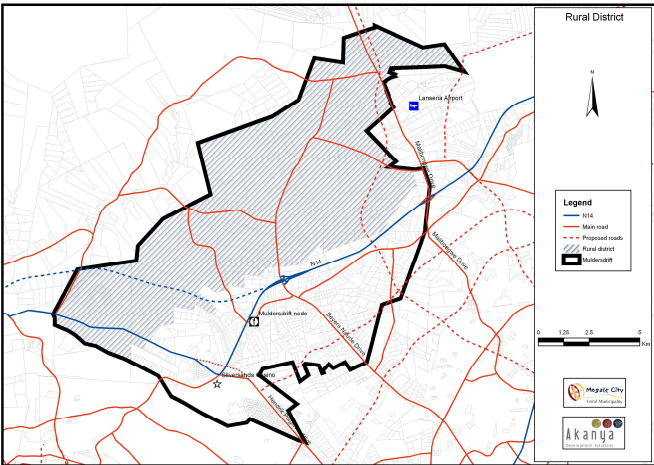
	acquaintances and experience enjoyable interactions. Buildings located at the sidewalk also create a more pleasing street scene because the focus is on architecture and human activity rather than on asphalt and parked cars	
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MIXED LAND USE DISTRICT		DEVELOPMENT GUIDELINES		
Name	Commercial			
Maximum Storeys	Up to 5 storeys			
Mix of Uses:	Retail, residential, offices, community and social			
	Public	Employment	Housing	
	5% to 15%	10% to 25%	20% to 60%	
Predominant Use	Commercial			
Vegetation	All street side walks to be planted with trees. All ingenious trees to be retained.			
Sun angles and viewing angles:	<div></div>			
Design Guidelines & Principles	<p>Buildings, residences, shops, and services should be closer together for ease of walking, to enable a more efficient use of services and resources, and to create a more convenient, enjoyable place to live.</p> <p>Create housing opportunities and choices for a range of household types, family size and incomes. Create walkable neighborhoods.</p>			





ECO-TOURISM AND AGRI-COOPERATION DISTRICT		DEVELOPMENT GUIDELINES		
Name	Rural Residential			
Maximum Storeys	Up to 2 storeys			
Mix of Uses:	Residential, home offices, conference facilities, hospitality uses			
	Employment	Public	Housing	
	5% to 10%	5% to10%	70 % to 90%	
Predominant Use				
Vegetation	Existing vegetation should be retained as much as possible. More trees should be planted with ingenious trees.			
Design Guidelines & Principles	Buildings, residences, shops, and services should resemble the rural nature of the district.			



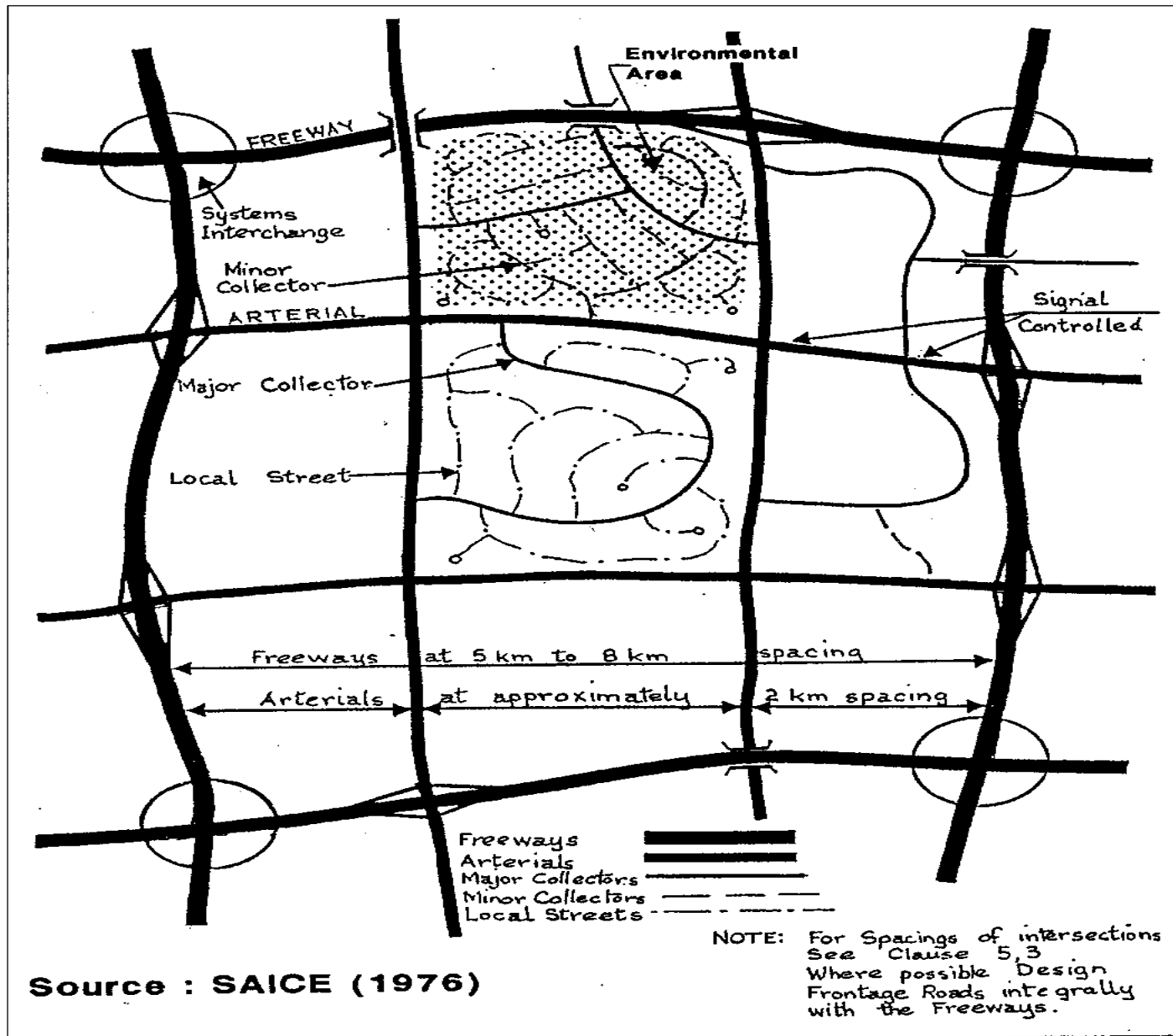


7.2 Transportation Guidelines

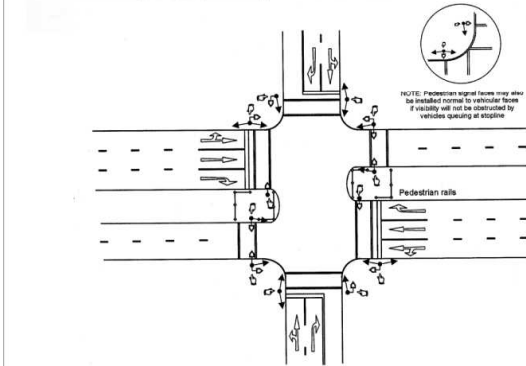
The Functional Road Hierarchy within the Muldersdrift study area is depicted in **Figure 17**. The main roads with a description of the classification are summarised in **Table 9** below:

ROAD HIERARCHY	STREETS IN PRECINCT	DESCRIPTION OF ROAD CLASS
Class 1: Freeway	N14/ R28	Primary function is mobility. Designed for safer high-speed operation of motor vehicles through the elimination of at-grade intersections . This is accomplished by preventing access to and from adjacent properties and eliminating all cross traffic through the use of grade separations and interchanges . Such highways are usually divided with at least two lanes in each direction.
Class 2: Arterial	<ul style="list-style-type: none"> • Malibongwe Drive • Beyers Naude • Hendrik Potgieter • R114 	Primary arterial routes providing vehicular mobility with limited off-street access. These roads are generally the ring roads around districts providing external circulation but can also traverse the district itself.
Class 3: Distributor		Minor arterial road / collector road serving as internal vehicular circulation road within the districts. These roads have a greater balance between mobility and access. The roads serve the internal circulation of the districts as well as the relatively few trips wishing to travel through the precinct, as opposed to travelling around the district on the Class 3 Arterial Routes.
Class 4: Collector		Residential collector / access roads serving properties within the district. These roads are mainly utilised as access routes with little mobility. pedestrian movement is key in these roads
Class 5: Local Streets	All other lower order roads in the area	These roads have direct accesses to all property and link developed clusters, such as a residential area, to the Class 4, collector roads.

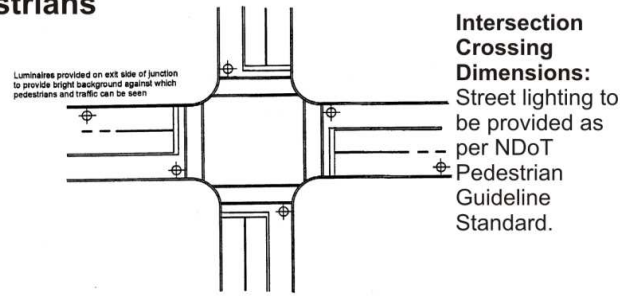
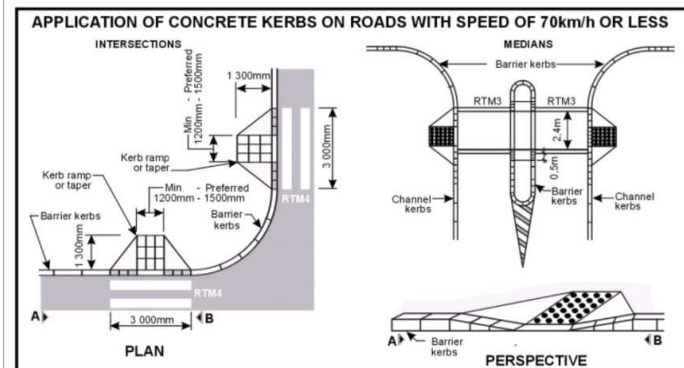
Table 9 Road classification and hierarchy



Pedestrian Signal Application:
Scramble Pedestrian Phase



Kerb ramps must be implemented at all crossing points to accommodate for wheelchair users and sight impaired pedestrians.



Provide signalized pedestrian crossings at all Class 2 route intersections with S11 signal heads and pedestrian demand push-buttons.

Audible signals to be implemented for sight impaired road users.
RTM 3 pedestrian crossing lines to be implemented (minimum width 1.5m / desirable width 3m)

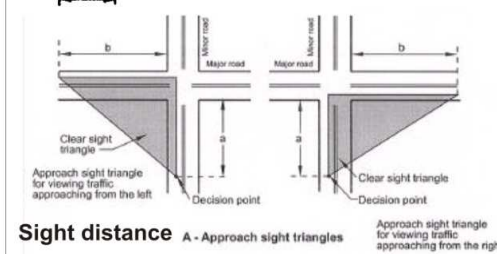
Interlocking pavers or coloured asphalt is recommended at Class 2 junctions serving as gateways to the precinct (indicates higher pedestrian volumes and entrance to the precincts). Staged crossings should be considered. Minimum median width for staged crossings 2m.

Transparent palisade fence may be erected on the site boundary

Kerb radii (turning vehicles)

Diagram illustrating the kerb radii for turning vehicles. The diagram shows a vehicle turning at a 90-degree angle. Key dimensions and labels include:

- 7.4m**: Radius of the inner path.
- 10m**: Radius of the outer path.
- 6.0m**: Distance from the vehicle's rear axle to the curb.
- REFUSE VEHICLE**: Label for the vehicle.
- Major Access Link**: Label for the path.
- Collector**: Label for the main road.



BRT Feeder Routes and Other Supporting Public Transport
Feeder routes form part of the general traffic stream and are not separated as with trunk routes. Signage and special road surfacing should demarcate these feeder routes.

Figure 1 is a cross-sectional diagram of a road with a bus shelter. The total width of the road is 50.0 m. The distance from the centerline to the left edge is 35.0 m, and to the right edge is 35.0 m. The distance from the centerline to the left edge of the bus shelter is 15.0 m (minimum). The distance from the centerline to the right edge of the bus shelter is 3.0 m. The bus shelter has a height of 0.5 m. The road surface is 1.0 m wide. The shoulder is 0.5 m wide. The road surface is marked with a 100 mm broken white center line, 4.5 m stripes, 7.5 m gap, 100 mm broken white line, 2.7 m stripe, 4.5 m gap, and 100 mm wide continuous yellow line.

Class 3: Intersection design for pedestrians

Intersection and signal layout:

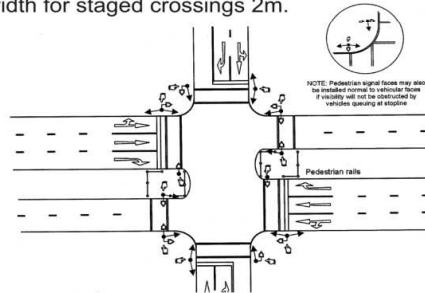
Provide signalized pedestrian crossings at all Class 3 route intersections with S11 signal heads and pedestrian demand push-buttons.

Audible signals to be implemented for sight impaired road users.

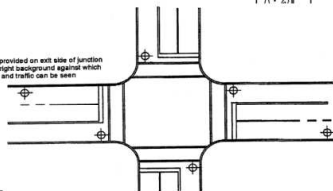
RTM 3 pedestrian crossing lines to be implemented (minimum width 1.5m / desirable width 3m)

Interlocking pavers or coloured asphalt is recommended at Class 2 junctions serving as gateways to the precinct (indicates higher pedestrian volumes and entrance to the precincts).

Staged crossings should be considered. Minimum median width for staged crossings 2m.



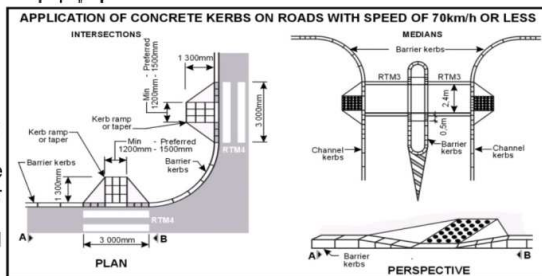
Luminaires provided on exit side of junction to provide sight background against which pedestrians and traffic can be seen.



Intersection Crossing Dimensions:

Street lighting to be provided as per NDoT Pedestrian Guideline Standard.

Kerb Transitions:
Kerb ramps must be implemented at all crossing points to accommodate for wheelchair users and sight impaired pedestrians.



Pedestrian Signal Application:

Two types are recommended for precinct intersections:
Standard Pedestrian Phase; Early Start Pedestrian Phase

Class 3: Pedestrian and cycle ways

Layout and Geometry:

Walkways and cycle to be provided adjacent to all Class 3 Roads (these facilities should always be separated from the roadway itself by means of a buffer strip minimum 1.0m / desirable 3m). Walkway and cycle way also separated because of speed differential of modes (Barrier Kerb 0.3m). All lateral obstructions should be removed from the walkway / cycle way area.

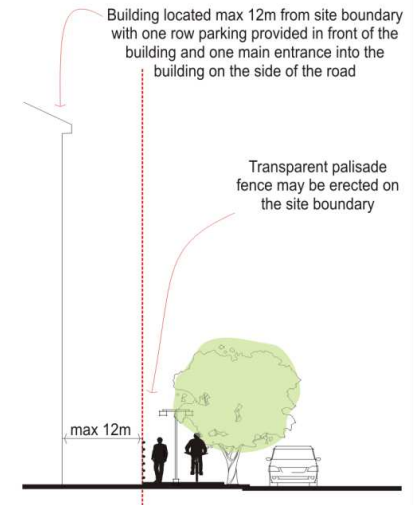
Walkway	Cycle way
Gradient $\leq 5\%$	Gradient $\leq 5\%$
Minimum Width 1.2m	Minimum Width 1.5m
Desirable width 1.8m	Desirable width 1.8m
Lateral clearance $\geq 0.1m$	Lateral clearance $\geq 0.5m$
Height clearance $\geq 2.1m$	Height clearance $\geq 2.1m$
Buffer strip 0.6m	Buffer strip 0.6m

Surfacing should be conducive to movement of able bodied users and **Edges** should be defined visually and tactile.

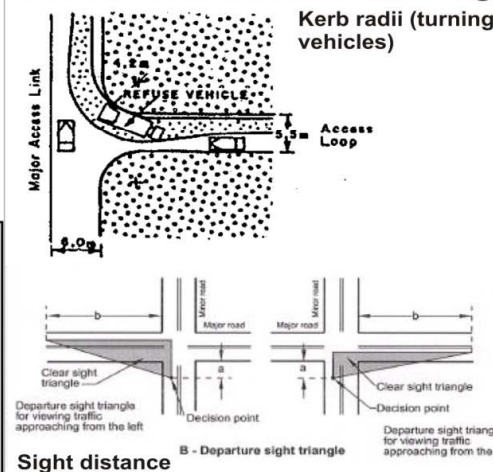
Handrails to be implemented where vertical drop of 0.8m with slope steeper than 1:2 (50%) occurs within 1.2m from edge.

Lighting should be provided along all walkways and cycle ways for safety and security as well as night-time operational reasons.

Class 3: Interface design



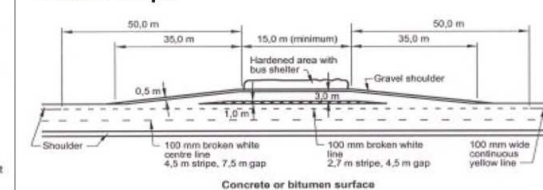
Class 3: Intersection road design



Class 3: Public transport

BRT Feeder Routes and Other Supporting Public Transport
BRT Feeder Stops and Other Public Transport Stops (Refer to B and C)
Stops to be provided within the road reserve, but also separated from through traffic (i.e. Lay-by)
Multi-modal stop sharing is encouraged.
Multi-modal signage recommended at stops.

Feeder stops



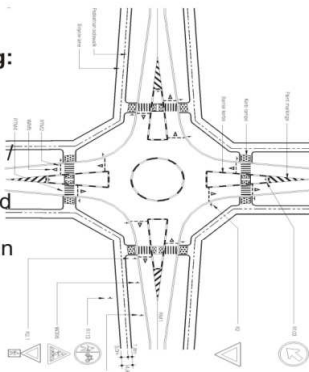
Class 4: Intersection design for pedestrians

Roundabout Intersection

Pedestrian Crossing:

RTM 4 pedestrian crossings to be implemented (minimum width 1.5m desirable width 3m)
RTM 2 with WM5 yield road signage on both sides of the pedestrian crossing. Therefore vehicle will yield for pedestrians before entering the circle, then vehicles upon entering the circle, again yielding before exiting the desired road.

Shared pedestrian and cycle lanes provided adjacent to road with signage R113 W201 Roundabout sign
Provide barrier kerbing.
Option to provide raised roundabout intersection to further reduce vehicular speed.

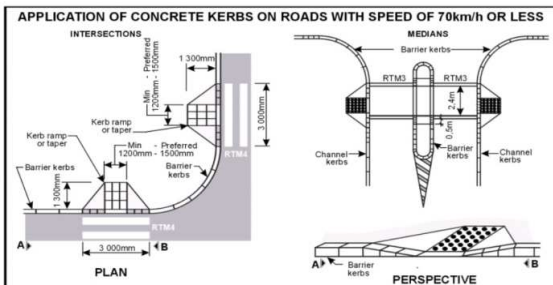


Staged Intersection Crossing:

RTM 3 pedestrian crossing lines to be implemented (minimum width 1.5m / desirable width 3m)
Interlocking pavers or coloured asphalt is recommended at Class 4/5 junctions serving as gateways to a residential road.
Staged crossings should be considered. Minimum median width for staged crossings 2m.
Raised pedestrian crossing can be considered.

Kerb Transitions:

Kerb ramps must be implemented at all crossing points to accommodate for wheelchair users and sight impaired pedestrians.



Pedestrian Signal Application:
Standard Pedestrian Phase
Early Start Pedestrian Phase

Class 4: Pedestrian and cycle ways

Layout and Geometry:

Walkways to be provided adjacent to all Class 4/5 Roads with cycle ways provided within roadway separated by paint marking.
Walkway and cycle way also separated because of speed differential of modes (Barrier Kerb 0.3m).
All existing lateral obstructions should be removed from the walkway / cycle way.

Walkway	Cycle way
Gradient ≤5%	Gradient ≤5%
Minimum Width 1.5m	Minimum Width 2.5m
Desirable width 1.8m	Desirable width 3m
Lateral clearance ≥0.1m	Lateral clearance ≥0.5m
Height clearance ≥2.1m	Height clearance ≥2.1m
Buffer strip 0.6m	Buffer strip 0.6m

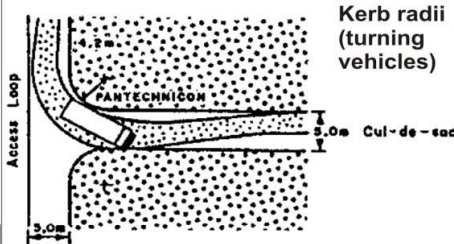
Surfacing should be conducive to movement of able bodied users and users and users with disabilities.

Edges should be defined visually and tactile.

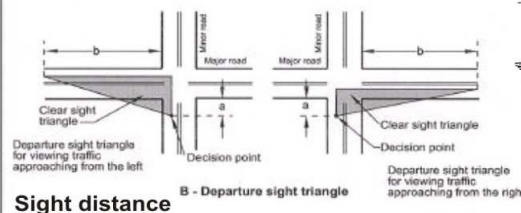
Handrails to be implemented where vertical drop of 0.8m with slope steeper than 1:2 (50%) occurs within 1.2m from edge.

Lighting should be provided along all walkways and cycle ways for safety and security and night-time operational reasons.

Class 4: Intersection road design

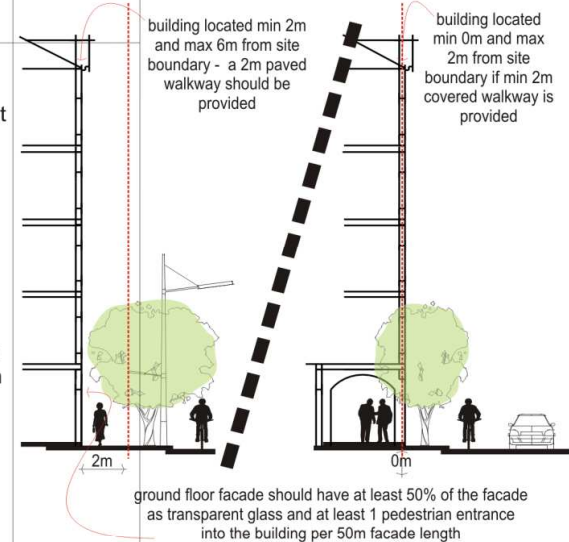


Kerb radii (turning vehicles)



Sight distance

Class 4: Interface design



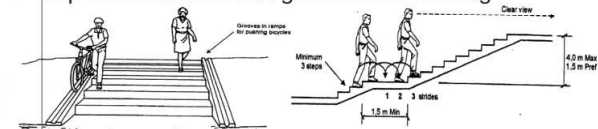
Class 4: Building frontage

Geometry (Accessed from the Sidewalk):

Ramps should be provided for disabled users at 1:12 (8.3%) gradient.

Ramp rises should be stepped at ≤400mm intervals. Stairs to be implemented according to National Building Regulations (SABS 1900)

Public stairs ≥1.5m width, minimum of 3 steps, non-slip materials with -2% gradients for drainage.



Bicycle Ramps and Storage:

Bicycle ramps to be provided adjacent to all stairs ≤ 1:2 (50%) gradient.

Locate bicycle storage and parking adjacent to major destinations i.e. BRT stations, GRRL station, employment-, retail- and entertainment centres.

7.3 Environmental Guidelines

To promote the sustainable management of open space system in Muldersdrift, the open space system should be developed and used as part of the spatial planning tool in decision-making. It should comprise an inter-connected and managed network of open spaces, consisting of public and private spaces, human-made or delineated spaces, disturbed natural spaces, and undisturbed or pristine natural spaces. There are six proposed categories of open spaces, with some examples, namely:

- Ecological open space.
- Social open space
- Institutional.
- Heritage.
- Agriculture.
- Prospective open space – these are degraded sites (e.g. quarries landfill sites etc) which, after rehabilitation, may have the potential of becoming part of the ecological open space network.

It is proposed that any development adjacent to the open space system should be requirement to observe a buffer zone for developments in close proximity to these open space system. The 1:100 year and the 1:50 year flood-line should be respected at all times. **The table 10** shows the applicable buffer zones per open space system:

Open Space system	Applicable buffer zone
Ridges	200m
Rivers and tributaries	50m
Waste water treatment works	500m
Quarry	750m

Table 10 Applicable buffer zones per open space system

Rivers and tributaries: Rivers and its tributaries are important in the urban form. They provide linear open space system that also could as well as are a habitat for fauna and flora. They also provide a corridor for the migration of these fauna and flora. The development along these rivers and tributaries should observe 50 m buffer.

Ridges: Ridges play an important role in ecosystem sustenance and biological biodiversity as they provide habitats for certain fauna and flora. They must be seen as part of the wider ecological continuum and a part of the Ecological Open Space Network that must be preserved as a migratory corridor for faunal movement, as well as a habitat and roosting site. Development on ridges should not be allowed. Any development along the ridge should be limited to the at least a 200 m buffer zone between residential development and the "ridge" in order for the other species to survive.

Waste water treatment works: the buffer zone for the waste water treatment works is prescribed and determined by the health department due to consideration for flies and movement of pathogens (which is not that critical). The odour poses serious

annoyance to adjacent developments. The major threats are the system failure. The applicable buffer is 500m. This buffer does not affect the pipelines.

Quarry: Quarries are manmade features that resemble sub-surface based mining activities. They increase the risk of dust pollution. The change in topography also poses the danger of sink holes. The applicable buffer zone is 750m.

8. IMPLEMENTATION

8.1 Land Use

As discussed above, the development framework has been divided into the developmental districts. The tables below depict the land use budget per district and the required supporting social facilities. These districts areas are calculated after the environmental buffers have been applied. The environmental guidelines, as stated above have been applied to conserve environmentally sensitive areas as mentioned in the Mogale City Environmental Management Framework. Hence, the tables below shows each development district individually and the land use 'basket' (in hectares). The cost estimates are determined from the tenders submitted for various facilities as at the year 2008 and 2009. These figures are not static and are subject to inflation rate per annum.

Zone	Area before buffers are applied (ha)	Use	Land Use Budget (ha)	Density/Coverage	Yield (gross units)	Projected population (3.5 persons per unit)	Number of public facilities required	Cost per facility	Total required
Mixed use zone 1	844	329							
		Housing @ 30%	98.7	50- 70 du/ha	5922	20727			
		Primary School	12				5	R 50,000,000	R 250,000,000
		Secondary School	9.2				2	R 60,000,000	R 120,000,000
		Crèche	2				4	R 1,500,000	R 6,000,000
		Clinic	0.8				4	R 5,000,000	R 20,000,000
		Hospital	0				0	R -	R -
		Places of worship	9,000				3	R 1,500,000	R 4,500,000

Precinct Plan Muldersdrift Development Zone

Zone	Area before buffers are applied (ha)	Use	Land Use Budget (ha)	Density/Coverage	Yield (gross units)	Projected population (3.5 persons per unit)	Number of public facilities required	Cost per facility	Total required
		Community halls	1				2	R 12,000,000	R 24,000,000
		Library	0.26				2	R 4,000,000	R 8,000,000
		Post office	0.1				2	R 1,500,000	R 3,000,000
		Police station	0.01				1	R 34,000,000	R 34,000,000
		Emergency services	0				0	R 7,000,000	R -
		Cemetery	0				-	R 21,000,000	R -
		Municipal Pay points	0				0	R -	R -
		Roads	32.9	10 % of total area					
		Employment @ 60%	197.4	FSR as per the Mogale City Town Planning Scheme	Gross leasable area to be determined per development area				

Precinct Plan Muldersdrift Development Zone

Zone	Area before buffers are applied (ha)	Use	Land Use Budget (ha)	Density/Coverage	Yield (gross units)	Projected population (3.5 persons per unit)	Number of public facilities required	Cost per facility	Total required
Mixed use zone 2	226	186							
		Housing @ 30%	55.8	50- 70 du/ha	1674	5859			
		Primary School	2.4				1	R 50,000,000	R 50,000,000
		Secondary School	4.6				1	R 60,000,000	R 60,000,000
		Crèche	0.5859				1	R 1,500,000	R 1,500,000
		Clinic	0.2				1	R 5,000,000	R 5,859,000
		Hospital	0				0	R -	R -
		Places of worship	3000				1	R 1,500,000	R 1,464,750
		Community halls	0.5				1	R 12,000,000	R 7,030,800
		Library	0.13				1	R 4,000,000	R 2,343,600
		Post office	0.05				1	R 1,500,000	R 798,955
		Police station	0				0	R 34,000,000	R 7,968,240
		Emergency services	0				0	R 7,000,000	R 683,550
		Cemetery (Regional)	0				-	R 21,000,000	R -
		Municipal Pay points	0				0	R 5,600,000	R -
		Roads	18.6	10% of total area					
		Employment @ 25%	46.5	FSR as per the Mogale City Town Planning Scheme	Gross leasable area to be determined per development area				

Zone	Area before buffers are applied (ha)	Use	Land Use Budget (ha)	Density/Coverage	Yield (gross units)	Projected population (3.5 persons per unit)	Number of public facilities required	Cost per facility	Total required
Mixed use zone 3	144	126							
		Housing @ 30%	37.8	50- 70 du/ha	1134	3969			
		Primary School	2.4				1	R 50,000,000	R 50,000,000
		Secondary School	0				0	R 60,000,000	R -
		Crèche	0.5				1	R 1,500,000	R 1,500,000
		Clinic	0.2				1	R 5,000,000	R 5,000,000
		Hospital	0				0	R -	R -
		Places of worship	3000				1	R 1,500,000	R 1,500,000
		Community halls	0				0	R 12,000,000	R -
		Library	0				0	R 4,000,000	R -
		Post office	0				0	R 1,500,000	R -
		Police station	0				0	R 34,000,000	R -
		Emergency services	0				0	R 7,000,000	R -
		Cemetery	0				-	R 21,000,000	R -
		Municipal Pay points	0				0	R 5,600,000	R -
		Roads	12.6	10% of total area					
		Employment @ 25%		FSR as per the Mogale City Town Planning Scheme	Gross leasable area to be determined per development area				

Zone	Area before buffers are applied (ha)	Use	Land Use Budget (ha)	Density/Coverage	Yield (gross units)	Projected population (3.5 persons per unit)	Number of public facilities required	Cost per facility	Total required
High density residential		703		50-70 du/ha	42180	156066			
	877	Primary School	93.6				39	R 50,000,000	R 1,950,000,000
		Secondary School	73.6				16	R 60,000,000	R 960,000,000
		Crèche	15.5				31	R 1,500,000	R 46,500,000
		Clinic	6.2				31	R 5,000,000	R 155,000,000
		Hospital	4.5				3	R -	R -
		Places of worship	78000				26	R 1,500,000	R 39,000,000
		Community halls	8				16	R 12,000,000	R 192,000,000
		Library	2.08				16	R 4,000,000	R 64,000,000
		Post office	0.7				14	R 1,500,000	R 21,000,000
		Police station	0.06				6	R 34,000,000	R 204,000,000
		Emergency services	3.6				3	R 7,000,000	R 21,000,000
		Cemetery	6				1	R 21,000,000	R 21,000,000
		Municipal Pay points	0.9				3	R 5,600,000	R 16,800,000
		Roads							

Zone	Area before buffers are applied (ha)	Use	Land Use Budget (ha)	Density/Coverage	Yield (gross units)	Projected population (3.5 persons per unit)	Number of public facilities required	Cost per facility	Total required
Medium density residential		918		30-50 du/ha	36720	135864			
	1882	Primary School	81.5184				34	R 50,000,000	R 1,700,000,000
		Secondary School	62.49744				14	R 60,000,000	R 840,000,000
		Crèche	13.5864				27	R 1,500,000	R 40,500,000
		Clinic	5.43456				27	R 5,000,000	R 135,000,000
		Hospital	4.07592				3	R -	R -
		Places of worship	0.3				23	R 1,500,000	R 34,500,000
		Community halls	6.7932				14	R 12,000,000	R 168,000,000
		Library	1.766232				14	R 4,000,000	R 56,000,000
		Post office	0.617563636				12	R 1,500,000	R 18,000,000
		Police station	0.0543456				5	R 34,000,000	R 170,000,000
		Emergency services	2.71728				2	R 7,000,000	R 14,000,000
		Cemetery	0				-	R 21,000,000	R -
		Municipal Pay points						R 5,600,000	R -
		Roads							

8.2 Infrastructure

As stated above, the principle purpose of programmes to supply water and sanitation is to improve health. It is essential to understand the attitudes and behaviours of communities within a particular area when it comes to water and sanitation infrastructure usages so as to formulate a comprehensive implementation strategy in the provision of water and sanitation. The provision of water has to follow a logical planning process. In Muldersdrift the following planning stages are essential for any land development area or zone. The planning process should be followed in any scale. The following tables depict the supporting infrastructure per districts. Detailed calculations still need to be done per development area within the districts.

Zone	Area in Ha	Yield (units)	Type of Infrastructure	
			Service	Quantity needed
High density residential	703	42180	Water demand	13 919 400 l/day
			Sanitation need	25 308 kl/day
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need in ha	4218 ha

Zone	Area in Ha	Yield (units)	Type of Infrastructure	
			Service	Quantity needed
Medium density residential	918	45900	Water demand	15 147 000 l/day
			Sanitation need	27 540 kl/day
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need in ha	4590 ha

Zone	Area in Ha	Yield (ha)	Type of Infrastructure	
			Service	Quantity needed
Office Park 1		53.2	Water demand	34 048 00 l/day
			Sanitation need	
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need in ha	5.32 ha

Zone	Area in Ha	Yield (ha)	Type of Infrastructure	
			Service	Quantity needed
Office Park 2	199	79.6	Water demand	50 944 00 l/day
			Sanitation need	
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need	8 ha

Zone	Area in Ha	Yield (ha)	Type of Infrastructure	
			Service	Quantity needed
Commercial	1201	960	Water demand	4 800 000 l/ha
			Sanitation need	
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need in ha	

Precinct Plan Muldersdrift Development Zone

Zone	Area in Ha	Yield (ha)	Type of Infrastructure	
			Service	Quantity needed
Mixed Use 1	329	329	Water demand	329 000 00 l/day
			Sanitation need	19740000 l/day
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need in ha	33 ha

Zone	Area in Ha	Yield (ha)	Type of Infrastructure	
			Service	Quantity needed
Mixed Use 1	186	186	Water demand	18 600 l/day
			Sanitation need	11160000 l/day
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need in ha	18.6 ha

Zone	Area in Ha	Yield (ha)	Type of Infrastructure	
			Service	Quantity needed
Mixed Use 1	126	126	Water demand	126 000 00 l/day
			Sanitation need	7560000 l/day
			Electricity demand	Use the After Diversity Maximum Demand Modeling approach
			Roads need in ha	12.6 ha

8.3 Urban Edge (Growth management Approach)

Growth management is a set of techniques used by government to ensure that as the population grows that there are services available to meet their demands. These are not necessarily only government services. Other demands such as the protection of natural spaces, sufficient and affordable housing, and delivery of utilities, preservation of buildings and places of historical value, and sufficient places for the conduct of business are also considered. In the case of Muldersdrift, the Gauteng Urban Edge 2009 and the Mogale City Urban Development Boundary as contained in the Mogale City Spatial Development Framework 2009, is the bases of the growth management for Muldersdrift development zone.

In order to achieve the spatial vision stated in this document, it is essential that the areas on the eastern side of the N14 be released for development in the short term. However, the availability of services should be the determining factor in these study areas. It is therefor imperative that the short term development phase be in the areas illustrated in **Figure 28**. This is the area that should be included within the Urban Edge I the short term.

In the medium term, depending on the availability of services, the areas in Figure 29 should be released for development and included in the Urban Edge medium term.

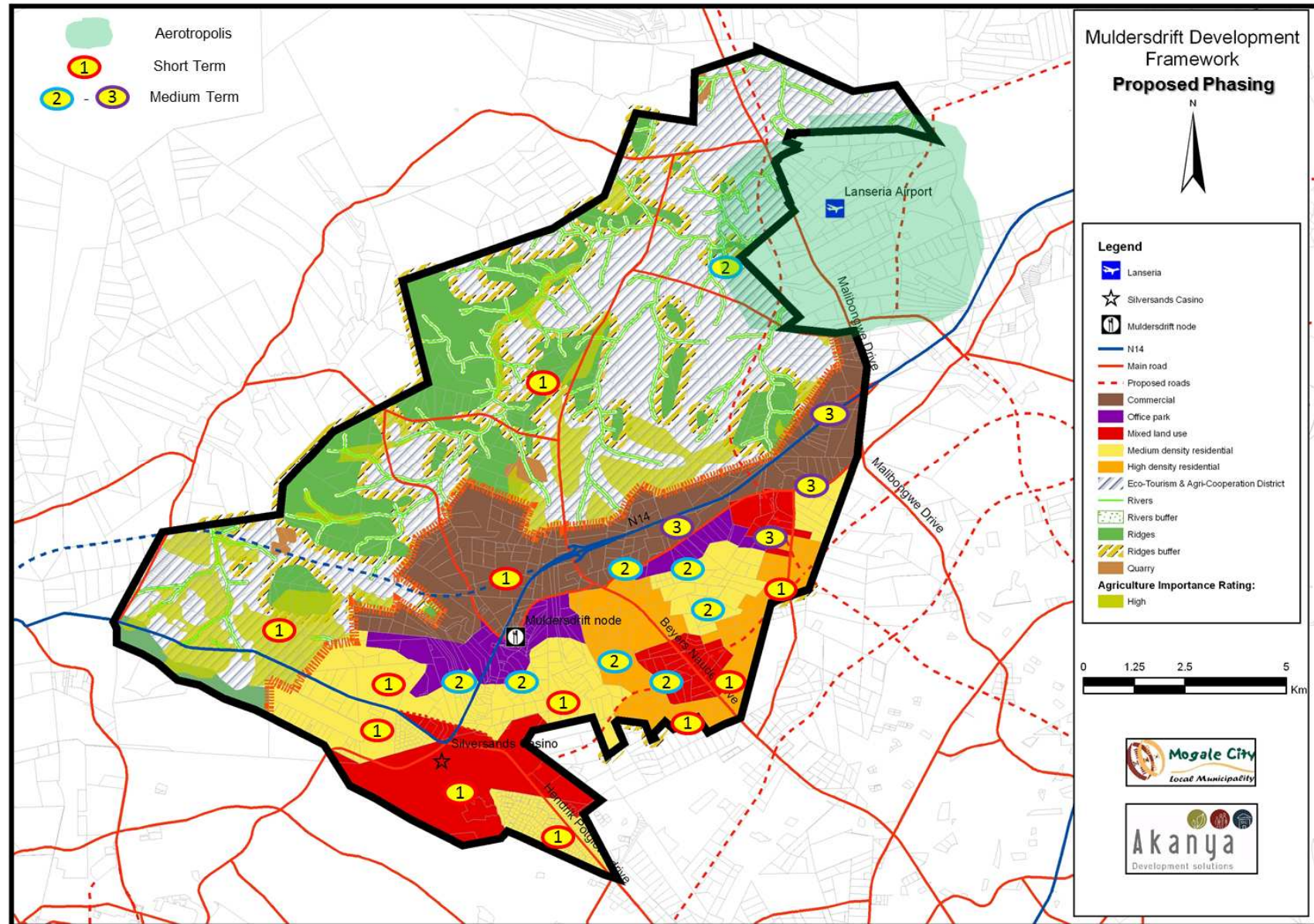
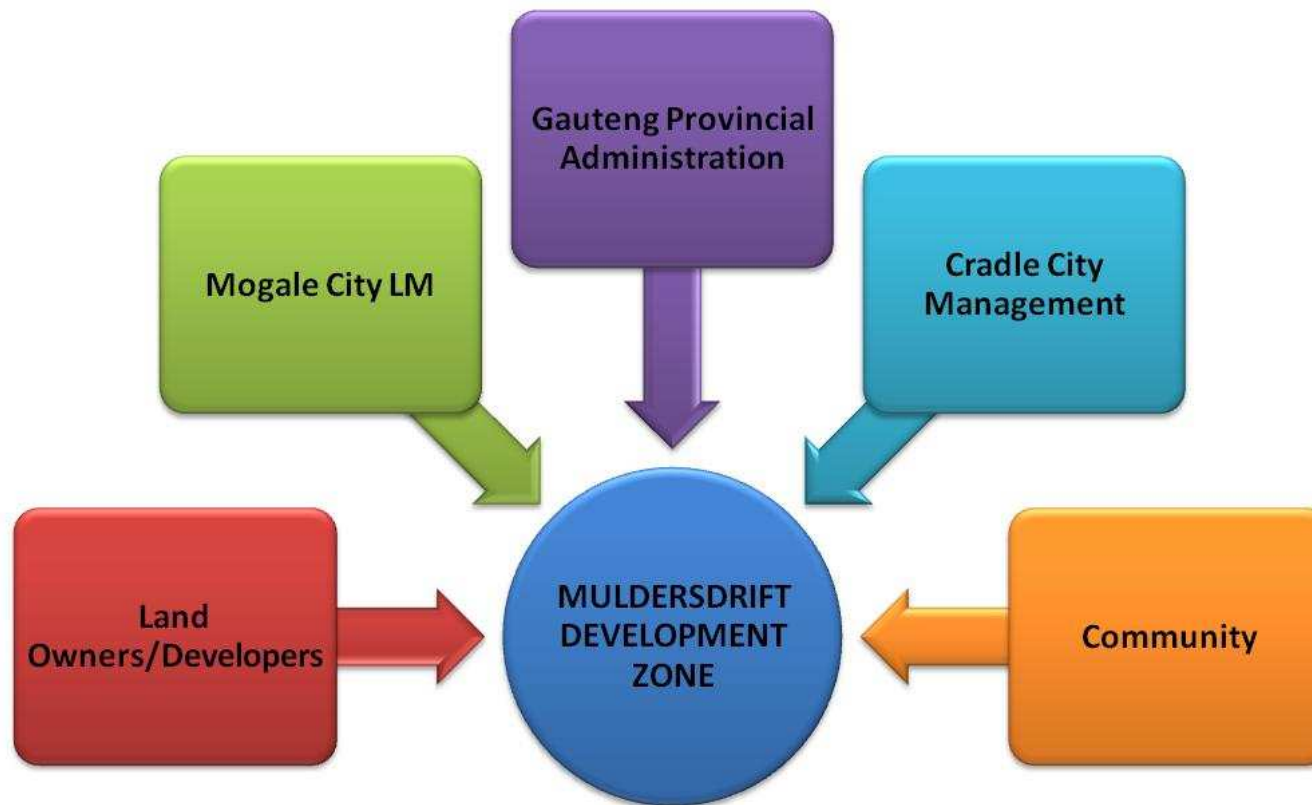


Figure 30 Short – medium term development

8.4 Institutional Arrangements

The development of the Muldersdrift Development zone is not only the responsibility of Mogale City Local Municipality, but it's that of the entire developmental community as a whole. There are a number of role players and of beneficiaries in the whole process. The diagram below depicts the institutional arrangements in the development of Muldersdrift.



Mogale City Local Municipality: Mogale City LM's Constitutional mandate dictates that Mogale City LM is the custodian of the plan and as such are responsible for the overall management of the plan and the implementation hereof. This also implies that they should ensure the enforcement of proper plans to eliminate the weaknesses and failures of governance. It was further stated that, in terms of the Municipal Systems Act, 2000 the institutional model of Mogale City LM suggests that the developmental processes and

relationships in these processes between municipal departments and other government entities are defined by the following characteristics:

- The Mogale City LM is wholly responsible for the planning of the area in its jurisdiction
- The Mogale City maintains policy and implementation direction, while allowing for developers to exercise relative autonomy in the execution of their duties in the implementation of these policies and plans;

Cradle City Management: The Cradle of Human Kind World Heritage Site is a significant site not only in South Africa but the whole world. The World Heritage Convention Act (Act No. 49 of 1999) established the legal, institutional and administration framework that provides for the incorporation of the UNESCO World Heritage Convention into South African laws. In response to the legislative framework the Cradle City management is to ensure the sustainable management of the site in accordance to legislation and policies around World heritage sites. As part of the management of this WHS the Cradle City Management Authority will have to develop Environmental Management Plans and Framework to guide development in and around the WHS. These plans should:'

- identify areas exerting the greatest impact on the COH WHS;
- Define the extent of the development buffer around the core COH WHS;
- Identify areas of natural resource importance, ecological sensitivity and transformation pressures that will form part of a desired environment; and
- Formulate a spatial environmental plan to guide decision-making and relevant spatial development plans for the area, using a range of measures to promote an appropriate mix of land uses to ensure the integrity of the COH WHS.

Gauteng Provincial Government: The role of the Gauteng Provincial Government is informed by national policy, strategy and legislation, as governed by Schedule 5 of the Constitution¹. The Provincial Government works in co-operation with the National Government to create laws for and provide services to the people of Gauteng. The Gauteng Provincial Department of Agriculture and Rural Development (GDARD) is the legislative authority for all the environmental issues within the province. The most applicable legislation used to manage these environmental issues is the National Environmental Management Act. The provisions of the EIA Regulations require environmental authorisations from the Gauteng Provincial Government for listed activities in terms of NEMA.

¹ South Africa. 1996. Constitution of the Republic of South Africa, Act no 108 of 1996. Pretoria: Government Printers

Communities: The Municipal Systems Act, the Development Facilitation Act etc required that in any planning within a municipal area should involve the communities within that particular area. The role of the communities is to actively inform the planning processes and the direction within which development should go. The accountability cycle within the municipal planning environment gives the community the role of oversight. This oversight role is expressed performance management regulations.

Land Owners/ Developers: Developers and land owners can be arguable coined as the initiators of development. This was mentioned in the introduction of this document that one of the reasons for this plan to be developed is due to the development pressure exerted on the study area. Some of the development pressure is in a form of enquiries and application to develop the areas. The determination of the time frame for development is largely with the developers and land owner. Land owners make available the land for development and the developers are investors that make the development a reality.

8.5 Performance Management

In order to assess whether the Muldersdrift Precinct plan has achieved its objectives, a measurement tool need to be developed. The table 11 below depicts the planning objectives and key performance indicators.

PLAN OBJECTIVE	KEY PERFORMANCE INDICATOR
Pro- active absorption of the poor, particularly in the informal settlement throughout Muldersdrift	% of Muldersdrift population living below R4800 p.a. (in constant 2000 rand) (Poverty head count index)
Balanced and Shared Growth	% increase in Gross Value Addition (GVA)
Facilitated Social Mobility and Equality	Human Development Index
Human settlement restructuring	% of households living in formal dwellings
Sustainability and the environment	% of households with access to basic or higher level of solid waste removal (NKPI) % of decrease in environmental degradation % of conservation areas proclaimed
Equitable and sustainable provision of engineering services	% of households with access to basic or higher level of infrastructure (NKPI)
Facilitate Mobility and access to amenities	% of house with access to social amenities within prescribed locations and travel times

Table 11 Plan objectives