

Emfuleni Local Municipality

EMFULENI

SPATIAL DEVELOPMENT FRAMEWORK 2017-2025

September 2017

Compiled on behalf of the
Emfuleni Local Municipality by:



Urban Dynamics Gauteng



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SECTION 1: INTRODUCTION

1.1. STUDY BRIEF

The Emfuleni Local Municipality appointed Urban Dynamics Gauteng to prepare a Spatial Development Framework (SDF) for the Emfuleni Municipal Area. According to the Terms of Reference, the following objectives needed to be met by the SDF:

- To provide a strategic development vision for Emfuleni in line with the EGDS and the IDP;
- To draft a comprehensive spatial development framework for Emfuleni;
- To address specific developmental issues and challenges in Emfuleni;
- To provide a strategic context for the integration and implementation of existing studies applicable to Emfuleni;
- To identify specific interventions to realise the vision; and
- To ensure sustainable integrated development.

The Emfuleni SDF is an overall strategic land development document that provides municipal-wide strategic direction in terms of spatial development patterns, the promotion of economic development in close proximity to residential developments, the conservation of valued environmental assets, the enhancement of the effectiveness of public capital projects, the optimization of existing and planned municipal engineering infrastructure, the promotion of tourism and agricultural industries, and the reversing of distorted spatial human settlement patterns.

As an overall strategic document, the Emfuleni SDF may be devoid of comprehensive details pertaining to certain specific geographical areas. Detailed stand-level planning is delegated to Local Spatial Development Frameworks (LSDFs) or Precinct Plans to depict more detailed land use planning and spatial development guidelines. The higher level of detail in these plans is enabled by the limited scope of the study areas investigated, since the level of detail is circumscribed by the size of the area under consideration. In other words, larger areas permit limited detail, whereas smaller areas provide more detailed planning information.

The evaluation or assessment of lodged development applications shall be guided by the Local Spatial Development Frameworks (LSDFs) or Precinct Plans. Where Local Spatial Development Frameworks or Precinct Plans have not been formulated and approved by the Municipality, the Emfuleni SDF shall be applicable. Where a LSDF or Precinct Plan is in contradiction with the

Emfuleni SDF, the Emfuleni SDF shall take precedence over a LSDF or Precinct Plan, since local plans should only give a more detail or refined expression of the contents of the Emfuleni SDF and not contradict its expressed intentions.

Provisions of most land development policies or frameworks have been improved and accommodated in the Emfuleni SDF document to ensure planning alignment. However, some planning policies cannot be accommodated due to lost relevance or observed superfluity when read in conjunction with land development proposals of the Emfuleni SDF.

1.2. METHODOLOGY AND APPROACH

1.2.1. PROJECT METHODOLOGY

The methodology for the preparation of the Emfuleni SDF was conducted in several distinct phases, as set out in detail below. This methodology aimed to holistically address all the requirements that are typically required of a Municipal SDF.

Phase 1: Situational Analysis

This phase involved the analysis of the information obtained for Emfuleni. This status quo analysis comprised of the following components.

a. Socio-economic analysis

This component involved an analysis of the socio-economic profile of Emfuleni population. This profile analysis specifically took into account the socio-economic attributes of households that live within Emfuleni, such as household income and age distribution.

b. Spatial characteristics

This component involved an analysis of the spatial characteristics of Emfuleni. The spatial characteristics included aspects such as the existing land uses within Emfuleni, housing typologies applied within Emfuleni and social amenities currently available within Emfuleni.

c. Infrastructure network

This component involved an analysis of the existing and planned transportation network within Emfuleni. It included identifying the existing public transport network for all modes of public transport (bus, minibus taxi and commuter rail). The existing municipal services (water, sanitation and electricity) infrastructure network serving Emfuleni was determined and information was obtained with regard to the capacity of this infrastructure network.

d. Environmental issues

This component involved determining environmental issues affecting Emfuleni. In particular, environmental sensitive areas, high-potential agricultural soils and geo-technically unsuitable areas were identified. The impact of these on urban development was illustrated.

Phase 2: Land Use Estimates

The purpose of this phase was to formulate a Land Use Budget for Emfuleni. This Land Use Budget was tailor-made for Emfuleni and calculated the development need and development potential within Emfuleni over a given period. This Land Use Budget provided quantitative projections upon which the spatial proposals were based, thus providing realistic and achievable spatial development goals.

The time-span of the Land Use Budget was divided into a number of incremental periods (5-year periods) and the calculation of the Land Use Budget was made accordingly. This provided a clear indication of the growth and development envisaged during each Land Use Budget period. In turn, this enables the planning of roads and bulk municipal services infrastructure, which needs to coincide with each growth and development period. The Land Use Budget also enables the planning of affordable housing, social and recreational amenities. The Land Use Budget calculated the retail floor area potential that will be generated by each consecutive growth and development period.

Phase 3: Vision and Development Concept

The visioning phase involved defining objectives for the development of Emfuleni, based on a rudimentary SWOT analysis of the development challenges facing Emfuleni. These objectives focused on issues such as urban consolidation and urban infill, nodal and corridor development, and land use and public transport integration. Based on these objectives, a Development Concept was drafted for Emfuleni. This Development Concept illustrated proposed nodes and corridors, urban linkages and aimed to promote positive development trends and urban patterns within Emfuleni.

Phase 4: Development Framework

This phase involved preparing development proposals for Emfuleni. The development proposals were based on the information gathered and conclusion made in the previous phases. Proposals were made with regard to the following:

a. Spatial Development

Proposals were made with regard to land use development to ensure the orderly development of future land uses within Emfuleni. It included proposals with regard to residential expansion and housing development, the development of activity nodes, the infill of greenfield areas, and the intensification brownfield areas. Proposals were also made with regard to the development of public-owned land, where applicable.

b. Socio-Economic Development

The proposals incorporated criteria for the provision of community facilities in an equitable manner. This included, for example, the provision of education facilities, health facilities and recreation facilities. Also, proposals were made with regard to improve the economic viability and sustainability of Emfuleni, such as the development of retail and office nodes and industrial and commercial areas.

c. Infrastructure Development

The proposals included guidelines for the development of transportation infrastructure, the promotion of public transport and the integration of land use and transportation. The concept of Transit Oriented Development (TOD) was employed. The proposals also guided the development of municipal infrastructure by applying the land use budget, which estimated the extent of future urban development within Emfuleni.

d. Housing Development

Proposals were made to address the housing backlog within the Municipal Area. Also, proposals were made to apply housing as a strong form-giving element that would shape the future spatial structure of Emfuleni. For example, housing was used as an infill land use, which can integrate the fragmented urban area currently found within Emfuleni. Also, housing was used to provide the necessary land use densities to support public transport and retail centre development within the Municipal Area.

e. Open space conservation

Guidelines for the conservation of natural open space and the creation of an open space lattice were proposed. These proposals were based on existing environmental documents, such as those prepared by GDARD.

Phase 5: Strategic Environmental Assessment

The primary aim of the Strategic Environmental Assessment (SEA) was to evaluate the Emfuleni SDF proposals and its impact on the natural, social and infrastructural environment. This was done in order to determine the sustainability of the proposed spatial development pattern and to propose mitigating measures to limit the negative impacts that these proposals may pose to the natural environment.

Phase 6: Land Use Management System

The Development Framework set out above, was translated into a Land Use Management System (LUMS) that can be used to implement the Framework proposals through applications for land use change. Detailed land use management issues pertaining to the implementation of the Development Framework proposals were addressed. The Land Use Management System was presented in the following mutually supporting formats:

a. Demarcated zones

Emfuleni was divided into a number of Land Use Management Zones. Each of these zones aimed to promote the development of a specific land use character within the Municipal Area through the application of land use mix and density.

b. Land use matrix

The Land Use Management System was presented in a matrix format for easy reference and use by municipal planners, developers and property owners. The matrix was linked to the demarcated zones mentioned above and must be read with these zones. The matrix defines the land use mix and density to be allowed within each demarcated zone.

Phase 7: Implementation Framework

A comprehensive Implementation Framework was prepared for the implementation of the proposals presented in the Emfuleni SDF. This Implementation Framework contained the following components:

a. Development programme

The development of Emfuleni was phased over a number of years. This development programme aims to guide the township establishment process and the approval of land use rights within Emfuleni. In addition, this programme enables the planning of the roads and bulk municipal services infrastructure that needs to coincide with and support each development phase. This phasing programme also enables the planning of affordable housing development and the provision of the necessary supporting community facilities.

b. Capital Investment Programme

A rudimentary Capital Implementation Programme (CIP) was prepared; based on the development programme set out above. The CIP focused on the public-sector investment needed to unlock the development potential of Emfuleni.

1.2.2. GIS DATABASE COLLATION

The spatial and infrastructure planning information pertaining to the Emfuleni Municipal Area was drawn into a GIS database. The electronic mapping and other information was made available to the Municipality for inclusion in their GIS database and was

made compatible with the Municipality's Geographical Information System. Care was taken to ensure that the information that was presented is as true as possible, legible and user-friendly.

1.2.3. STAKEHOLDER PARTICIPATION

It was considered essential to obtain buy-in into the Emfuleni Spatial Development Framework. To achieve this, Urban Dynamics Gauteng consulted with all the relevant stakeholders. Consultation was conducted on the following three levels:

a. Project Manager

Monthly meetings were held with the municipal project manager and the core municipal planning team responsible for the management of the Emfuleni SDF. This enabled the municipal project manager to be kept up to date with the progress of the project.

b. Technical Steering Committee

Two meetings were held with the Technical Steering Committee, which included relevant municipal technical representatives from all the relevant municipal departments of the Municipality. Technical meetings were convened and chaired by the Municipality. Provision was made to allow Steering Committee members to review all interim project documents.

c. Community Stakeholders

Urban Dynamics Gauteng consulted with key local stakeholders in Emfuleni. To ensure relevant and needs-accurate inputs are obtained, the consultation process targeted specific stakeholders that have a good understanding of Emfuleni, but who also had the necessary experience of and exposure to town planning and town planning principles. This included ward representatives, environmental action groups, property owners, town planning consultants, developers, and resident's associations.

In total, 2 project presentations were presented to the Technical Steering Committee, one after the completion of the draft Status Quo (Phase 2) and one after the completion of the draft Development Framework proposals (Phase 4). To accommodate local

stakeholders, a presentation was held where all ward representatives were present. A report was prepared detailing the public participation process followed. This report is included as the last chapter of the Emfuleni SDF report. This report sets out the consultation process followed, as well as the comments received on the draft Emfuleni SDF report.

SECTION 2: STATUS QUO

2.1. CONTEXTUAL SETTING

The Emfuleni Municipal Area (also referred to as Emfuleni) is located within the southern region of the Gauteng Province. As depicted on Figure 1, Emfuleni is situated south of Johannesburg and southwest of Ekurhuleni. Midvaal is situated between Emfuleni and Ekurhuleni. To an extent, Emfuleni is peripherally located within Gauteng and it is therefore not well-located in terms of access to core employment opportunities found within the region, which is mostly found within the triangle formed by the Johannesburg CBD, the Tshwane CBD and the OR Tambo International Airport. However, Emfuleni is well-connected to its neighbouring municipal areas by the N1 freeway and the R59 freeway (amongst others), which gives it access to these areas and the employment opportunities that are found within these areas. Locally, Emfuleni has good access to Sasolburg, located south of it, and Meyerton, located northeast of it. The Vaal River forms the southern boundary of Emfuleni. It also forms the boundary between the Gauteng Province and the Free State Province.

Figure 2 depicts an aerial photograph of Emfuleni. It is evident from this photograph that Emfuleni is separated in terms of land use by the N1 freeway. Emfuleni is mostly rural to the west of the N1 freeway, comprising smallholdings and farmland. In contrast, Emfuleni is mostly urban to the east of the N1 freeway. The eastern half of Emfuleni includes (amongst others) Evaton, Sebokeng, Vanderbijlpark Boipatong, Bophelong, Sharpeville, Vereeniging and Three Rivers. Mittal Steel is located in the centre of Emfuleni, between Sebokeng and Vanderbijlpark. This industrial facility is one of the largest heavy industrial facilities in Gauteng. Coal mining land is situated on the southeastern boundary of Emfuleni, directed southeast of Vereeniging.

2.2. EXISTING POLICY

A number of policy documents relating to spatial development within Emfuleni have been developed in recent years. These documents include the Gauteng Spatial Development Framework 2016, Sedibeng Growth and Development Strategy 2017, and the Sedibeng Spatial Development Framework 2014. These policy documents are recognized as the basic points of departure in the formulation of the Emfuleni SDF 2017. This will be done to ensure that the Emfuleni SDF meets the objectives of overarching

plans such as the Gauteng Spatial Development Framework 2017 and the Sedibeng Spatial Development Framework 2014, which aim to integrate spatial development on a provincial and regional level.

2.2.1. GAUTENG SDF (GSDF) 2016

The Gauteng SDF considers the Polycentric Growth Management Model to be best able to address the development objectives and challenges of the Province it does so for the following reasons:

- It creates a strong economic and movement network as the basis of spatial structuring and integration and focuses strongly on the principles of proximity and accessibility;
- It promotes the clustering of economic activities and the creation of agglomeration advantages and spatial synergy;
- It creates a liveable compact urban form around strategic locations that are based on the integration of density with proximity to public transport networks and economic opportunity;
- It not only focuses on the spatial distribution of activity, but also on the functional relationships and linkages between different locations and activities;
- It allows for strategic intensification and compaction as a main priority, but at the same time allowing for lower intensity development which will accommodate affordable housing developments as well;
- It provides a range of choices for people in terms of living arrangements, but at the same time ensuring that the relationship between density, economic activity and public transport is firmly entrenched.
- It promotes the optimal use of land, infrastructure, services and transportation in strategic or 'central' locations.
- Outward growth is not permitted at the expense of high potential agricultural land or natural resources.
- It allows for the integration of secondary towns into the overall urban economic and movement network; and
- It allows for spatial prioritisation and investment in areas where the greatest benefits can be achieved for communities and the economy collectively.

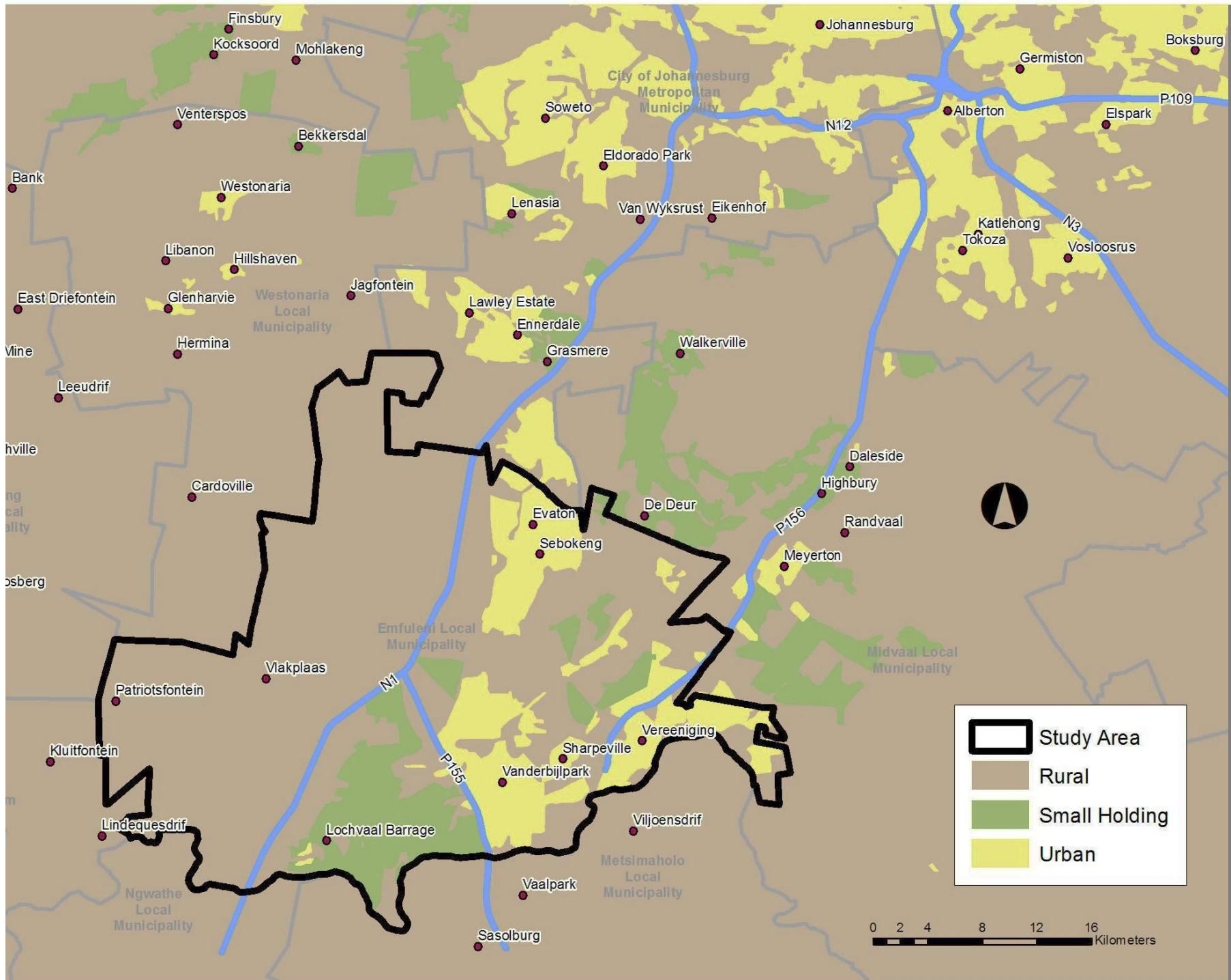
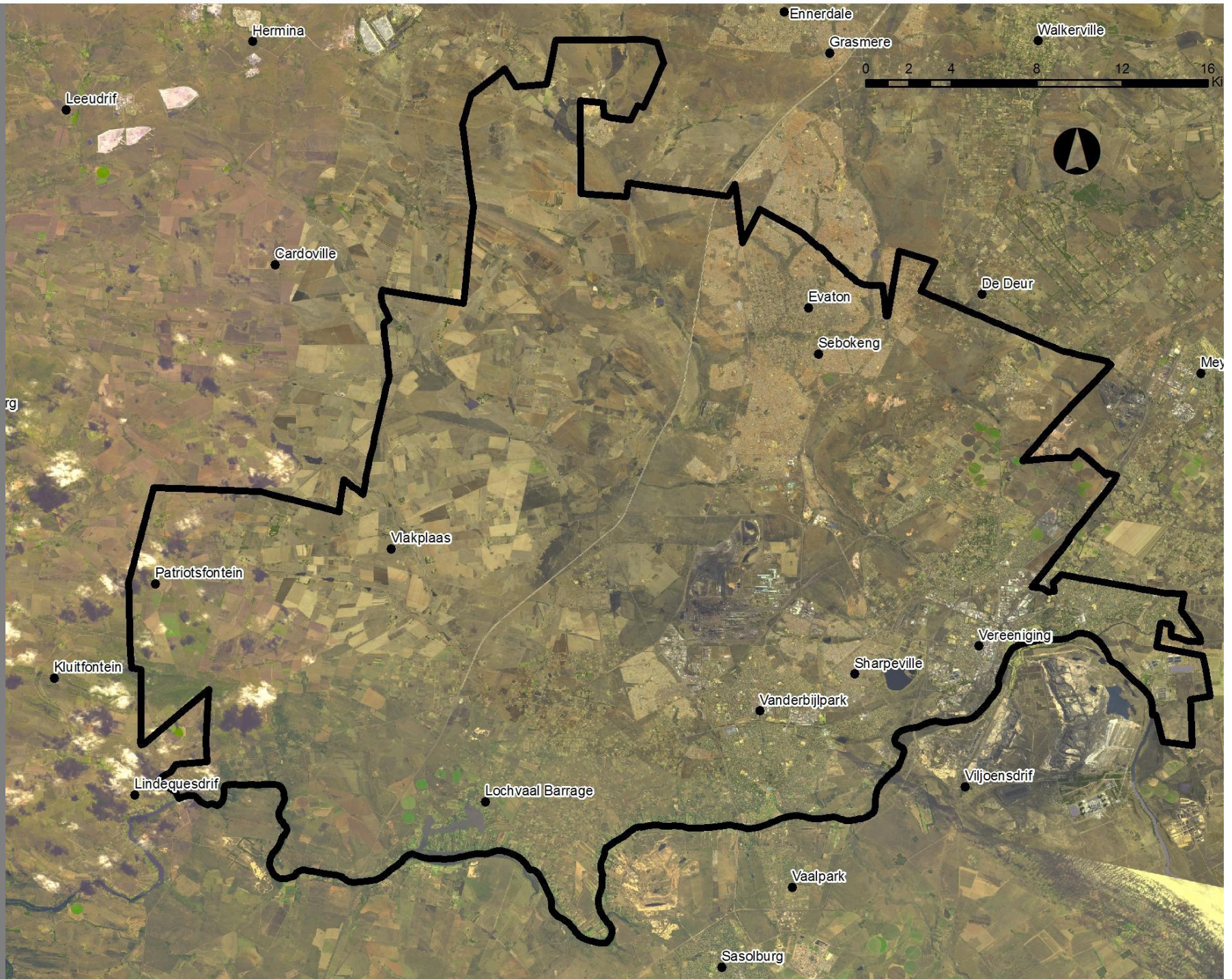


FIGURE 1 | STUDY AREA LOCALITY

FIGURE 2 | AERIAL PHOTOGRAPH



Based on the advantaged of the Polycentric Growth Management Model set out above, the Gauteng SDF defines the following objectives for the spatial development of Gauteng province:

a. Building an Integrated Network

Building an Integrated Network has four sub-objectives. It needs to develop and strengthen nodes of provincial significance in order to create a well-distributed network of higher-order Activity Nodes across the province. It needs to ensure that the major Activity Nodes are connected by a well-developed movement (in particular public transport) network. It needs to harness the opportunity of major provincial transportation networks for the development of Activity Corridors.

b. Capitalising on Proximity

Capitalising on Proximity has one main objective, and that is to harness the densification and intensification potential of the geographic proximity to areas of economic and transport opportunity.

c. Managing Settlement Development, Growth and Integration

Managing Settlement Development, Growth and Integration involves ensuring that settlements are developed in an integrated and sustainable manner. It also involves ensuring that long term outward expansion take place in areas where there is available infrastructure, transportation infrastructure and economic opportunities and do not encroach on valuable agricultural land and sensitive natural environments.

d. Creating a Viable and Productive Hinterland

This objective has a number of sub-objectives pertaining to the Gauteng hinterland. It includes the protection of sensitive natural environments, the protection of high potential agricultural areas from urban development, the identification of opportunities for viable and appropriate economies and sustainable livelihoods in the hinterland; and the creation of linkages between the hinterland and the urban conurbation to facilitate the flow of people, goods, services and capital between these spaces.

2.2.2. GAUTENG INTEGRATED TRANSPORT MASTER PLAN 2013

The Gauteng 25-Year Integrated Transport Master Plan (GITMP25) proposes eight key Transport-related interventions in Gauteng:

- Subsidised housing provision within urban core areas;
- Land use densification in support of transit;
- Reinforcing the passenger rail network as the backbone of the transit system;
- Extending the integrated rapid and road-based transit networks;
- Strengthening freight hubs;
- Ensuring effective travel demand management;
- Mainstreaming non-motorised transport; and
- Ensuring continued provincial wide mobility.

The GITMP25 states that land use and transportation should be integrated through land use densification and TODs along the priority transit routes within the urban core of Gauteng. This would require that local (and provincial) authorities initiate dedicated strategies and detailed plans for specific priority areas to ensure that a significant portion of the future housing stock is located along the Provincial priority transit network. From a spatial growth perspective, the GITMP25 makes the following recommendations:

- There is sufficient land available within the former Gauteng Urban Edge to accommodate the total population projected for the province up to 2037;
- An even distribution of the population and job opportunities on all the major vacant land areas within the urban edge, focusing on the areas around the Provincial Strategic Public Transport Network;
- Authorities will have to prioritise transit corridors for densification and infill development;
- The prioritisation of transit corridors for densification will have to be aligned and coordinated across municipal boundaries in Gauteng and the Gauteng City Region;
- Existing grant and subsidy codes for subsidised housing must be amended to achieve the construction of significantly larger quantities of higher-density residential units around the Provincial Strategic Public Transport Network.

2.2.3. SEDIBENG GROWTH AND DEVELOPMENT STRATEGY 2017

The Sedibeng Growth Development Strategy (GDS) presents a multi-stakeholder framework to develop Sedibeng up to 2030 by focusing on the following principles:

- Eradicating poverty, providing access to basic and essential services, providing all forms of income that are readily accessible, preparing people with relevant skills, and growing employment and business opportunities.
- Creating an economy that is diverse, robust and growing, ensuring that the benefits of growth are shared, ensuring the SMME sector continues to grow and flourish, and making Sedibeng an attractive destination for direct investment.
- Ensuring human settlements have mixed housing typologies and mixed uses, it is easy and safe to move around, and ensuring good governance.
- Building on the region's competitive advantages, and engaging the private sector in joint local economic development initiatives.

Base on the principles set out above, the Sedibeng Growth Development Strategy details a 'Framework for Action' which addresses the following spatial and non-spatial goals:

a. Township Renewal

Townships within Sedibeng typically were geographically isolated and set away from the bustling and affluent centres. To address this, Sedibeng needs to develop a comprehensive and coherent township strategy for its urban areas that draw businesses and residents to them.

b. Urban Renewal

It is necessary to establish an urban renewal strategy that will breathe life into decaying business districts, which in turn will create places where people and businesses would want to locate. Urban renewal also requires creating livable urban environments that makes the most of the built heritage, open spaces, natural environments and waterways to improve the health and welfare of local residents.

c. Rural Development

Rural development must be about improving the capacity of the people, specifically enabling the rural poor to prosper and thrive. This requires a multi-pronged approach that helps create vibrant, equitable and sustainable rural communities that contribute to food security for all.

d. Human Settlements

It is important to ensure that settlements are built in areas with supporting infrastructure, community amenities, public spaces and security. Creating such vibrant human settlements includes broadening of the variety of housing typologies that is delivered, and creating integrated, mixed-income and well-connected settlements on well-located land.

e. Clean Energy

Sedibeng must tackle climate change, reduce pollution, develop a low carbon economy, consume fewer resources and using them more effectively. Such plans could include measures to retrofit buildings to improve energy efficiency, expand public transit, and support the development of renewable energy.

f. Connectivity

Sedibeng must not only rely on hard infrastructure, but must increasingly also rely on Information and Communication Technologies (ICTs). This requires a clear understanding of how key economic sectors in Sedibeng, such as manufacturing, agriculture and services, can be better served by ICT networks.

2.2.4. SEDIBENG SPATIAL DEVELOPMENT FRAMEWORK 2014

The Sedibeng Spatial Development Framework consists of various structuring elements, such as nodes, corridors and the open space network. The development of this structure is constrained and will have to be phased in accordance with the availability of engineering services and funding for key infrastructure. Due to the constraints with infrastructure, the following four approaches are proposed by the SDF:

a. Consolidation

This approach relates to the urban centres, nodes and development corridors that have been identified in the SDF. These areas have good infrastructure and the aim is to consolidate and densify these areas. This will promote the sustainable use of resources, efficiency and a focused infrastructure programme. Maintenance of infrastructure and possible upgrades should be prioritised to ensure that these remain thriving nodes within the district.

b. Upgrading of existing settlements

According to the SDF, there is a large concentration of informal settlements in the district with large portions of the population earning below the minimum living standards. Engineering and social services must be provided to these areas to increase the standard of living of these communities and to increase their access to opportunities.

c. Protection of environmental areas

Sedibeng has various natural resources that need to be upgraded and protected. According to the SDF these resources should be used as assets to attract tourists and used for low intensity recreational activities.

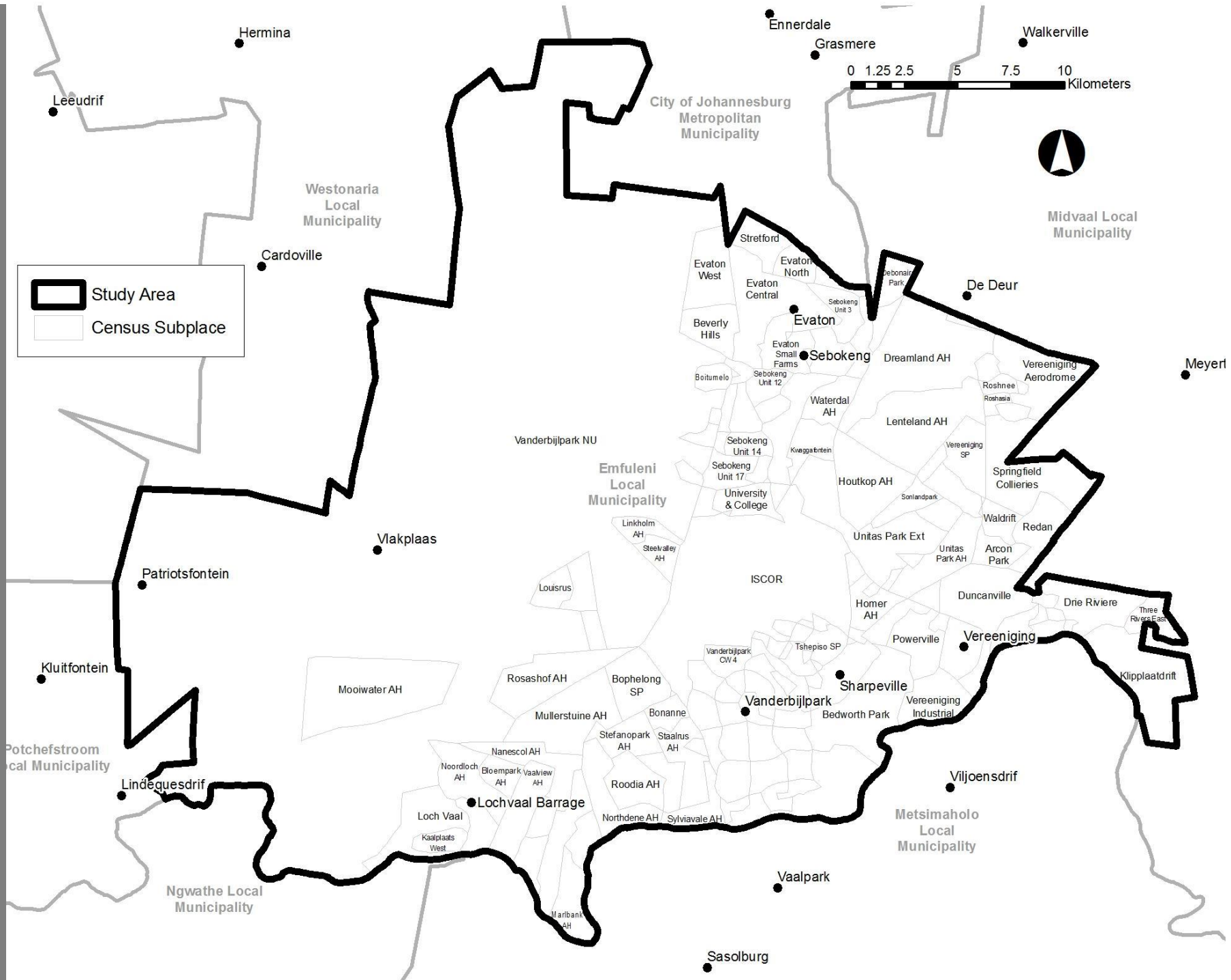
d. Support agricultural development

Sedibeng has various areas with potential for commercial agriculture. These areas require governmental support to ensure this potential realized, such as addressing issues related to linkages, transport modes, storage facilities, etc.

The SDF highlights key spatial projects that have a high catalytic impact, high legacy value, or are critical to the future growth of the region. These projects are not necessarily public sector initiatives, but may require government support and facilitation to the private sector. The projects include the following relevant to Emfuleni:

- Establishment of Vaal Logistical Hub initiative
- Construction of the Sedibeng Regional Sewer Scheme
- Development of the R59 Corridor
- Implementation of the Evaton Eastern Precinct Plan

FIGURE 3 | CENSUS SUB-PLACES



The Sedibeng SDF concludes that a strategy for spatial development cannot on its own ensure the success of the implementation of the SDF. The spatial strategy must be supported by effective decision-making, and the mobilization of financial resources that will affect a meaningful change in the existing spatial pattern.

2.3. SOCIO-ECONOMIC

2.3.1. SOCIO-DEMOGRAPHIC PROFILE

The purpose of this section is to provide an analysis of Emfuleni in terms of its socio-demographic development, particularly with regard to population and education.

2.3.1.1. Population and Households

TABLE 1: EMFULENI POPULATION 2017

Item	Population Estimate (2011)	Population Estimate (2017)
Total Population	721653	750985
Formal population	613875	637119
Informal population	41526	43872
Backyard population	66252	69994
% growth		0,92
Households	232791	242253
Formal households	198024	205522
Informal households	13395	14152
Backyard households	21372	22579
Average household size	3,10	3,10
Household growth (incl. informal)		44229

Source: Estimated from Census 2001

Emfuleni population was calculated using Census 2011 figures (see Figure 3). As depicted by the Table above, Emfuleni housed a population of approximately 721,000 people by the year 2011. It was estimated that this population had increased to

approximately 750,000 people by the year 2017. The number of households that resided in Emfuleni area by 2011 was estimated to be approximately 232,000. This figure was estimated to have increased to an estimated 242,000 by 2017. Emfuleni currently has approximately 44,000 informal households living in informal settlements within Emfuleni and approximately 70,000 informal households living within backyard shacks within Emfuleni.

TABLE 2: EMFULENI URBAN AND RURAL POPULATION 2017

Item	Population Estimate (2011)	Population Estimate (2017)	%
Rural population	95847	96094	13
Urban population	625806	654890	87
Total	721653	750985	100

Source: Estimated from Census 2001

The Table above illustrates that Emfuleni is a largely urban area in terms of population, with 87% of its population living within urban areas. This is despite the fact that most of Emfuleni is rural from a geographical perspective. The size of the urban population is also significant, pointing to an emerging metropolitan area or city developing within Emfuleni. This high level of urbanization within Emfuleni inevitably stresses the need to manage urban development within this municipal area.

2.3.1.2. Age Profile

The Diagram below reflects the age distribution within Emfuleni. Reading this Diagram, it can be concluded that Emfuleni has a predominantly young to middle-age population. The dependent and schools going population, aged between 1 and 19 years of age, constitutes 34% of the population. The working population, aged between 20 and 64 years of age, constitute 61% of the population. The retired and aged population constitute only 5% of the population. This Diagram shows that most people within Emfuleni can contribute to the economy and therefore, if employed, can carry the dependent sections of the population.

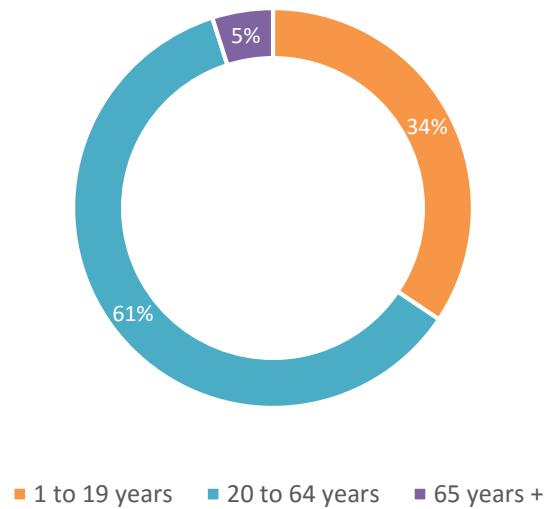


DIAGRAM 1: AGE PROFILE
Source: Census 2011

2.3.1.3. Education Level

The Diagram below illustrates the education levels within Emfuleni. This Diagram shows that most of the people (61%) in Emfuleni are at school or have not completed Grade 12. In total, 25% of the residents living within Emfuleni have completed secondary school or Grade 12. Less than 5% of the population has no education and 10% of the population has a post-scholastic educational qualification. Higher education levels are usually associated with higher income levels and certain employment categories, such as professional and managerial positions.

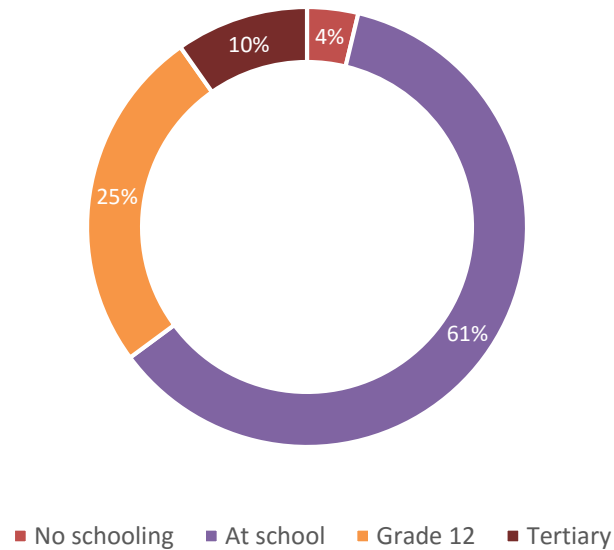


DIAGRAM 2: EDUCATION LEVEL
Source: Census 2011

2.3.2. ECONOMIC OVERVIEW

The purpose of this section is to perform an analysis of Emfuleni area in terms of its economic development, particularly with regard to employment, income and expenditure patterns.

2.3.2.1. Level of Employment

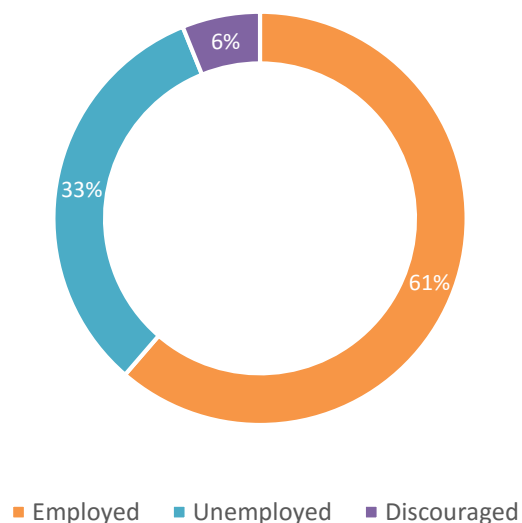


DIAGRAM 3: LEVEL OF EMPLOYMENT
Source: Census, 2011

The unemployment rate can be expressed as the number of economically active people who are willing and able to work but do not have jobs. Unemployment is one of the major contributors to poverty as unemployed people are not able to provide for their household's basic needs due to the lack of disposable income. The Diagram above indicates relatively high unemployment levels within Emfuleni, with 39% of the economically active population being unemployed or discouraged to continue looking for work. In total, 61% of the economically active population in Emfuleni are employed.

2.3.2.2. Formal and Informal Sector

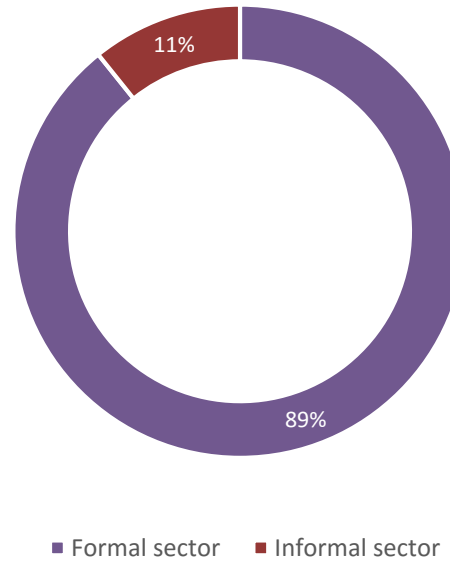


DIAGRAM 4: EMPLOYMENT SECTOR SPLIT
Source: Census 2011

The Diagram above depicts the occupations held in the formal and informal sectors within Emfuleni. It is evident from the Diagram that almost 90% of the economically active population of Emfuleni are employed in the formal sector of the economy. Only 11% of the economically active population need to or choose to work in the informal sector of the economy.

2.3.2.3. Sector Employment

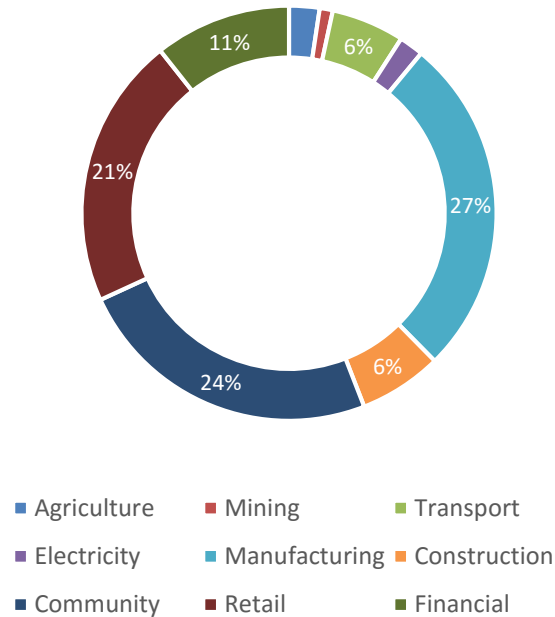


DIAGRAM 5: EMPLOYMENT BY SECTOR

Source: Census, 2001

The Diagram above shows major employment sectors that employ residents living within Emfuleni. The key sectors employing Emfuleni area residents are the community sector, the retail sector and the manufacturing sector. It can be assumed that the Vanderbijlpark CBD and the Vereeniging CBD contribute significantly to the community sector and retail sector statistics, and that Mittal Steel and the industrial areas of Vereeniging contribute significantly to the manufacturing sector statistic. The number of people employed by the agricultural sector is surprisingly low, which suggests that the smallholdings and farms within Emfuleni are primarily used for rural residential purposes, rather than commercial farming purposes.

2.4. TRANSPORTATION

2.4.1. MOVEMENT PATTERN



DIAGRAM 6: MOVEMENT AXIS

Movement patterns provide an understanding of how an area functions, because it illustrates the spatial relationships between settlements and core areas (employment and shopping areas) and the linkages that exist between such spatial entities. The Diagram above depicts the movement of people within Emfuleni and between Emfuleni and the neighbouring municipal areas. Six primary core areas are located within and close to Emfuleni. Movement within Emfuleni largely occurs within a triangle, anchored by the core areas of Vanderbijlpark, Vereeniging and Sebokeng. Movements between Emfuleni and neighbouring municipal areas occur along three axes. The first axis is located between Vereeniging and Sebokeng towards Lenasia and Johannesburg. The second axis is located between Vanderbijlpark, Vereeniging and Meyerton towards Ekurhuleni. The third axis is located between Sebokeng, Vanderbijlpark and Sasolburg.

A strong movement of people occurs between Vanderbijlpark, Vereeniging and Meyerton towards Johannesburg along the P156 freeway. A strong movement also occurs between Sebokeng and Johannesburg, especially during morning and afternoon peak hours, as commuter access employment opportunities in Johannesburg and surrounding areas. A strengthening of movement in future can be expected between Vereeniging and Sebokeng, as urban development and densification occurs along this corridor. The densification of this corridor is set out in the Development Concept that is presented in Section 4 of the Emfuleni SDF. Movement along the corridor between Vereeniging, Sebokeng and Johannesburg is supported by the existing commuter railway line.

2.4.2. ROAD NETWORK

The South African Road Classification and Access Management Manual is an official road planning document supported by SANRAL and the National Department of Transport (NDOT). According to the South African Road Classification and Access Management Manual, the road hierarchy within South Africa functions on 5 levels. The first level contains freeways, consisting of national freeways and provincial PWV roads and these are classified as Class 1 roads. These roads provide regional access, connecting an area to neighbouring cities and towns. The second and third levels comprises major and minor arterials (or K-routes), which aim to provide better intra-urban access between suburbs and activity areas. These are classified as Class 2 and 3 roads. The fourth level comprises collector roads, which are classified as Class 4 roads. These roads connect residential areas to the mentioned arterial network. On the fifth level, local streets provide direct access to land uses and link these land uses to the mentioned collector roads. These are classified as Class 5 roads.

In essence, freeways and arterials are highly mobile and therefore aim to connect people over large distances to activity areas and neighbouring settlements. Collector roads and local streets provide good accessibility and therefore aim to connect people and land uses to the more mobile roads. Road-based public transport systems (minibus taxis and busses) mostly use arterials and collector roads, because these provide an efficient balance between mobility and land use accessibility.

Figure 4 depicts the road network serving Emfuleni area. The N1 freeway passes through the centre of Emfuleni, linking Emfuleni to Johannesburg and Soweto. The primary role of this freeway is link Gauteng Province to the Free State Province and the Western Province and therefore fulfills a through-traffic function, rather than serving Emfuleni specifically. The P156 freeway, on the other hand, primarily serves Emfuleni, linking Vanderbijlpark and Vereeniging to Ekurhuleni and the OR Tambo International Airport. Due to its function, corridor development is increasingly occurring along the P156 freeway, especially in the Vereeniging and Meyerton areas. The P156 freeway is located on the eastern boundary of Emfuleni.

Most of Emfuleni's planned K-route network has been developed, although not all the K-routes have been developed to a dual carriageway level. Many of the K-routes are also in need of rehabilitation, especially K-routes such as the K174 (Barrage Road). Despite this, the complete K-route network allows urban infill and expansion to take place in almost any part of Emfuleni, providing the access infrastructure needed for urban development. There are four K-routes that can be highlighted as prominent K-routes serving Emfuleni. The first is the K53 (Moshoeshoe Road that become the Golden Highway), which runs between Vanderbijlpark and Sebokeng. This is an important commuter spine serving Emfuleni. The second K-route worth mentioning is the K174 (Barrage Road), linking Vanderbijlpark to Vereeniging. This road is a gateway route into Emfuleni and the Municipality is thus concerned over the type of development that take place along this route. The K178 links Sebokeng to Vereeniging and the shopping and employment opportunities found within Vereeniging. This K-route is expected to become a major commuter spine, as urban development intensifies along this route. The fourth K-route is the K164, which links Evaton to Meyerton. Savanna City (a 14000-residential unit development) will be situated on and have access from the K164, which will increase the prominence of this K-route.

2.4.3. RAIL NETWORK

Emfuleni is served by a rail network that connects Emfuleni to neighbouring areas in Gauteng and the Free State. As depicted by Figure 4, this rail network consists of 3 lines. The first rail line stretches along the P156 (R59) freeway and links Sasolburg to Vereeniging, Meyerton and Germiston. This rail line is primarily a freight line, but does contain commuter railway stations along the line. The second railway line stretches from Sasolburg, via Vereeniging towards Sebokeng, Orange Farm and Johannesburg.

This railway line also functions as a freight railway line, although it also fulfills a significant commuter railway line function. The third railway line stretches from Sebokeng towards Westonarea. This railway line is exclusively used for rail freight purposes.

TABLE 3: TRANSPORT INFRASTRUCTURE LAND ALLOCATION

Infrastructure	Extent (ha)
Private road	52,4
Public road	2612,3
Parking	22,0
Taxi rank	60,0
Rail reserve	561,2

Source: Emfuleni Local Municipality, 2017

The Table above shows the land in Emfuleni allocated to the various transportation infrastructure serving Emfuleni. It is evident that rail infrastructure uses far less land compared the private vehicle to transport commuter and is therefore an efficient means of transporting commuters.

2.4.4. PUBLIC TRANSPORT

The Diagram below provides an indication of the modes of transport that commuters within Emfuleni use to access employment opportunities and social amenities. According to this Diagram, most people (42%) within Emfuleni access employment opportunities and social amenities by mini-bus. A relatively low number (7%) of people access employment opportunities and social amenities by train, which is surprising when taking into account it has access to the Johannesburg- Vereeniging commuter rail line. This rail ridership may be due to other factors, such as the frequency of trains. Cars make up a significant portion (38%) of the transportation modes used to access employment opportunities and social amenities within Emfuleni. However, this portion of car usage also shows that the Emfuleni population is a predominantly public transport-reliant community with the remainder of the population (62%) using public transport to access employment opportunities and social amenities within Emfuleni.

The modes of transport used (as set out above) shows that most households within Emfuleni are reliant on public transport to access employment opportunities and social amenities. In a sense, this is a desirable situation, because there are specific and valid reasons for providing and promoting the use of public transport within urban areas. One such a reason is to lessen carbon emission, which is the primary cause of climate change. As depicted by Figure 5, three municipal-level public transport networks serve Emfuleni. These are the following:

a. Metrorail

Emfuleni is served by a commuter rail network that connects Emfuleni to neighbouring areas in Gauteng. This commuter rail network consists of 2 lines. The first rail line stretches from Vereeniging to Meyerton towards Germiston. This commuter railway line contains commuter railway stations, with prominent stations being the Vereeniging Station, the Duncanville Industrial Halt Station and the Meyerton Station. The use of this railway line as a commuter railway line is limited due to fragmented urban development and low residential densities along this railway line. The second commuter railway line stretches from Vereeniging towards Sebokeng, Orange Farm and Johannesburg. Prominent stations along this line are Houtheuwel Station, Residentia Station and Stredford Station. This railway line traverses densely built-up urban areas, as is found in Sebokeng and Orange Farm, and it therefore fulfills a significant commuter railway line function. However, the full potential of this railway line to function as a commuter railway line is impeded by the following factors:

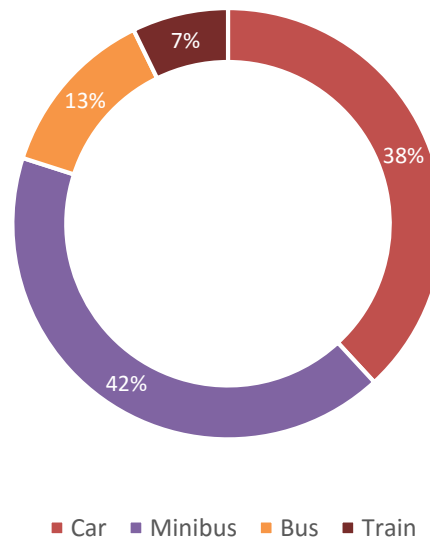


DIAGRAM 7: MODE OF TRANSPORT
Source: Census 2001

- Large undeveloped areas between Vereeniging and Sebokeng, with low residential densities to support commuter rail.
- The lack of urban development on both sides of the railway line, in particular in the Sebokeng and Evaton region.
- Gaps in the spacing of commuter railway stations, in particular on the stretches of railway line between the Leeuhof Halt and Kleigrond Stations and between the Houtheuwel and Kwaggastroom Stations.

Urban development along the Vereeniging-Sebokeng-Orange Farm commuter railway line will provide the necessary commuter thresholds needed to allow the viable operation of this commuter railway line. In turn, this will provide opportunities for Transit Oriented Development (TOD) at the stations along this line.

b. Bus network

Emfuleni comprises an extensive bus network that serves the municipal area. A prominent bus route is the bus route linking Vereeniging to Sebokeng along the K53 (Moshoeshoe Road) and the K45 (Golden Highway). This bus route links Evaton and Sebokeng to the Vereeniging CBD and the industrial areas located within Vereeniging. Other bus routes worth mentioning are the bus route linking Vereeniging to Meyerton, the bus route linking Vereeniging to Residentia Station, and the Bus route linking Evaton to Meyerton. Linking the bus network to the commuter rail network will enable the bus network to act as a feeder system to the commuter rail network. This will give Emfuleni access to an integrated hierarchy of public transport modes servicing different parts of the municipal are and it will greatly improve the current public transport network serving Emfuleni.

c. Mini-bus taxi network

Emfuleni comprises an extensive minibus taxi network. This network largely uses the same routes and serves the same areas within the municipal area that the bus network does. The only significant exception is that a minibus taxi route links the Vanderbijlpark CBD to Sebokeng via Mittal Steel; a route which the bus network does not serve. A disadvantage of the minibus taxi network is that the routes of this network are not fixed and can therefore change in future. Therefore, minibus taxi route does not indicate fixed locations where Emfuleni can develop. Bus routes and in particular commuter railway lines provide much better indication of where to densify Emfuleni.

2.4.5. AIRPORTS

Emfuleni comprises 2 light aircraft airports. The Vanderbijlpark Airport is located on the western boundary of Bophelong and the Vereeniging Airport (Aerovaal) is located on the eastern boundary of Roshnee. The Vereeniging Airport has two runways and hangar facilities to accommodate approximately 64 planes. It has the capacity to handle freight and handles an average of 80 tons of freight per month. This airport is situated within the airspace of the OR Tambo International Airport, requiring air traffic from Vereeniging Airport to be co-coordinated from the OR Tambo International Airport control tower. OR Tambo International Airport is located approximately 80km from Emfuleni and is accessed via the P156 (R59 freeway).

2.5. MUNICIPAL SERVICES

The primary municipal services (water, electricity and sanitation) are broadly discussed below. It illustrates the level of municipal services provision within Emfuleni, as well as the bulk network serving Emfuleni. The level of service is derived from Census 2011 and only shows the existing number municipal services connections by 2011. It does not show the capacity of the bulk municipal services network to accommodate urban expansion and densification. The Table below shows the land areas dedicated to the various municipal services in Emfuleni.

TABLE 4: MUNICIPAL SERVICES LAND ALLOCATION

Infrastructure	Extent (ha)
Water	1515,8
Sanitation	72,4
Electricity	39,1
Landfill	264,2

Source: Emfuleni Local Municipality, 2017

2.5.1. INFRASTRUCTURE CHALLENGES

Emfuleni's existing infrastructure is overburdened, largely due to population growth and the poor state of the infrastructure within Emfuleni. In addition, the replacement, rehabilitation and preventative maintenance of existing infrastructure has suffered due

to a persistent focus on the extension of infrastructure and ad hoc repairs. To address this problem in part, the Municipality is planning a Regional Sewer Scheme that is aimed at addressing the sewer problems of the Sedibeng district municipal area and its locals: Emfuleni, Midvaal and Lesedi. Once started, the project will be constructed over a period of five years and it is estimated that the project will cost approximately R2 billion to construct.

2.5.2. WATER SUPPLY

According to the Diagram below, the majority of households that reside in Emfuleni have access to piped water. A relatively small number of households acquire water from other sources, such as such as boreholes.

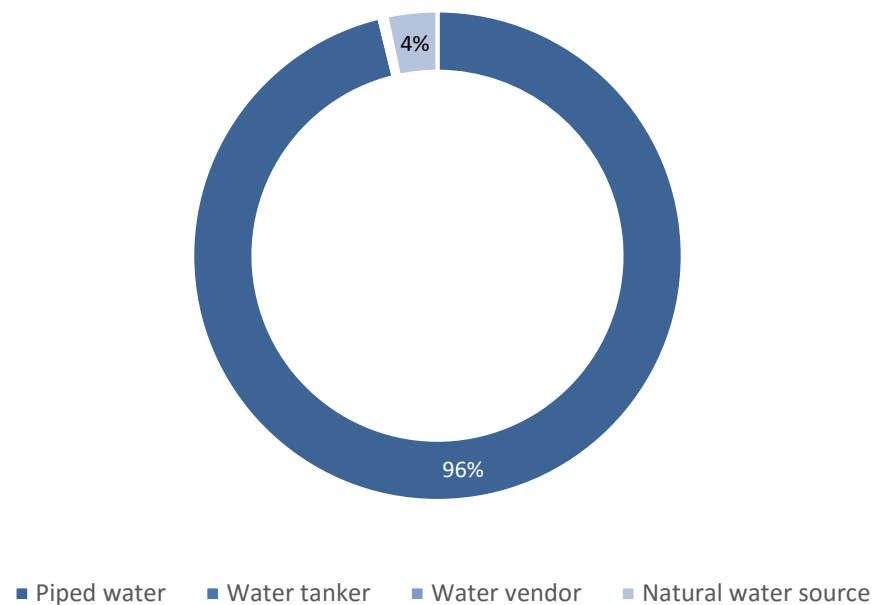
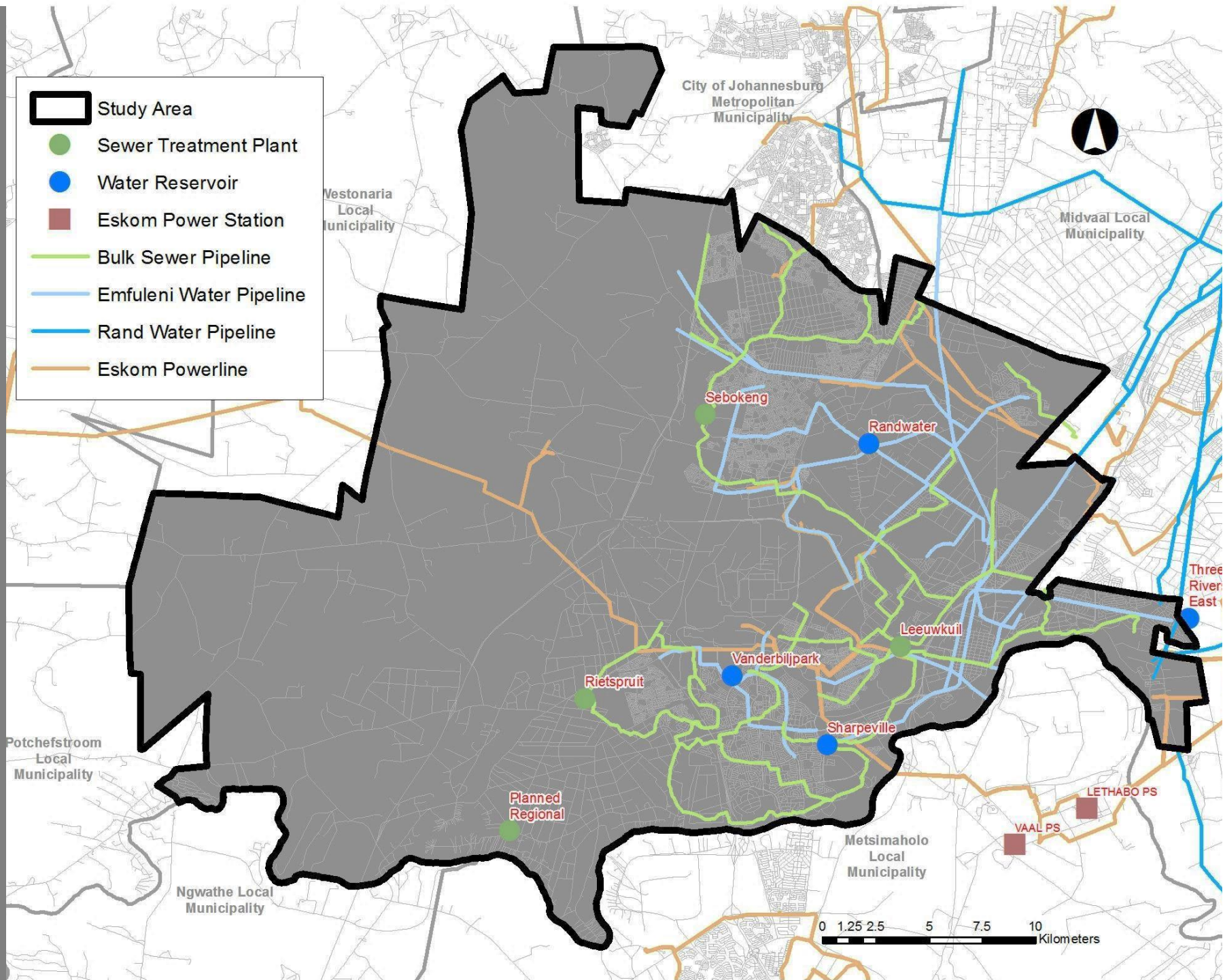


DIAGRAM 8: WATER SUPPLY
Source: Census 2011

FIGURE 6 | BULK SERVICES



The water system consists of pipe networks, 9 reservoirs, and a small potable water treatment plant. Emfuleni borders the Vaal River and therefore extracts water from the river for consumption within Emfuleni. However, only a small amount of the required quantity is extracted from the Vaal River and purified at 0.2 MI/day. Most potable water required by Emfuleni is supplied by Rand Water (205 MI/day). The bulk water network is illustrated on Figure 6.

The bulk water network is old and it is overworked due to the demand for potable water. The age of the networks varies between 60 -70 years across the municipal area. There are no backlogs in the supply of water connections. Additional water connections have largely been provided to informal settlement households to cope with growth of those settlements. In addition, water connections are continuously being provided to new housing development within Emfuleni.

2.5.3. SANITATION SUPPLY

As depicted by the Diagram below, flush toilets are the most common form of sanitation provision within Emfuleni. The only other significantly used sanitation system in use in Emfuleni is pit latrines, which is most probably used in the informal settlement of Emfuleni.

The bulk sanitation network is illustrated on Figure 6. The sanitation system consists of gravity pipelines and, due to the flat terrain; it also consists of 49 sewage pump stations. The waste water system consists of 3 wastewater treatment works. The Sebokeng wastewater treatment works, located in Sebokeng next to the Rietspruit, is the largest waste water treatment works within Emfuleni.

This waste water treatment facility has a capacity of 119 MI/day. Significant parts of the sanitation system infrastructure, including the Rietspruit and Leeuwkuil wastewater treatment works, need to be upgraded and rehabilitated. A summary of the wastewater treatment facilities is shown in the Table below.

The bulk sanitation network is old and it is overworked due to the demand for sanitation services. The age of the networks varies between 60 -70 years across the Municipal area. The short-term sanitation infrastructure plans involve the rehabilitation of existing infrastructure, including sewer pump stations to minimize sewer spills. While this will give a significant improvement to overall performance, problems which could result in raw sewage spillage cannot be ruled out. Existing sanitation infrastructure has reached the end of its life-span and can only be kept operational with a high risk of sewer spills. New infrastructure needs to be constructed in order to prevent future sewer spills.

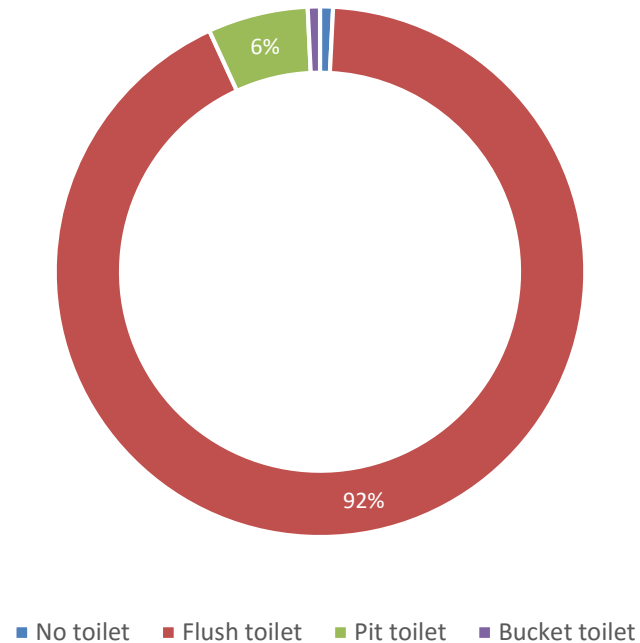


DIAGRAM 9: SANITATION SUPPLY
Source: Census 2011

The long-term solution for the aging sewer network problem includes the elimination of sewer pump stations and the construction of a new gravity pipe next to the Klip and Vaal Rivers. The replacement of the 3 Emfuleni waste water treatment plants (Sebokeng, Leeuwkuil and Rietspruit), as well as Midvaal's waste water treatment plants that serves Roshnee, are also included in the long-term sanitation infrastructure plans. The long-term plans aim to reduce sewer spillages and reduce the high bulk infrastructure costs associated with urban development in Emfuleni. The long-term solution is estimated to take at least 8-10 years to implement.

TABLE 5: EXISTING WASTE WATER TREATMENT PLANTS

Waste Water Treatment Works	Service Area	Capacity	Discharge Locality
Rietspruit	Vanderbijlpark, Boipatong	23 MI/day	Discharges into the Rietspruit and Vaal River, below the Barrage
Leeuwkuil	Vereeniging, Sharpeville, Tshepiso	32 MI/day	Discharges into the Vaal River
Sebokeng	Sebokeng, Evaton, Palm Springs, Orange Farm and areas of Johannesburg	119 MI/day	Discharges into the Rietspruit

Source: Emfuleni IDP, 2012

2.5.4. SEDIBENG PLANNED REGIONAL SEWER SYSTEM

The growth of the Sedibeng district (which includes Emfuleni), as well as Johannesburg is expanding southwards, putting pressure on municipal services south of Johannesburg. As a result, the capacity of the sewer network in Sedibeng is increasingly unable to serve the current needs of the population, let alone future urban developments. This creates numerous problems. For example, the sewer system of Emfuleni and Midvaal is currently running at its full capacity, which means that any breakdown in the system due to mechanical failure reduces the system's capacity to treat effluent to the required standards. As a result, Rand Water (in consultation with DWAF) placed a moratorium on development within Sedibeng until the sewer system capacity has been increased to cater for the current needs and future growth within Sedibeng.

Restricting urban development within a municipal area due to municipal services constraints is always problematic, because people need to be housed, regardless of whether there is municipal services capacity or not. In addition, the municipalities themselves have ambitious growth and development plans, which are in jeopardy if sufficient municipal services capacity is not provided. These growth and development plans can only materialize if it is supported by municipal services network and capacity expansion. Given the challenges mentioned above, the planned Sedibeng Regional Sewer Scheme project needs to be implemented as soon as possible. The proposed design capacity of the planned Waste Water Treatment Works of the Sedibeng Regional Sewer Scheme will be 150 MI/day up to the year 2025. The site for the location of the planned Waste Water Treatment Works has been identified and approved, awaiting implementation.

2.5.5. ENERGY SUPPLY

As depicted by the Diagram below, Emfuleni population mostly uses electricity as their source of energy supply. A relatively small portion of the population uses candles as their primary source of energy. The use of candles can either be attributed to households that are not connected to the electricity grid or households that cannot afford electricity.

Emfuleni Local Municipality is licensed to provide electricity in the Vanderbijlpark, Bophelong, Boipatong, Ironsyde, Eatonside, Roshnee, Rust-ter-Vaal and Vereeniging areas. Eskom has been licensed to provide electricity in the remaining areas. Between Eskom and the Municipality there is a 100% coverage of Emfuleni as far as the electricity network is concerned.

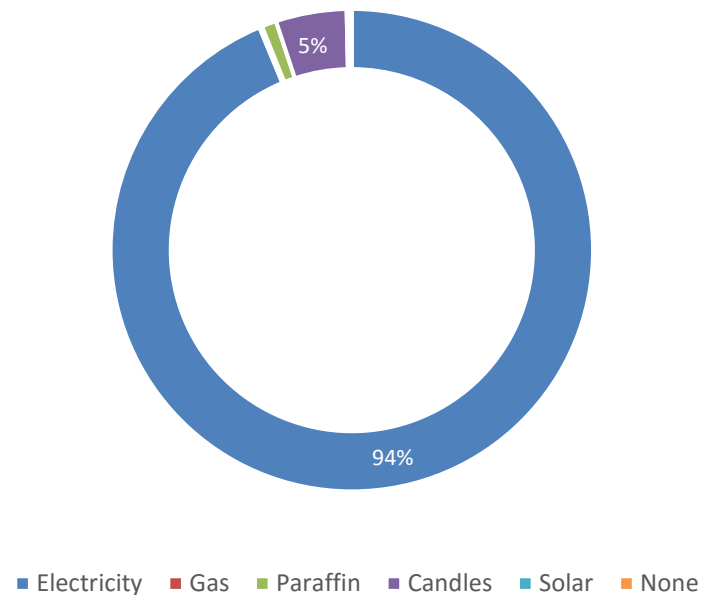


DIAGRAM 10: ENERGY SUPPLY
Source: Census 2011

The electrical infrastructure network consists of 88/22kV and 11/6,6kV overhead power lines, 31 primary substations (88/33/22kV). Major portions of Emfuleni's distribution networks have been in service for more than 50 years and much of this network is approaching or exceeding its design life-span. As a result, the existing networks have begun to exhibit a reduction in performance reliability and even obsolete deterioration. The low level of investment in the upgrading, refurbishment and expansion of the bulk electricity infrastructure network has led to a situation where new developments can no longer be accommodated without major capital investments in bulk electricity infrastructure. This situation is aggravated by the densification of existing developments, which is placing a huge demand on the provision of electricity. The bulk electrical network is illustrated on Figure 6.

2.6. NATURAL ENVIRONMENT

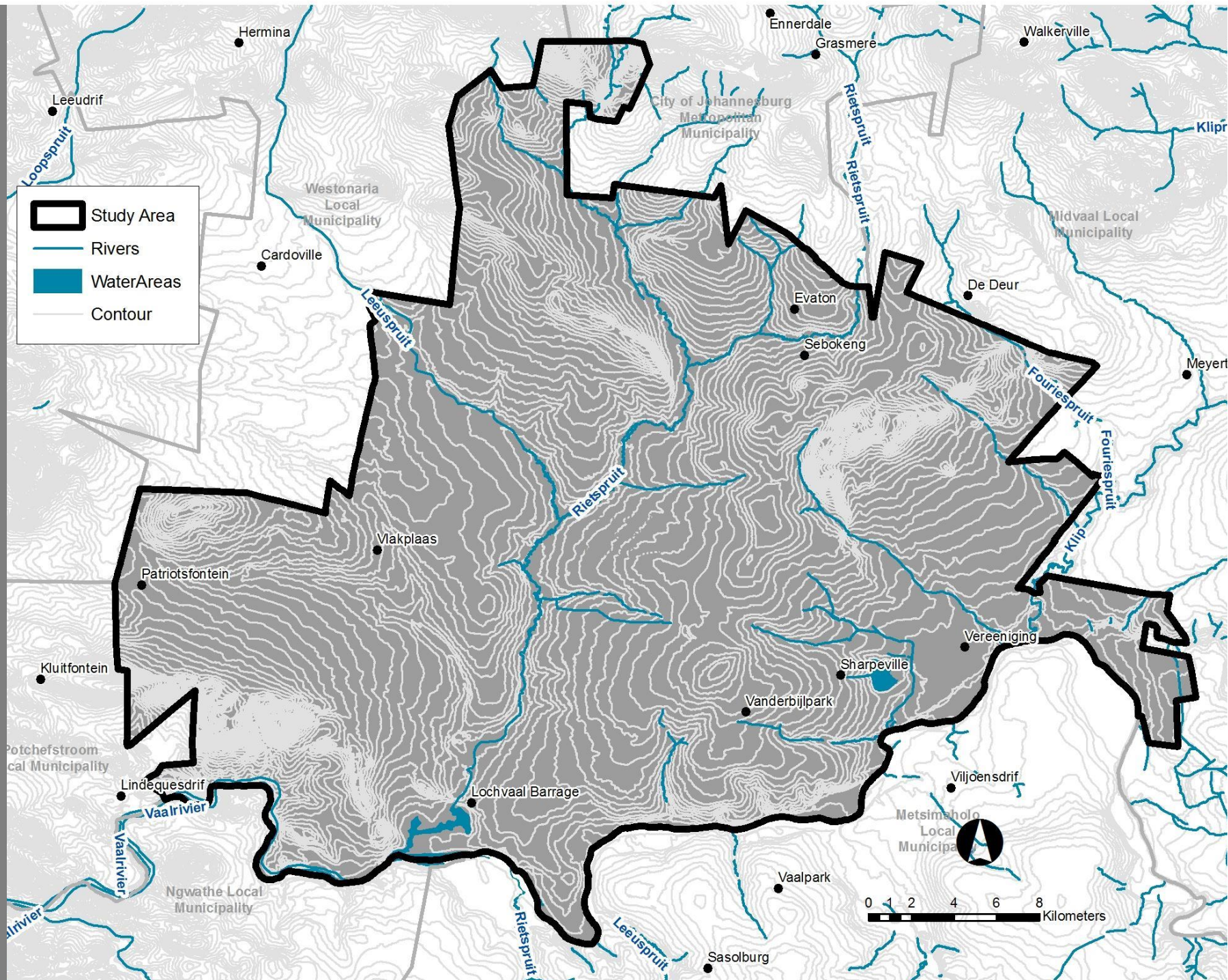
2.6.1. TOPOGRAPHY

As depicted by Figure 7, Emfuleni has an undulating, but relatively flat topography. This topography forms a number of watersheds within Emfuleni. The most significant watershed is located between Sebokeng and Vereeniging. Its location affects urban development and in particular the servicing of urban areas with bulk sewer reticulation. The hydrological system of the municipal area drains from these watersheds into a number of rivers, which in turn flow into the Vaal River. Apart from the Vaal River, 3 rivers are of importance within Emfuleni: the Klip River, which flows from Meyerton towards Three Rivers, the Rietspruit, which flows past the western boundary of Sebokeng towards Lochvaal Barrage, and the Leeuspruit that flows from Carltonville into the Rietspruit. Apart from the hydrological function, the undulating topography and the Vaal River provide a picturesque environment, which lends Emfuleni a significant tourism potential.

2.6.2. MOUNTAINS AND RIDGES

Emfuleni comprises a relatively flat topography. As a result, not many ridges are found within Emfuleni. The GDARD Ridges Policy (GDACE, 2001), identifies 2 major ridges within Emfuleni. These ridges are depicted on Figure 8. A significant ridge, in terms of size, is found on the southwestern boundary of Emfuleni, directly north of the Vaal Oewer settlement. Most of this ridge is categorized as a low priority ridge. A few pinnacles of this ridge are considered of high protection value and it is therefore categorized as a high priority ridge. A significant ridge is also found between Sebokeng and Sonlandpark. Most of this ridge is categorized a low priority ridge, with the exception of some of the edges of this ridge, which is categorized as a high priority ridge.

FIGURE 7 | HYDROLOGY



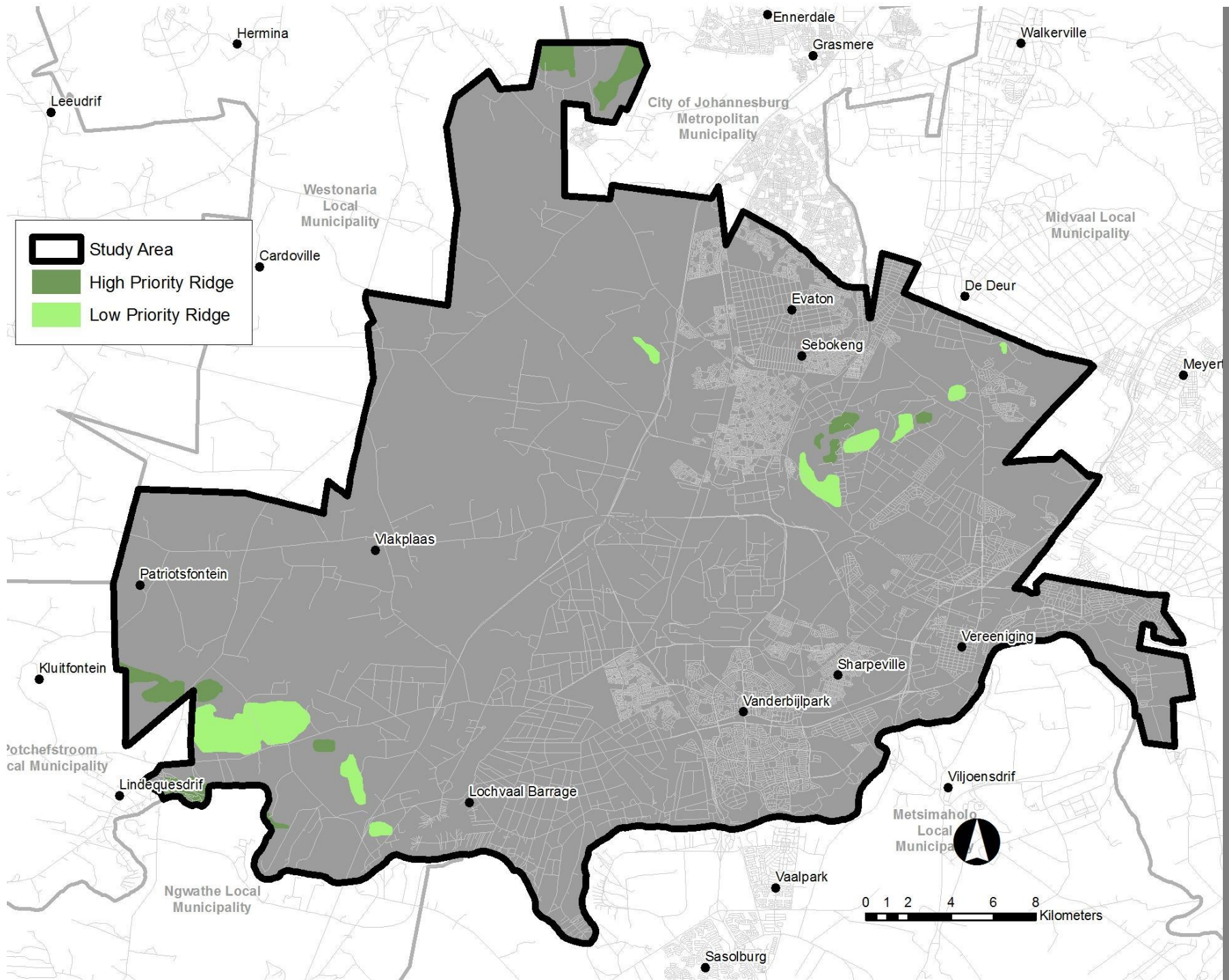
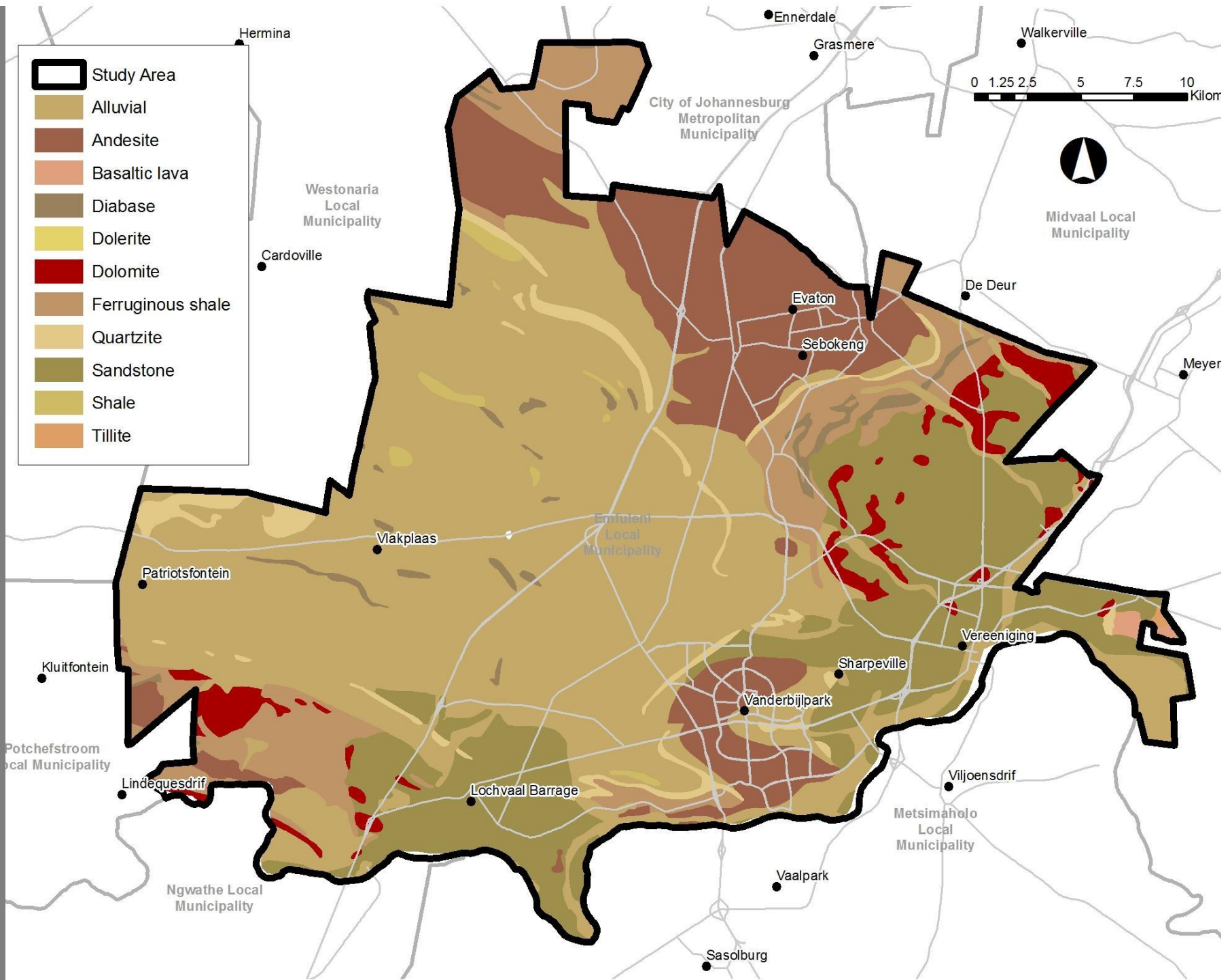


FIGURE 8 | RIDGES NETWORK

FIGURE 9 | GEOLOGICAL PROFILE



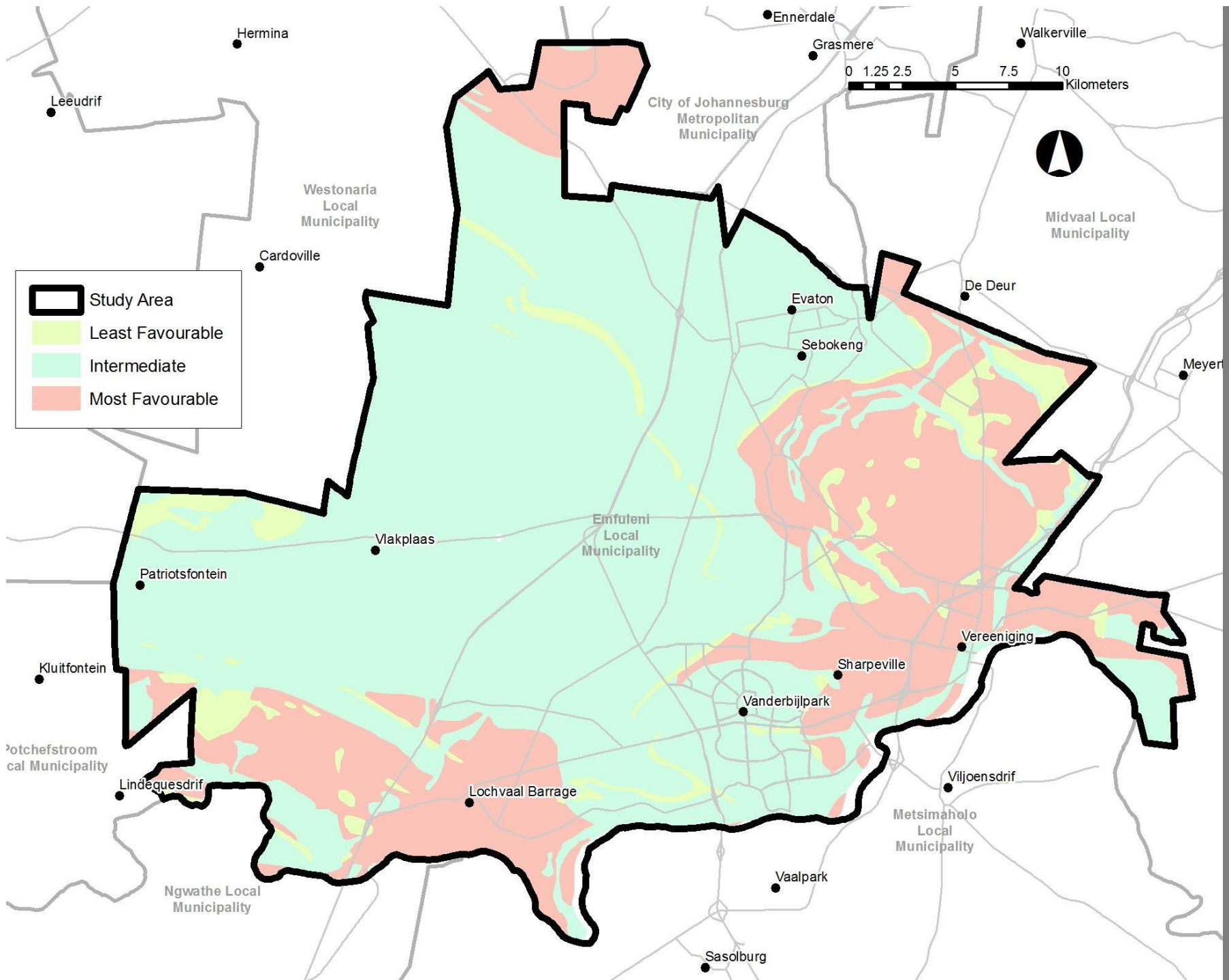
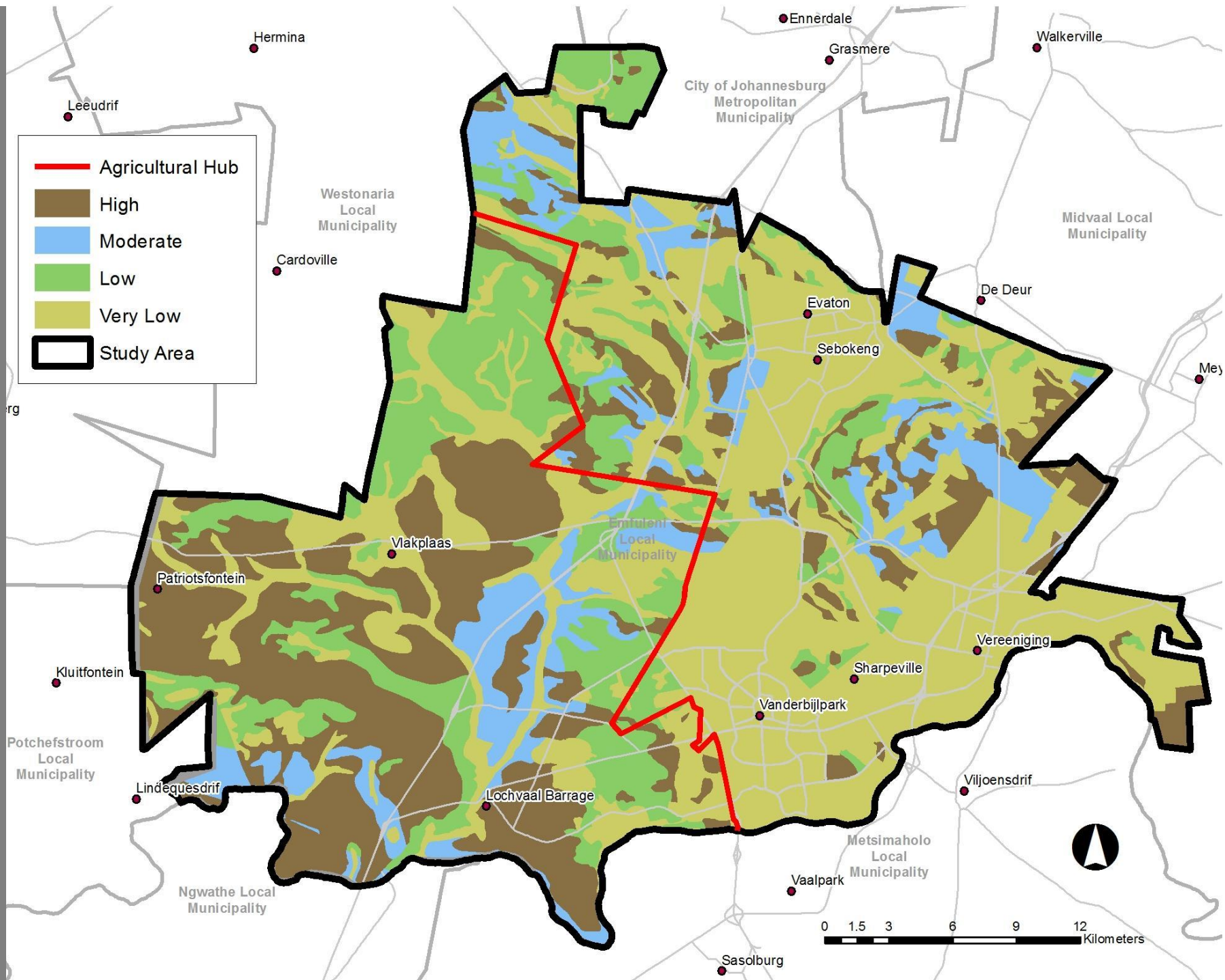


FIGURE 10 | GEOTECH SUITABILITY

FIGURE 11 | AGRICULTURE



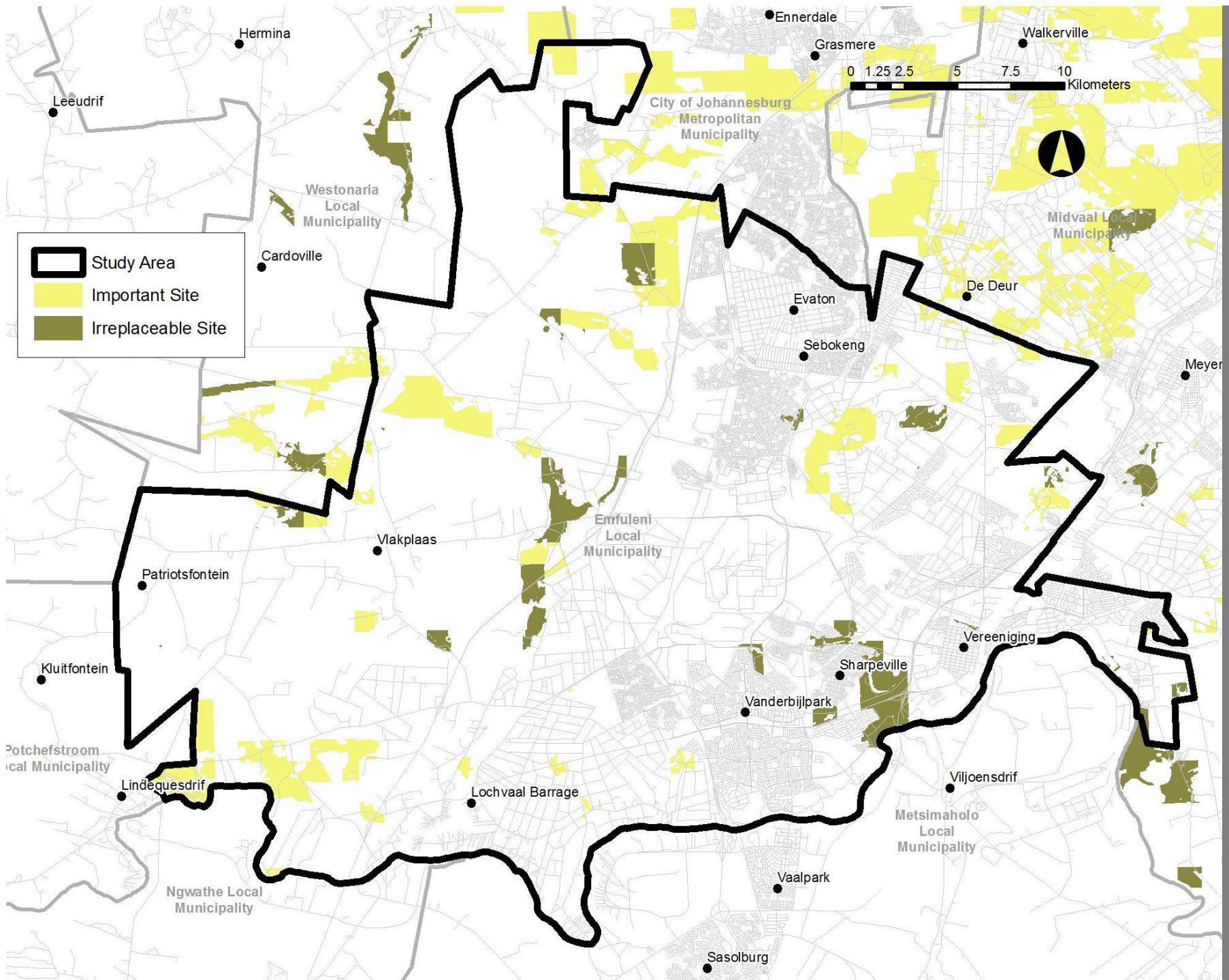


FIGURE 12 | ENVIRONMENT

Although the abovementioned ridges are mostly classified as low priority ridges (Class 2-4 ridges), these ridges are all deemed sensitive until verified by GDARD. Low impact developments on these ridges will only be considered on submission of full EIA and specialist studies. Any proposed developments on these ridges will have to include a management plan to maintain the ecological integrity of the ridges. No exemption from the EIA process will be given if a Red Data species is recorded on the ridge, the open space is 4 ha or larger, and/ or the surrounding landowners object to proposed development.

No development is permitted on a part of the ridge classified as high priority (Class 1 ridges). If a developer wishes to deviate from the strict no-go policy, a full EIA will be required (including public participation exercise) with a full set of specialist reports including a Red Data study for both fauna and flora, an invertebrate study, a hydrological study, a geotechnical study, a pollution study (including both air and water pollution), a social study, and a visual study.

2.6.3. GEOTECHNICAL SUITABILITY

Figure 9 shows that Emfuleni is largely underlain by Alluvial, Andesite and Sandstone geological formations. Dolomite areas are found in the region of Sonlandpark, in the region of Roshnee, and north of Vaal Oewer. However, these areas are relative small compared the entire municipal area and should not affect urban expansion severely due to the amount of land that is available for urban expansion within the municipal area.

As is depicted on Figure 10, most of Emfuleni has geotechnical conditions that are favourable or intermediately favourable for urban development (DPLG, 2002). The only unfavourable geotechnical conditions are located on the mentioned dolomite area. As mentioned above, these dolomite areas are found in the region of Sonlandpark, Roshnee, and Vaal Oewer.

The geotechnical information presented above is only based on a broad desktop analysis of the geotechnical conditions affecting Emfuleni. Consequently, it cannot be determined conclusively whether the land parcels within Emfuleni that are deemed unsuitable for urban development are in actual fact no-go areas for urban development. Such an assessment can only be done through a detailed and comprehensive geotechnical survey. Such a detailed study will have a decisive influence on the typology and intensity of land uses allowed within these geological zones. Considering the aforementioned, it has to be added that there is enough land for urban expansion within Emfuleni to avoid developing on these no-go areas altogether. This is the approach followed in the Emfuleni SDF.

2.6.4. AGRICULTURAL POTENTIAL

The agricultural potential of Emfuleni varies from high to low potential (GDACE, 2002). As illustrated on Figure 11, most of the high-potential agricultural soils found within Emfuleni are located within the southwestern quadrant of Emfuleni, in the vicinity of Lochvaal Barrage and Vaal Oewer. GDARD has demarcated this region of Emfuleni as a provincial agricultural hub. This provincial initiative requires this hub to be protected from urban development and expansion. Because the Agricultural Hub is a Provincial initiative, it is considered a higher-order and therefore overriding land use initiative. Thus, all land use proposal made within this region of Emfuleni are subject to the requirements and guidelines of the Agricultural Hub Initiative.

The rest of Emfuleni, and in particular the Sonlandpark region, contains pockets of high-potential agricultural soils that are scattered through the municipal area. These pockets of high-potential agricultural soils are mixed with low and medium potential agricultural soil areas, thus not forming an identifiable agricultural region similar to the agricultural hub. This reduces the legitimacy of protecting these pockets of high-potential agricultural areas for agricultural purposes, thus making these areas potentially suitable for urban development and expansion.

2.6.5. ENVIRONMENTAL SENSITIVITY

C-Plan2, which was compiled by GDARD (2005), provides an overview of ecologically sensitive sites within Gauteng and is used (in conjunction with site surveys) by GDARD to determine whether a site is suitable for urban development. It therefore provides an indication of the chances of having a township application approved within a specific area. C-Plan2 divides ecologically sensitive sites into two categories: 'Irreplaceable Sites', which contain fauna and flora that are not found elsewhere, and 'Important Sites', which are required for the healthy functioning of an eco-system.

An 'Irreplaceable Site' is defined as a site that is essential in meeting targets set for the conservation of biodiversity. Options for achieving these targets will be reduced should such a site not be protected. According to C-Plan2, which is depicted by Figure 12, there are a number of land parcels within Emfuleni that contain conservation-worthy habitats and have consequently been designated as 'Irreplaceable Sites'. The most notable of these is the Sharpeville Dam. Although this dam has been polluted in the past by a neighbouring sewer works, it remains a significant ecological area within Emfuleni. The future closure of the Leeuwkuil waste water treatment works abutting Sharpeville Dam, once the planned Sedibeng regional waste water treatment works is operational, should significantly contribute to the rehabilitation of the Sharpeville Dam in future. In addition to the

aforementioned, the dam provides significant recreational opportunities within the heart of the Emfuleni urban complex. It also provides an aesthetic gateway on the R59 freeway approaching Vanderbijlpark.

Apart from the 'Irreplaceable Sites' found within Emfuleni, a number of 'Important Sites' are also found within Emfuleni, as defined by C-Plan2. Two important sites in particular need to be mentioned. The first site is located to the east of Sebokeng and basically covers Falcon Ridge. This 'Important Site' also contains a tributary of the Vaal River. The significance of this site is pronounced by the fact that it is located within the path of eastward expansion of Sebokeng. For example, Lethabong is a planned township that borders the western edge of this site. This eastward advance of Sebokeng, as well as the westward advance of Sonlandpark, will increasingly place pressure on this environmental site; requiring the protection of this environmental site from urban expansion.

The second 'Important Site' worth mentioning is the mountain range situated on the southwestern boundary of Emfuleni, next to the Vaal Oewer settlement. This environmental site provides a scenic quality to Emfuleni, which in turn benefits the tourism industry within Emfuleni. This site requires protection from settlement development and agricultural practices that will destroy the scenic qualities of this mountain range.

The 'Irreplaceable Sites' and the 'Important Site' of C-Plan2 need to be included in the proposed open space lattice of Emfuleni. These sites can be linked to the open space lattice by utilizing rivers and tributaries as corridors linking these environmental sites. For example, a tributary of the Vaal River runs along the foot of Falcon Ridge and this tributary can therefore be used to link this site to the Emfuleni open space lattice. This will help maintain species migration corridors within Emfuleni.

2.7. LAND USE

Although Emfuleni contains a significant urbanized component, it is largely rural in character in terms of land coverage. However, the urbanized component houses more than 80% of Emfuleni's population, making Emfuleni an urban area in this respect. In addition, the urban share of Emfuleni is steadily increasing with urban development and expansion taking place within the municipal area.

2.7.1. BROAD LAND USE STRUCTURE

Figure 13 illustrates the land use pattern found within Emfuleni. This land use pattern is broadly divided spatially by the N1 freeway. To the west of the N1 freeway the land use character is largely rural and to the east of the N1 freeway the land use character is largely urban. The urban component largely comprises the residential, business and industrial land uses of Vanderbijlpark, Sebokeng, Evaton, Sharpeville, Boipatong, Bophelong, Vereeniging and Three Rivers. The following individual land uses occur within Emfuleni:

a. Residential

Emfuleni is characterized by relatively high residential densities. These high residential densities mostly occur in the northern half of Emfuleni, in areas such as Sebokeng and Evaton, but also in areas to the south, such as Boipatong and Sharpeville. These township areas have average densities of 40 units per hectare. Although these residential densities are too low to sufficiently support public transport, they do provide better support than many other lower-density residential areas found within Emfuleni. Lower-density residential areas are found within Vanderbijlpark and Vereeniging. The residential densities in these areas vary from approximately 10 units per hectare to approximately 20 units per hectare.

b. Agricultural Holdings and farmland

Although Emfuleni has a significant urban component, most of its land surface is still used for agricultural purposes. The western half of Emfuleni, west of the N1 freeway, comprises a mixture of intensive farms, extensive farms and agricultural holdings. The Emfuleni SDF considered intensive farms as farms that are smaller than 20ha in size. Extensive farms are farms that are larger than 20ha in size. The definition does not relate to the use of the farms. The intensive farms and agricultural holdings are largely used for small-scale farming or rural residential purposes. Many of the farms used for rural residential purposes are found near the Vaal River and other river environments, such as Loch Vaal Barrage. The Mantevrede agricultural holdings, situated near Loch Vaal Barrage, and the Unitas Park agricultural holdings, situated in the Sonlandpark area, are increasingly under urbanization pressure as Vanderbijlpark expands southwestwards and Vereeniging expands northwestwards. Extensive farms are mostly found within the northwestern quadrant of Emfuleni. These farms are mostly used for commercial agricultural purposes. An Agricultural Hub, which is a GDARD initiative, is located within the southeastern quadrant of Emfuleni. The Agricultural Hub Initiative requires that the farms within this quadrant are rigorously protected from urban development and expansion.

TABLE 6: RECENT TOWNSHIP ESTABLISHMENTS

Name	Land Use	Size
Vanderbijlpark SW 7 Extension 11	Residential	1 100 erven
Flora Gardens Extension 2	Residential	500 units
Vanderbijlpark SW 7 Extension 10	Residential	13 units
Eaglest Nest	Residential	249 units
Vanderbijlpark SE 8 Extension 1	Retirement Village	3400 units
Vanderbijlpark SE 8 Extension 2	Retirement Village	2500 units
SE 9	Residential	2400 units
Bophelong Extension 25	Residential	142 units
SW Extension 12	Residential	13 units
SW Extension 12	Private open space	2 spaces
Johandeo A.H. Extension 1-5	Residential	13620 units
Sebokeng Unit 6 Ext 6	Commercial	1 shopping mall
SW 8	Residential	8 units
Sebokeng Extension 30, 32 & 34	Residential	3343 units
Bedworth Park X 8	Residential	200 units
Bedworth Park X 8	Commercial	100 stands
Bedworth Park X 8	Business	50 stands
Powerville Park X 4	Residential	196 units
Powerville Park X 5	Commercial	31 stands
Powerville Park X 6	Commercial	2 stands
Sebokeng Extension 29	Residential	203 units
Vaalower Ext 1	Residential	450 units
SW 7 Ext 10	Residential	39 units
Sebokeng Extension 28	Residential	1995 units
Lethabong	Residential	3200 units
SE 5	Residential	1751 units

Source: Emfuleni Local Municipality, 2017

c. Business

Emfuleni has 3 Central Business Districts serving the municipal area. These are the existing Vanderbijlpark CBD, the existing Vereeniging CBD and the emerging Sebokeng CBD. The Vanderbijlpark CBD has access to the K174 Barrage Road, which links it to the Vereeniging CBD, as well as the K53 (Moshoeshoe Road), which links it to Sebokeng and the Sebokeng CBD

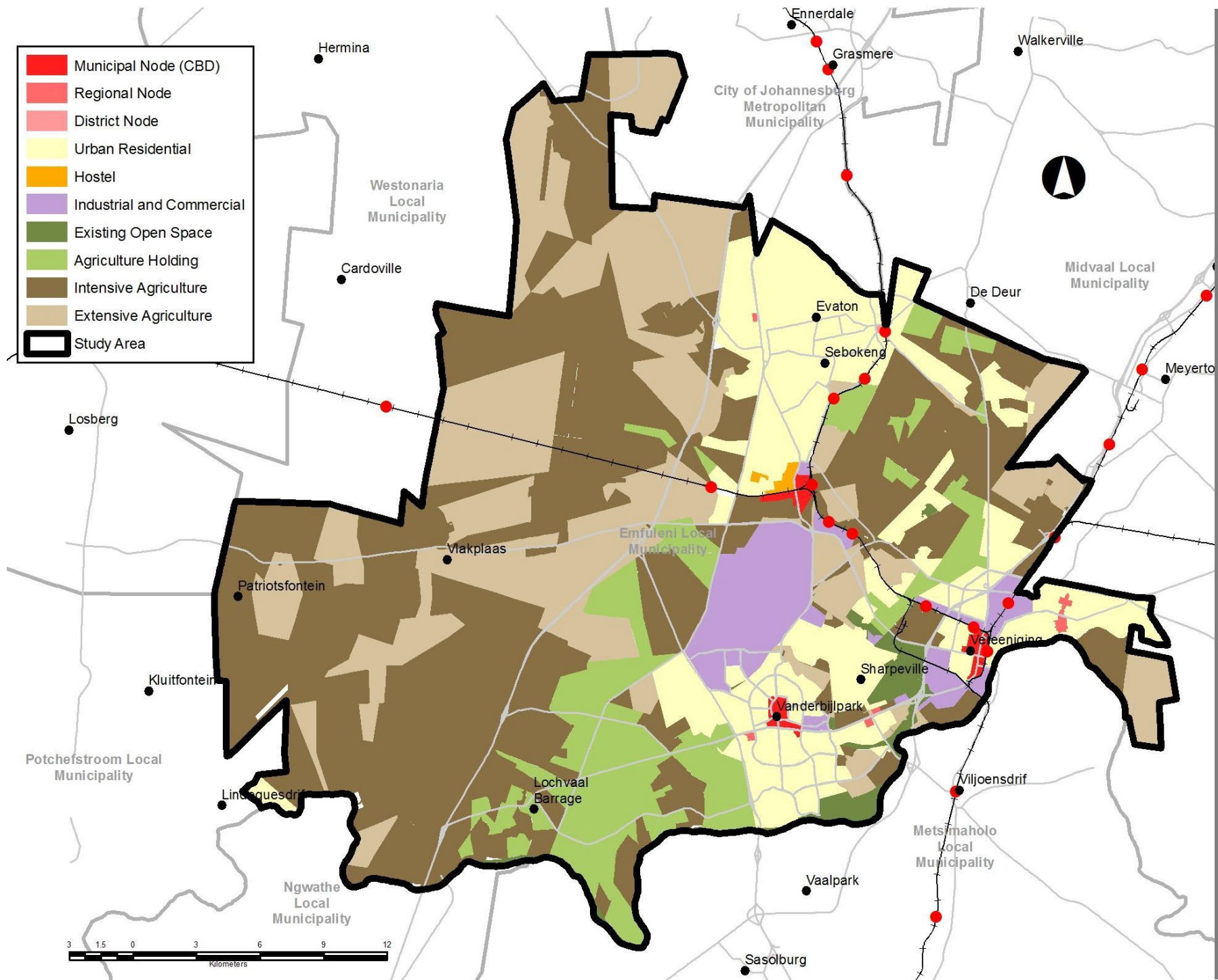
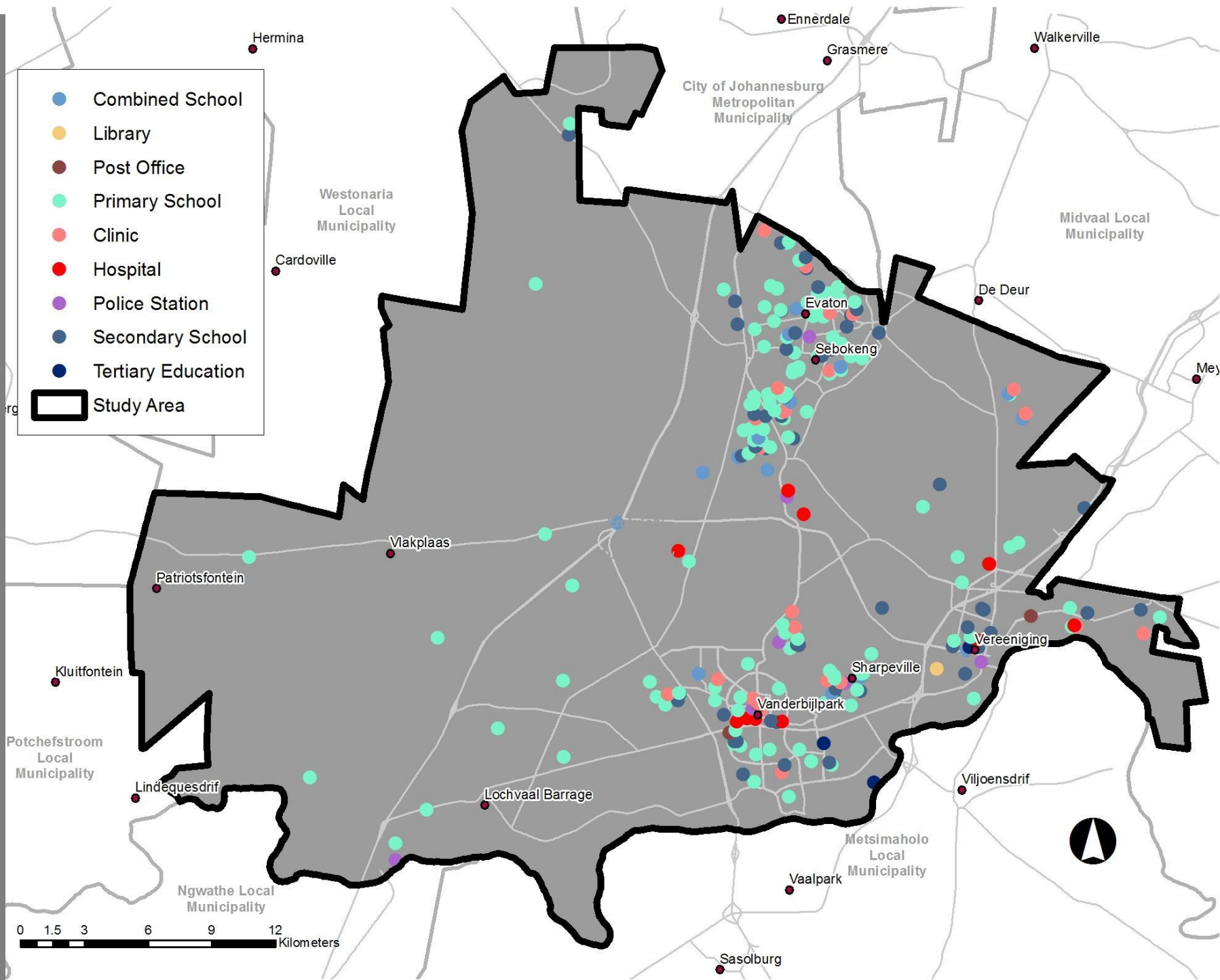


FIGURE 13 | BROAD LAND USE

FIGURE 14 | COMMUNITY FACILITIES



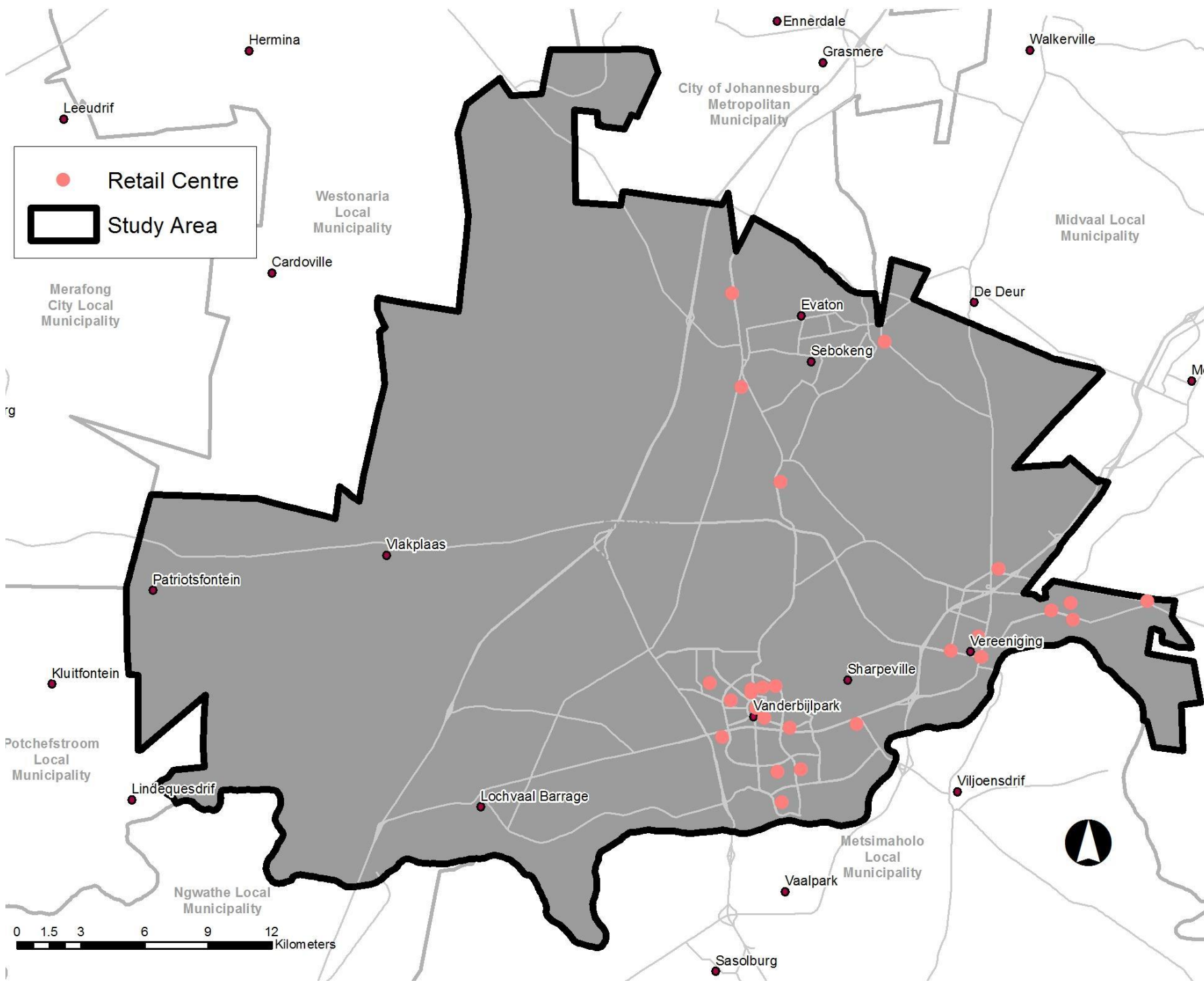


FIGURE 15 | RETAIL FACILITIES



0 1.5 3 6 9 12 Kilometers

FIGURE 16 | MINERALS AND MINING



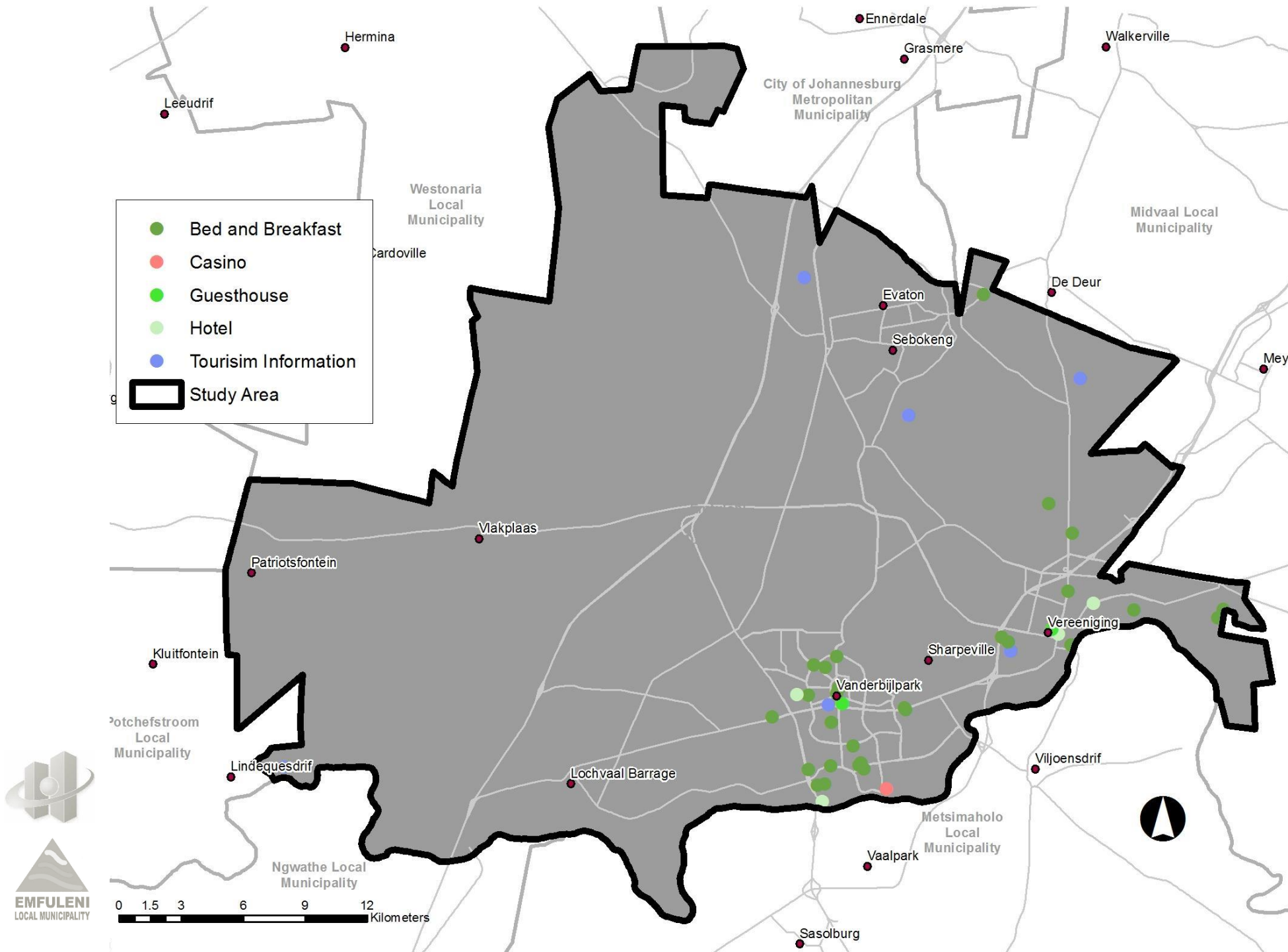
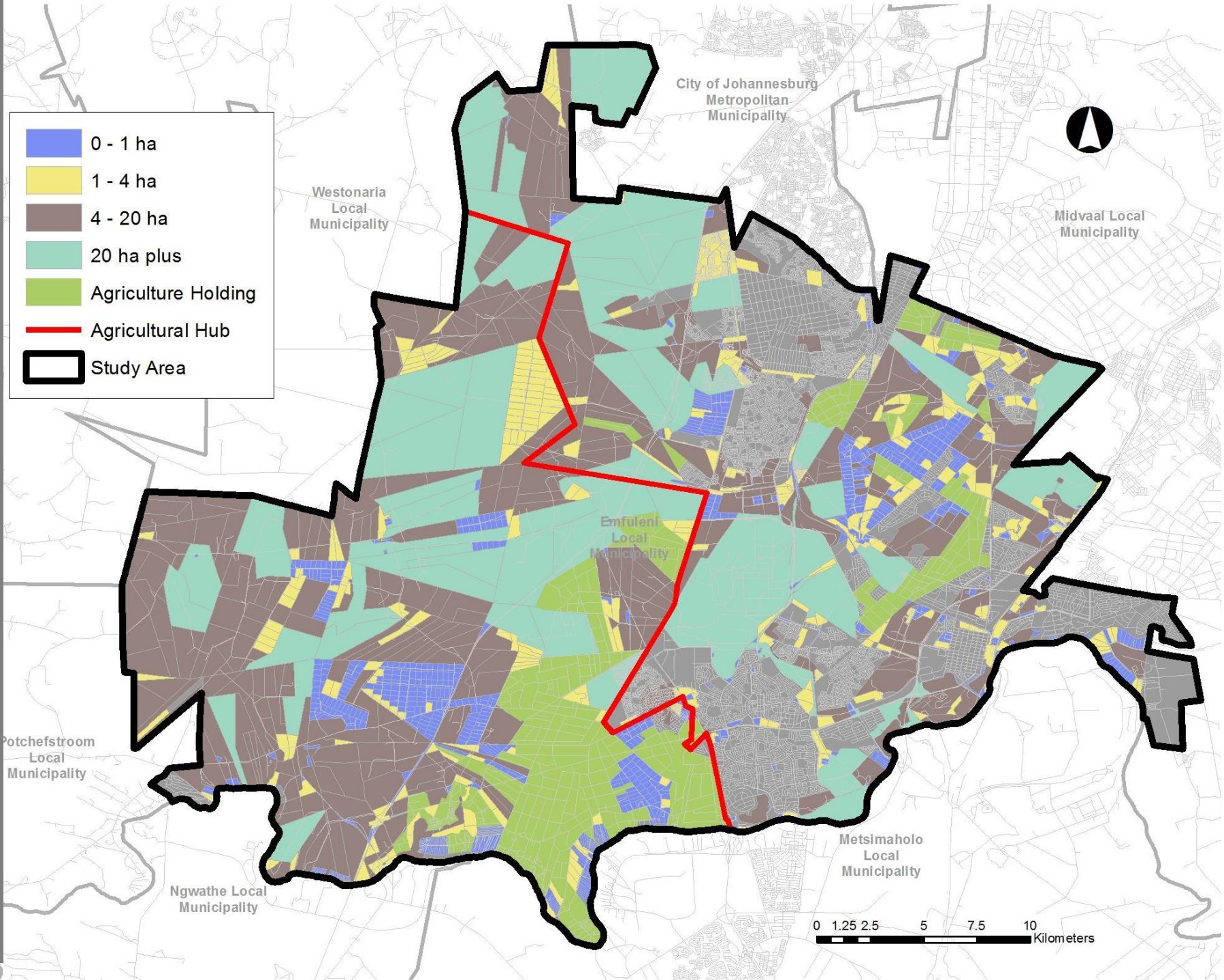


FIGURE 17 | TOURISM FACILITIES

FIGURE 18 | FARM PORTION SIZES



The Vereeniging CBD has access to the P156 (R59 freeway), which links it to Meyerton and Ekurhuleni, as well as the K178 (Boy Louw Road), which links it to Sebokeng and the Sebokeng CBD. The Vereeniging CBD also has access to the Vereeniging-Johannesburg commuter railway line, which connects it via rail to Sebokeng, Evaton, Orange Farm and Johannesburg. Both the Vanderbijlpark CBD and the Vereeniging CBD have large concentrations of retail and office space. Much of this retail and office space has become vacant in recent years due to the decentralization of retail and office space to suburban areas of Emfuleni.

The Sebokeng CBD is an emerging Central Business District within Emfuleni. It is located at the Houtheuwel commuter railway station, which is situated on the Vereeniging-Johannesburg commuter railway line. The CBD is located within walking-distance of this commuter railway station. The Sebokeng CBD has access to the K53 (Moshoeshoe Road), which links it to Evaton in the north and the Vanderbijlpark CBD in the south. It also has access to the K178 (Boy Louw Road), which links it to the Vereeniging CBD. From a land use perspective, the Sebokeng CBD contains the Sebokeng Hospital, municipal offices, the Sebokeng Teachers Training Collage, the Sebokeng Police Station, the Sebokeng Sports Stadium, a regional shopping centre and a partly-developed light industrial area. It also contains a community retail centre and a small regional retail centre. These land uses provide a strong platform for the further development of the CBD. The Sebokeng CBD requires further strengthening through the development of addition retail and office space within this CBD, as well as the development of high-density housing.

Apart from the abovementioned Central Business Districts, Emfuleni contains an existing regional business node structure, comprising a total of 5 regional business nodes. The existing regional business nodes include, amongst others, the business node located in Three Rivers, the business nodes on the K174 (Barrage Road) located at the Vaal Mall and the Bedworthpark Shopping Centre, and the business node located west of Evaton situated on the K45 (Golden Highway). The land use composition of these existing regional business nodes need to be diversified by adding uses such as office, community facilities and high-density housing to its land use mix.

d. Industrial and commercial

Emfuleni has 10 existing industrial and commercial areas. The largest industrial area within Emfuleni is Mittal Steel, which is situated between Vanderbijlpark and Sebokeng. This facility contains an industrial dump located on its northern boundary, which has buffer zones that may impact on development in the Cyferpan area and the Sebokeng CBD area. Other significant industrial areas include Leeuwkuil, Powerville, Peacehaven and Duncanville. These industrial areas are all located in Vereeniging and have access to the P159 (R59 freeway). Powerville and Peacehaven are heavy industrial oriented areas and Leeuwkuil and Duncanville are commercial and light industrial areas.

e. Open Space and Recreation

Open space can be divided into passive and active open space. Passive open space consists of land that is unsuitable or undesirable for urban development due to topographical or ecological constraints. Active open space involves the recreational component of the open space system. It provides sport facilities throughout an urban area for use by local clubs, schools, and the community. The existing sports facilities found within Emfuleni are listed in the Table above.

TABLE 7: EXISTING SPORTS FACILITIES

Name	Facility	Activities	Street	Suburb
Emfuleni Country Club	Golf Course	Golf	Emfuleni Drive	Vanderbijlpark
Riviera Resort Golf Club	Golf Course	Golf	Mario Milani Drive	Vereeniging
Sebokeng Sports Ground	Sports stadium	Soccer	No name	Sebokeng
Dick Fourie Stadium	Sports stadium	Cricket, soccer, hockey	Klip River Drive West	Three Rivers
Isak Steyl Stadium	Sports stadium	Cricket, tennis, athletics, hockey	Andries Potgieter Boulevard	Vanderbijlpark
General Smuts Rowing Club	Boating club	Rowing	Brandmuller Drive	Three Rivers
Eligwa Boat Club	Boating club	Sailing	Louis Trichardt Boulevard	Vanderbijlpark
Sonland Park Polo Field	Sports ground	Polo, bowls, tennis, cricket	Max Shapiro Street	Sonlandpark
Roshnee Sports Ground	Sports ground	Tennis, cricket	Tagore Drive	Roshnee
Drakensberg Park	Sports ground	Tennis	Drakensberg Street	Sonlandpark
ISCOR Recreation Club	Sports ground	Tennis, bowls, cricket, soccer	Stephenson Street	Vanderbijlpark
George Thabe Stadium	Sports ground	Cricket, soccer, athletics	Swane Street	Sharpeville
President Park	Sports ground	Rugby, swimming	Merriman Street	Vereeniging
Lewis Park	Sports ground	Tennis	Victoria Avenue	Vereeniging
Vereeniging Country Club	Sports ground	Tennis, bowls	Mario Milani Drive	Vereeniging
Cecil Oldbridge Park	Sports ground	Swimming, bowls, hockey, soccer, rugby, cricket, tennis	Shakespeare Street	Vanderbijlpark
Bophelong Sports Ground	Sports ground	Tennis, netball	Thema Street	Bophelong
Driehoek Park	Sports ground	Swimming	Ramsbottom Street	Vanderbijlpark

Source: Urban Dynamics Gauteng, 2017

The passive open space system is largely made up of the river system traversing Emfuleni, which has been protected as part of the township establishment process. This includes the Sharpeville Dam and its feeding tributary, which traverses Sharpeville and Boipatong, and the northern reaches of the Rietspruit, which flows through Sebokeng and Evaton. The active open space system consists of a number of sports stadium and recreation areas. The primary active open spaces within Emfuleni include the Sebokeng Sport Stadium, located within the Sebokeng CBD, the ISCOR Club sports fields,

located south of Mittal Steel, the George Thabe Stadium at Sharpeville, the Isak Steyl Stadium of the Vaal University of Technology, and the Sonlandpark Polo Field. In addition, there is the Emerald Casino located on the banks of the Vaal River and the Riviera Resort Country Club, situated at Three Rivers. The Table below shows the land allocated to the different recreational typologies in Emfuleni.

TABLE 8: SPORTS FACILITIES LAND ALLOCATION

Facility	Extent (ha)
Golf course	72,2
Sports centre	56,3
Sports grounds	423,5

Source: Emfuleni Local Municipality, 2017

2.7.2. COMMUNITY FACILITIES

Emfuleni has a well-developed community infrastructure network, providing educational, health and other essential social services. The Table below lists the number of community facilities found within Emfuleni and Figure 14 illustrates the location of the community facilities within Emfuleni. The community facilities found within Emfuleni are as follows:

a. Education

The educational infrastructure of Emfuleni comprises primary schools, secondary schools, combined primary and secondary schools and tertiary educational facilities. It is estimated that Emfuleni currently has an oversupply of primary and secondary schools. To an extent, this oversupply of schools can help provide interim education to pupils from new township areas, where schools have not yet been built. However, this is an undesirable state over the longer term, because schools need to be located within walking distance of pupils and those living within new township areas. Emfuleni has 3 tertiary educational facilities, of which is Vaal University of Technology is the most significant. This tertiary educational facility is located on the intersection of the K174 (Barrage Road) and Andries Potgieter Boulevard.

TABLE 9: EXISTING COMMUNITY FACILITIES

Facility	Number of Facilities
Primary School	146
Primary School	129
Combined School	17
Secondary School	76
Secondary School	59
Combined School	17
Tertiary Education	3
Clinic	26
Public Clinic	22
Private Clinic	4
Hospital	12
Public Hospital	5
Private Hospital	7
Library	3
Post Office	3
Police Station	8
Emergency Service Centre	2

Source: Urban Dynamics Gauteng, 2017

b. Health

Emfuleni has a limited number of clinics and hospitals that serves the Emfuleni population. These clinics and hospitals are either in public or private ownership. Clinics are located in all the major settlements of Emfuleni, including Sebokeng, Evaton, Roshnee, Sharpeville, Vanderbijlpark, and Vereeniging. Most of the clinics are capable of providing comprehensive primary health care services.

The hospitals are located within Sebokeng, Vanderbijlpark, and Vereeniging. Many of these hospitals are located within the CBDs of these settlements. The distribution of these facilities places them in accessible locations throughout Emfuleni. The Provincial Department of Health is responsible for all public hospitals, while the Provincial Health Department and the Local Municipality share the responsibility for clinics and community health centres within the municipal area. There are two major public hospitals in Emfuleni: the Kopanong Hospital located in Vereeniging, and the Sebokeng Hospital located

in Sebokeng. The Sebokeng Hospital does not attend to the primary day to day care of patients. Kopanong hospital provides primary care to day patients.

c. Community

Emfuleni has a number of community facilities. Libraries and post offices are located within the Central Business Districts of Vanderbijlpark and Vereeniging. Emfuleni has a general undersupply of community facilities, but in particular municipal libraries.

d. Safety and Security

Emfuleni has a number of police stations and emergency service centers (fire stations). The police stations are distributed across Emfuleni in areas such as Evaton, Sebokeng, Vanderbijlpark, Boipatong, Sharpeville and Vereeniging. The emergency service centers are located within the Vanderbijlpark CBD and Vereeniging CBD respectively. Poor response times are mostly due to topography and distances. Specifically, fire brigade services need to travel large distances to attend to emergencies in Evaton.

TABLE 10: COMMUNITY FACILITIES LAND ALLOCATION

Facility	Extent (ha)
School	898,4
Tertiary education	405,5
Clinic	96,1
Hospital	61,6
Community centre	85,7
Library	5
Post Office	3,3
Police Station	104,7
Emergency Service Centre	4,8

Source: Emfuleni Local Municipality, 2017

The Table above shows the allocation of land within Emfuleni for social facilities. As would be expected, most of the land is allocated to educational facilities, which contain sports fields that use up large areas of land. Significant parcels of land have also been allocated to police stations, clinics and community centres.

2.7.3. RETAIL CENTRES

As depicted by the Table below, Emfuleni has a total retail floor area of approximately 990,000m². This total retail floor area is divided into a number of retail centres of varying sizes and smaller, individual retail premises, mostly found within the CBD of Emfuleni. Each retail centre identified is classified in the Table below in terms of a standard retail classification. Figure 15 illustrates the location of the prominent retail centers located within Emfuleni.

Emfuleni has 2 primary business nodes serving Emfuleni, the Vanderbijlpark CBD and the Vereeniging CBD. These business nodes contain a number of shopping centres and a large number of smaller, individual retail premises. In total, the Vanderbijlpark CBD has approximately 200000m² of retail space and the Vereeniging CBD has approximately 408000m² of retail space. The Sebokeng CBD, located at the Sebokeng Hospital, is an emerging CBD area within Emfuleni containing a small regional shopping centre. The Sebokeng CBD has approximately 41000m² of retail space.

TABLE 11: EXISTING RETAIL FLOOR AREA 2017

Name	Location	Region	Classification	Approximate Size (m ²)
Vanderbijlpark CBD				200040
Supermarket Vaalgate Shopping Centre	DF Malan Street	Vanderbijlpark	Community Centre	11850
Shoprite Checkers Vanderbijlpark	Jan Van Riebeeck Blv	Vanderbijlpark	Community Centre	12380
Shoprite Checkers Civic Centre	Le Roux Street	Vanderbijlpark	Community Centre	16540
Vanderbijlpark CBD (other)		Vanderbijlpark	n/a	159270
Vereeniging CBD				408680
Markpark Shopping Centre	Beaconfield Street	Vereeniging	Small Regional Centre	26840
Vereeniging CBD (other)		Vereeniging	n/a	381840
Sebokeng CBD				41180
Score Supermarket Sebokeng Plaza	Mosotho Road	Sebokeng	Community Centre	13620
Shoprite Checkers Sebokeng	Moshoeshoe Road	Sebokeng	Small Regional Centre	27560
Shopping Centres				304070
Kwikspar Masiza	Vereeniging Road	Evaton	Local centre	720
Score Supermarket Evaton West	Golden Highway	Evaton	Small Regional Centre	25580
Score Supermarket Boitumelo	Golden Highway	Sebokeng	Neighbourhood centre	5410
Sonlandpark Centre	Tafelberg Avenue	Sonlandpark	Local centre	1200
Centre Save Centre	Majuba Street	Sonlandpark	Local centre	1620

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Name	Location	Region	Classification	Approximate Size (m2)
Falcon Ridge Centre	Renolds Street	Sonlandpark	Local centre	1700
Risiville Centre	Henry Street	Three Rivers	Local centre	1260
Three Rivers Fruit and Veg	Orwell Drive	Three Rivers	Local centre	1350
Spar Euro	General Hertzog Street	Three Rivers	Local centre	3680
Kwikspar Blackwood	Blackwood Street	Three Rivers	Neighbourhood centre	4450
Three Rivers North	Assegai Street	Three Rivers	Neighbourhood centre	5430
Shoprite Checkers Three Rivers	Umtata Road	Three Rivers	Neighbourhood centre	6830
Three Rivers Node	Umtata Road	Three Rivers	Community Centre	12470
PicknPay River Square Shopping Centre	Nile Drive	Three Rivers	Small Regional Centre	39610
Spar Golden Sun	Westing House Boulevard	Vanderbijlpark	Local centre	1070
Mittha Supermarket	Beech Street	Vanderbijlpark	Local centre	1100
Goodyear Centre	Goodyear Street	Vanderbijlpark	Local centre	1200
Crisco Plaza	Furrina Avenue	Vanderbijlpark	Local centre	1700
Saspark Centre	Ravel Street	Vanderbijlpark	Local centre	1700
Lipbro Court	Napier Street	Vanderbijlpark	Local centre	1970
Spar Stephenson Street	Stephenson Street	Vanderbijlpark	Local centre	2130
Faraday Centre	Faraday Boulevard	Vanderbijlpark	Local centre	2400
Supermarket Vanderbijl	Gill Street	Vanderbijlpark	Local centre	2630
Ericsson Centre	Ericsson Street	Vanderbijlpark	Local centre	2650
Spar Riverview Riverside Shopping Centre	Beefwood Street	Vanderbijlpark	Local centre	2660
Olympia Centre	Robert Broom Street	Vanderbijlpark	Local centre	3000
PicknPay Vanderbijlpark	Macowen Street	Vanderbijlpark	Local centre	3870
Spar Vanderbijl Build It	Rabie Street	Vanderbijlpark	Neighbourhood centre	4010
Cater Street Centre	Carter Street	Vanderbijlpark	Neighbourhood centre	4140
Colosseum Centre	Chopin Street	Vanderbijlpark	Neighbourhood centre	4300
Supermarket Artemis	Everest Street	Vanderbijlpark	Neighbourhood centre	4780
Spar Save Inn	Fitz Simmonds Street	Vanderbijlpark	Neighbourhood centre	5090
Barrage Road Showrooms	Rabie Street	Vanderbijlpark	Neighbourhood centre	5880
Macro Vanderbijlpark	Barrage Road	Vanderbijlpark	Community Centre	15260
President Square	Barrage Road	Vanderbijlpark	Small Regional Centre	37120
Riverside Boulevard	Frikkie Meyer Boulevard	Vanderbijlpark	Community Centre	16250
PicknPay Bedworthpark	Barrage Road	Vanderbijlpark	Small Regional Centre	27040
Vaal Mall	Rossini Boulevard	Vanderbijlpark	Regional Centre	56100
Crossroads Centre	Golf Street	Vereeniging	Local centre	1340

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Name	Location	Region	Classification	Approximate Size (m ²)
Waldrif Centre	Andesite Avenue	Vereeniging	Local centre	1940
Duncanville Shopping Centre	Senator Road	Vereeniging	Local centre	2460
Cash and Carry	Beaconfield Street	Vereeniging	Neighbourhood centre	4090
Shoprite Checkers Arcon Park	Arum Lee Road	Vereeniging	Community Centre	12000
Emfuleni Total				991090

Note: CBD calculation method: Total x 80% non-roads x 70% retail uses x 60% coverage

Source: Urban Dynamics Gauteng, 2017

Retail Centre Classification:

Classification	Size (m ²)
Local centre	1000-5000
Neighbourhood centre	5000-10000
Community Centre	10000-30000
Small Regional Centre	30000-60000
Regional Centre	60000-100000
Super-Regional Centre	>100000

Apart from the primary business nodes (CBDs) mentioned above, a number of suburban shopping centres exist within Emfuleni, many of which have been developed in recent years. The most notable suburban shopping centres are the Vaal Mall (56100m²), the Pick 'n Pay River Square Shopping Centre (39610m²), the Pick 'n Pay Bedworthpark (27040m²) and the Score Supermarket Evaton West (25580m²). A newly developed shopping centre is the President Square Shopping Centre (37120m²), situated on Barrage Road. Many of the shopping centres are clustered, creating secondary business nodes within Emfuleni. Notably, there is the Bedworthpark and Macro cluster on the intersection of Barrage Road and Ascot on Vaal Road, the River Square cluster on General Hertzog Road, and the Evaton West cluster on Moshoeshoe Road.

TABLE 12: ECONOMIC ENTERPRISE LAND ALLOCATION

Facility	Extent (ha)
Accommodation	19,2
Guest houses	20,7
Entertainment	43,7
Restaurants	14,6
Home office	34,5
Offices	48,5
Nursery	42,5
Motor trade	129,5

Source: Emfuleni Local Municipality, 2017

The Table above shows the land allocated to economic enterprises, other than retail enterprises, within Emfuleni. As is depicted by this Table, large tracts of land is allocated to the motor trade industry, which include uses such as filling stations, showrooms and carwashes.

2.7.4. INDUSTRIAL AND COMMERCIAL

As shown in the Table below, manufacturing is the most important economic sector of the Emfuleni economy with a 41.3% contribution to the local GDP. Although its importance declined from 50.0% in 1990, it still remains the most important economic sector within Emfuleni. In the manufacturing sector, the metal and metal products industries (mainly iron/steel) are responsible for 80.6% of all manufacturing production.

TABLE 13: BASE ECONOMY OF EMFULENI AREA

Area	Functional specialization	Economic base
Vanderbijlpark	Basic iron and steel, heavy metal, engineering workshops	Large, but smaller than Vereeniging. The economic base is less diversified and specialises in basic iron and steel manufacturing
Vereeniging	Heavy metal, ceramics, engineering workshops	Large, relatively more diversified but specialised in manufacturing

Source: University of Pretoria, 2004

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Emfuleni has a total of 10 existing industrial and commercial areas, which are listed in the Table below. The largest industrial area within Emfuleni is Mittal Steel, which is situated between Vanderbijlpark and Sebokeng. This is a heavy industrial facility. This facility has industrial dumps located on its northern boundary, which have buffer zones that may impact on development in the Cyferpan area and the Sebokeng CBD area. Other significant industrial areas include Leeuwkuil, Powerville, Peacehaven and Duncanville. These industrial areas are all located in Vereeniging and have access to the P159 (R59 freeway). Powerville and Peacehaven are heavy industrial oriented area and Leeuwkuil and Duncanville are more commercial and light industrial oriented areas.

The Table below provides the occupied and vacant land areas available within the existing industrial and commercial areas location within Emfuleni. Although Emfuleni has about 2800ha of occupied industrial land, approximately 2500ha of this land is occupied by Mittal Steel. Emfuleni has approximately 450ha of vacant industrial land available, which can be used for future industrial and commercial development, before additional land is made available for industrial and commercial development. Considering that the manufacturing sector remains the most dominant economic sector in the area, an industrial regeneration approach within Emfuleni critical to the health of the local economy.

TABLE 14: EXISITNG INDUSTRIAL AND COMMERCIAL LAND

Industrial area	Occupied Heavy (ha)	Occupied Commercial (ha)	Occupied Light (ha)	Vacant (ha)	Total (ha)
Mittal Steel	2482	0	0	0	2482
Duncanville	0	212	222	48	482
Leeuwkuil	0	71	0	204	275
NW7	0	162	206	149	517
NE3	34	30	0	15	45
Powerville	0	0	63	6	69
Peacehaven	300	0	0	0	0
Sebokeng	0	0	12	14	26
Vanderbijlpark	0	0	80	6	86
Vereeniging Road	28	22	0	12	34
Total	2844	497	583	454	4016

Source: Urban Dynamics Gauteng, 2017

2.7.5. MINING

As depicted on Figure 16, Emfuleni has almost no mineral deposits, despite the fact that it is located within the mineral rich Gauteng Province. Coal deposits, which are largely located within the Free State Province, stretch into Emfuleni directly south of Vereeniging and Loch Vaal Barrage. These coal deposits are heavily mined in the Free State Province, largely to feed the Lethabo coal-fired power station and the Sasol coal-to-fuel plant, both of which are located within the Free State Province. Limited stockpiling of coal occurs south of the Vereeniging CBD, abutting the Vaal River.

2.7.6. TOURISM

Although the tourism sector currently forms a relatively small part of the local economy, the sector has particularly high employment and income generating capacity. The sector is also more accessible to unskilled labour. It therefore makes sense to develop the local tourist industry in order to attract weekend visitors from nearby Johannesburg and Pretoria.

As depicted on Figure 17, a wide range of tourist facilities are found within Emfuleni. The facilities include bed and breakfast accommodation, guesthouses, hotels and tourist information centers. Most of these facilities are located within Vanderbijlpark and Vereeniging. The large number of tourist facilities operational within Emfuleni requires the land use management of these facilities. The management of these facilities implies allowing land owners to operate an accommodation establishment from their property to the degree that does not impact adversely on the quality and amenity of the surrounding properties.

Emerald Casino is a significant tourist attraction within Emfuleni and can be considered a provincial tourist destination in terms of its size. The Emerald Casino is located on the Vaal River, directly south of the Vanderbijlpark CBD. The Vaal River is the most significant tourist attraction within Emfuleni and Emfuleni's most important natural assets. The Vaal River is an important weekend holiday destination within Gauteng and as such, attracts tourists from Johannesburg and Pretoria. Much of the Vaal River waterfront has been divided into small farm portions, which are in private ownership and are used for weekend holiday purposes. A consequence of this is the fact that it makes the riverfront inaccessible to many inhabitants living within Emfuleni.

The Sharpeville Memorial Initiative, with it being the location of the signing of the Constitution, has the potential to visitors and tourists from Gauteng and abroad. Emphasis should therefore be placed on the development of this historical site in such a manner that will draw day visitors and overseas tourists.

2.7.7. AGRICULTURE

Geographically, Emfuleni mostly comprises farmland. This farmland is divided into farms of varying sizes. The farm sizes found within Emfuleni are depicted in Figure 18. Four basic farm sizes can be identified: farms up to 1ha in size, farms between 1ha and 4ha in size, farms between 4ha and 20ha in size and farms larger than 20ha in size. Farm portions that are smaller than 20ha in size can be considered intensive farms that are either used for intensive agricultural purposes or for rural residential purposes. Farm portions larger than 20ha can be considered extensive farms with extensive, commercial farming use or potential. The subdivision of farms larger than 20ha in size is generally prohibited by the National Department of Agriculture to ensure the viable operation of the commercial farming practices and to adhere to the national objective to ensure national food security.

Geographically, farm sizes in Emfuleni relate to spatial entities, such as rivers and high potential agricultural soils. These intensive farming units, which comprise farm portions that are smaller than 20ha in size, are mostly located within the southwestern quadrant of Emfuleni. These farms are predominantly located on high-potential agricultural soils, which has the capacity for high-yield, intensive farming. These farms are also located on the Vaal River, which allows irrigation water to be drawn from the river. The combination of high-potential agricultural soils and irrigation water allows for intensive farming practices. However, despite the aforementioned potential, these farms are often used for rural residential purposes instead of intensive agricultural purposes. This trend has to do with the fact that these farms are located near the Vaal River and its recreation potential.

TABLE 15: AGRICULTURAL LAND ALLOCATION

Land use	Extent (ha)
Agricultural	34,147
Agri co-operation	6
Agri residential	24,794
Total	58,946

Source: Emfuleni Local Municipality, 2017

As was mentioned, the farm portions larger than 20ha can be considered large farms with extensive, commercial farming potential. Geographically, the larger farms are located within the central and northern parts of Emfuleni. Many of the larger farms (although not all) are located on lower-potential agricultural soils, which limits the yielding capacity of these farms. Despite this limited yielding capacity, these larger farms are mostly used for cultivation farming, rather than cattle farming.

2.7.8. AGRICULTURAL HUB

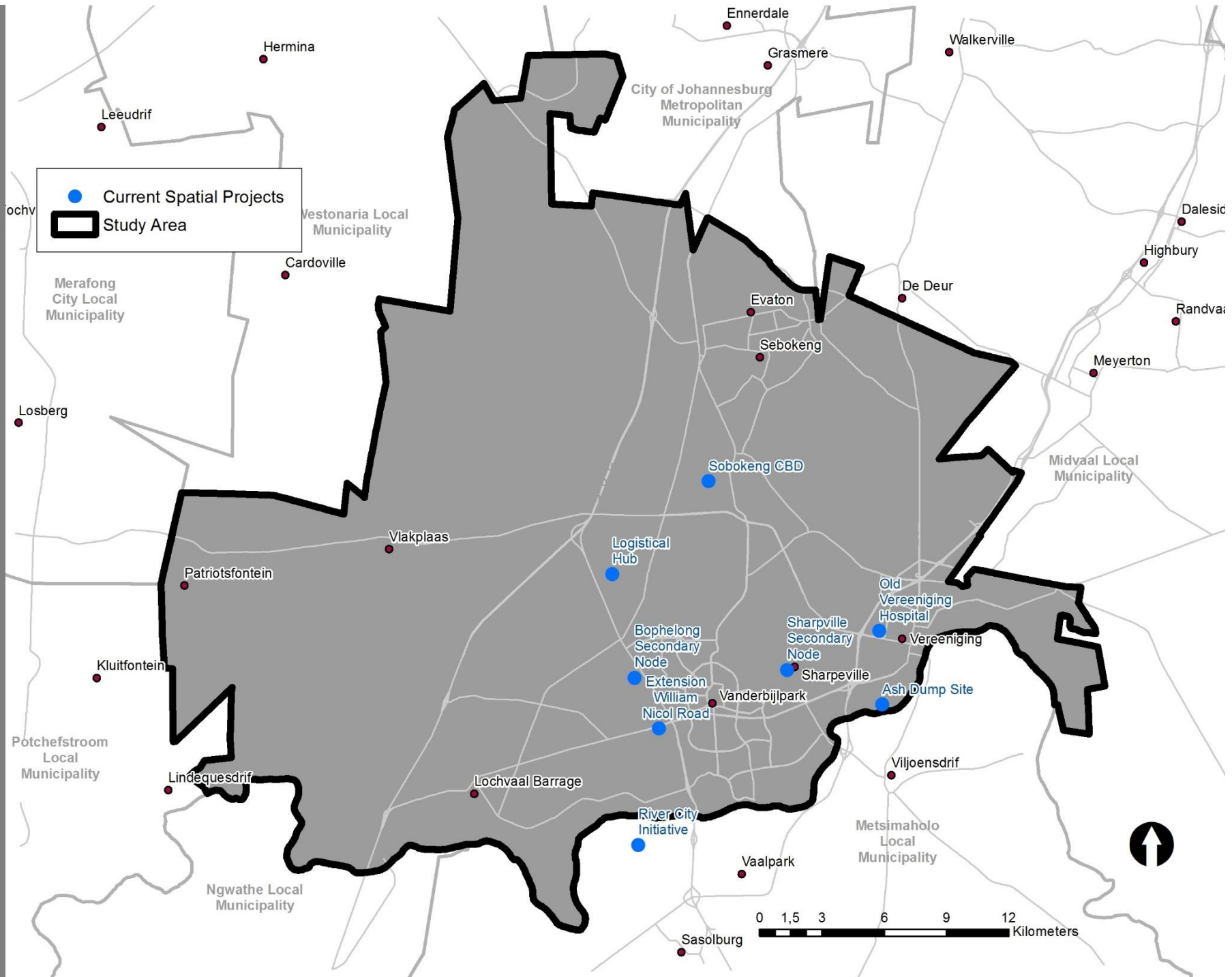
Gauteng intends to boost its agricultural economy and job creation by establishing agricultural hubs within Gauteng. These agricultural hubs take the form of clustered operations that focus on niche market agricultural produce. Seven agricultural hubs, totaling 605,750 ha of land have been identified within the Gauteng Province (see Table above). This land area constitutes 36% of the total surface area of the province. Three agriculture hubs are in Sedibeng District Municipality, 2 in Metsweding District Municipality, 1 in West Rand District Municipality and 1 in Ekurhuleni Metropolitan Municipality. The Emfuleni agricultural hub is one of the 3 agricultural hubs identified within Sedibeng District Municipality. These agriculture hubs were delineated by Province using farm boundaries and taking into account the clustering of commercial agricultural activities within the province.

TABLE 16: GAUTENG AGRICULTURAL HUBS

Agricultural hub	Total Hub Area (Ha)	High potential Area (ha)	Current farming Activities
Nokeng	65,408	14,365	Commercial & subsistence crop production, livestock, planted grasslands
Kungwini	83,561	33,619	Grass land, livestock and game
Ekurhuleni	79,749	17,404	Dry land & irrigated field crop, open field & hydroponic vegetable production, livestock, poultry
Emfuleni	61,182	23,285	Dry land & irrigated commercial agriculture
Midvaal	108,451	28,064	Grain crop production (rain-fed & irrigated)
Lesedi	101,683	38,760	Grain crop production, dry land crop production, livestock, dairy
West Rand	105,716	28,633	Horticultural production (veggies and ornamentals)
Total	605,750	184,130	

Source: Department of Agriculture and Rural Development (GDARD), 2011

FIGURE 19 | CURRENT PROJECTS



The agricultural hubs are expected to spearhead the production of quality agricultural products for local, national and international markets. Also, the agricultural hubs are expected to contribute significantly to job creation within the province, and help emerging black farmers grow their agricultural enterprises. A primary aim of the agricultural hubs is resource protection, in particular high-potential agricultural soils. The protection of high-potential agriculture soils is administered through the Environmental Impact Assessment (EIA) process.

2.7.9. CURRENT PROJECTS

The Emfuleni Local Municipality has a number of projects listed as current projects. Many of these projects are spin-offs from the previous Emfuleni SDF, such as the development of the Sebokeng CBD. Others are projects proposed by provincial and municipal entities. These are the following projects:

a. Logistical Hub

The proposed Logistical Hub will be located on the site located west of the Mittal factory and owned by Arcelor Mittal. This site enjoys access to the region's major road network and railway facility. The site is 896ha in extent and is zoned 'Agricultural'. The Logistical hub will be focused on the motor industry with its related need for storage and containers handling. The Logistical Hub will have access to air (new) and rail transport. The proposed airport will handle high-value low-weight cargo, whereas railway facility will handle heavy, low-cost cargo.

b. River City Initiative

The River City initiative aims to improve the connection between the City and the Vaal River. It basically comprises three elements. Firstly, it aims to focus prime development on the river front and avoid locating peripheral uses, such as industrial areas, next to the river. Secondly, it aims to focus development at key areas along the river in nodal form to provide distinct destinations along the river. Thirdly, to prevent the Vaal River from becoming an exclusive resource for only those living next to the river, the River City Initiative aims to establish linkages between the river and inland locations where possible, to make the river more accessible to the larger Emfuleni population.

c. Ash Dump Redevelopment

The Ash Dump site is owned by the municipality, it is zoned industrial and it is 21.1ha in extent. The site can be used for ash beneficiation purposes for another 2 to 5 years (depending on technology employed). This will generate employment and GDP for the municipality during this period. Upon closure of the operation after the 5 years, the land will be availed to accommodate the future growth of the river city.

TABLE 17: CURRENT EMFULENI PROJECTS

Project	Land Size	Cost Estimate	Ownership	Agent
Logistical Hub	8976.3 Ha	R200 million	Private	GPG
River City Development	28.7 Ha	R15 billion	Private	GPG/ELM
Ash Dump	6.9 Ha	R5 million	ELM	GPG/ELM
Old Hospital Redevelopment	8.1 Ha	R400 million	Provincial/ ELM	GPG
Alternative River City Development	6.5 Ha	R35 billion	Private	GPG/ ELM

Source: Emfuleni Local Municipality, 2017

d. Old Vereeniging Hospital Redevelopment

The Old Vereeniging Hospital site is zoned 'Residential' and it is 8,1ha in extent. A mixed development, including commercial, office, business, and residential uses, is planned for the site. The residential use (2000 dwellings) will feature different housing typologies to accommodate a variety of income groups. The residential component aims to make the Vereeniging CBD a mixed use, and therefore more 'livable city'. Public open space (including sport, recreation, arts and culture- public spaces) will be located in a green belt that loops around the periphery of the Vereeniging CBD.

e. Sebokeng Emerging CBD

The Sebokeng Emerging CBD is a Primary Node proposed at the Sebokeng Hospital in the Emfuleni SDF 2011. The site is currently a major transport network interchange for both rail and road transport and it is frequented and easily accessed by Sebokeng residents. The site currently contains National, Provincial and Local Government facilities and large tracts of undeveloped land available for development. Public sector investment in the site will promote the development of this node and will attract private sector investments to this part of Emfuleni.

f. Bophelong Secondary Node

The Bophelong Secondary Node is an existing node in Bophelong containing a limited number of business facilities. The node is located next to the R57 and the public transport network using this road. Thus, the site's locality presents an opportunity for the development of an inter-modal transport interchange. The undeveloped and under-utilised Municipality-owned land within the node is already zoned 'Business'.

g. Sharpeville Secondary Node

The Memorial Precinct, which was identified as a node within Sharpeville, needs further development in order to strengthen the node. Due to its historical legacy, this node has the potential to be developed as a tourist attraction within Sharpeville. A double storey building, which blends architecturally with the neighbouring museum buildings, is proposed for the node. The ground floor of the building could comprise of a cluster retail shops and the first floor could accommodate ITC centre, restaurants, internet café, craft markets and an art gallery.

h. Extension of William Nicol Street

The municipality holds the view that the development of a road (William Nicol Street) that will link with Barrage Road (K174) to Bophelong Townships will attract private sector developments to this part of Emfuleni. Once constructed, the proposed extension of William Nicol Road will not only render the land between it and R57 for office park development and other business developments north of Barrage Road (K174). These developments, together with existing Vaal Mall, will coalesce into a strong regional node providing sustainable employment and business opportunities near Bophelong.

2.8 HOUSING

Housing within Emfuleni is largely aligned with the land use character of Emfuleni. The eastern half of Emfuleni comprises the residential areas associated with Sebokeng, Vanderbijlpark and Vereeniging. These residential areas comprise bonded housing developments, security estates, affordable housing developments and informal settlements. The western half of Emfuleni mostly comprises farms and agricultural holdings.

2.8.1. HOUSING TYPOLOGIES

Census 2011 provides information with regard to the state of housing within Emfuleni. This information is reflected in the Table below. According to this Table, Emfuleni had approximately 192,000 dwelling units in 2011. Of this number, roughly 129,000 were conventional affordable housing units, making it the dominant housing type within Emfuleni. This total housing figure was estimated to have increased to approximately 203,000 by 2017. The number of conventional affordable housing units is estimated to be roughly 136,000 today. Conventional affordable housing units are still the dominant housing type within Emfuleni.

TABLE 18: NUMBER AND TYPE OF FORMAL HOUSING 2011 AND 2017

Year	Bonded House	Affordable House	Flat	Walk-Up	Townhouse	Semi-Detached	Total Dwelling Units
2011 (Census)	54511	129436	4681	456	2254	852	192190
2017 (Estimate)	57590	136748	4945	482	2381	900	203046

Source: Derived from Census 2011

Emfuleni has a number of hostels. The hostels located within Emfuleni, as well as the number of dwelling units found within each hostel are depicted by the Table below. The Sebokeng Hostel is by far the largest hostel located within Emfuleni. This hostel is situated on the boundary of the Sebokeng CBD, opposite the Sebokeng industrial area. It has access to Moshoeshoe Road, which is a primary public transport route traversing Emfuleni. KwaMasiza Hostel is also located within Sebokeng. The Sebokeng, Boipatong and Sharpeville hostels are under the direct ownership and management of the Emfuleni Local Municipality. The Kwa-Masiza Hostel is privately owned.

TABLE 19: EMFULENI HOSTELS

Name	Number of Units	Planned Project	Project Progress	Planned Units
Sebokeng	2214	Planned upgrading	First phase of 132 units almost completed	10,000
KwaMasiza	672	Conversion of hostel units into 110m2 family units	Service installation almost completed	672
Boipatong	264			
Sharpeville	141			
Total	3291			10,672

Source: Urban Dynamics Gauteng, 2017

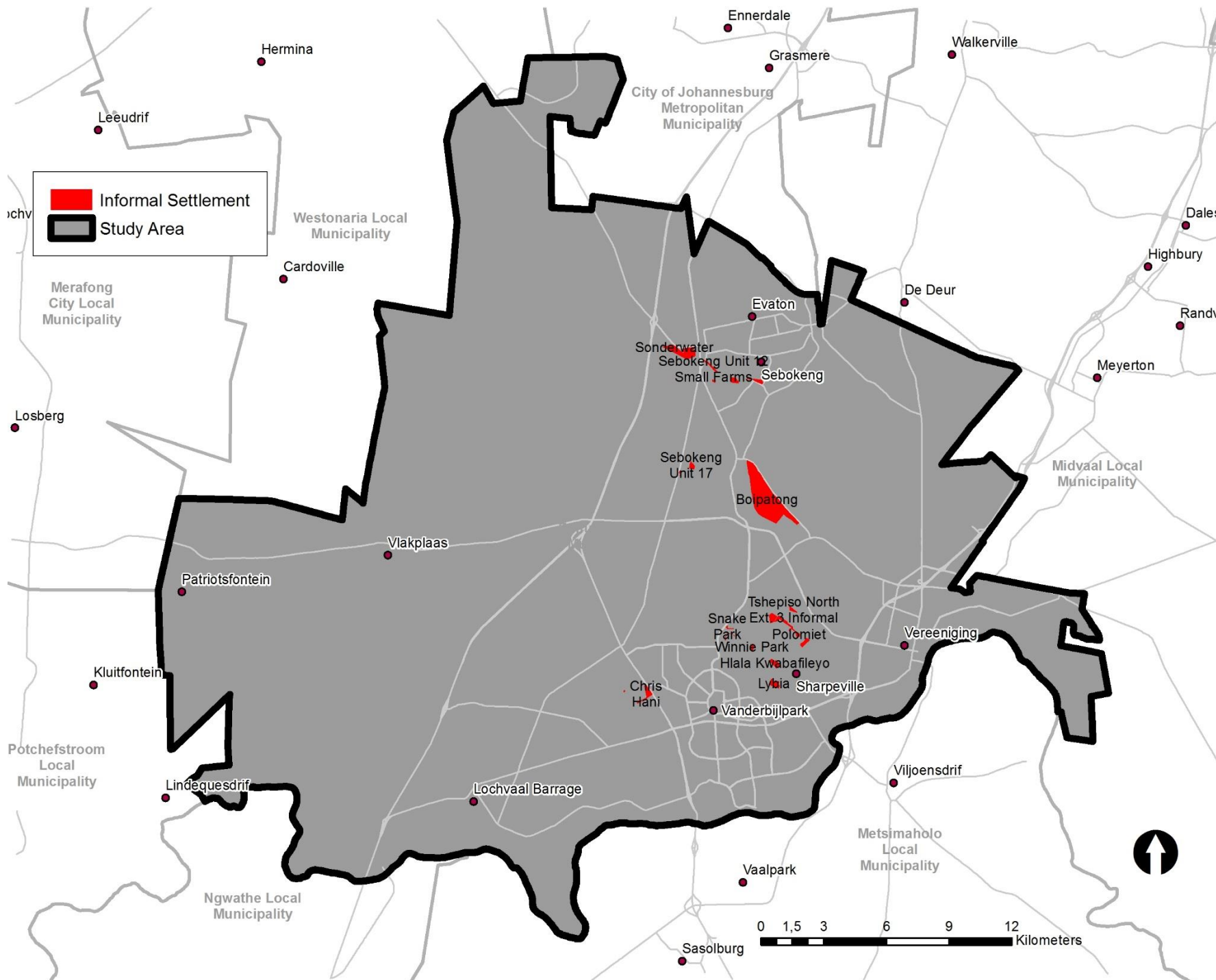
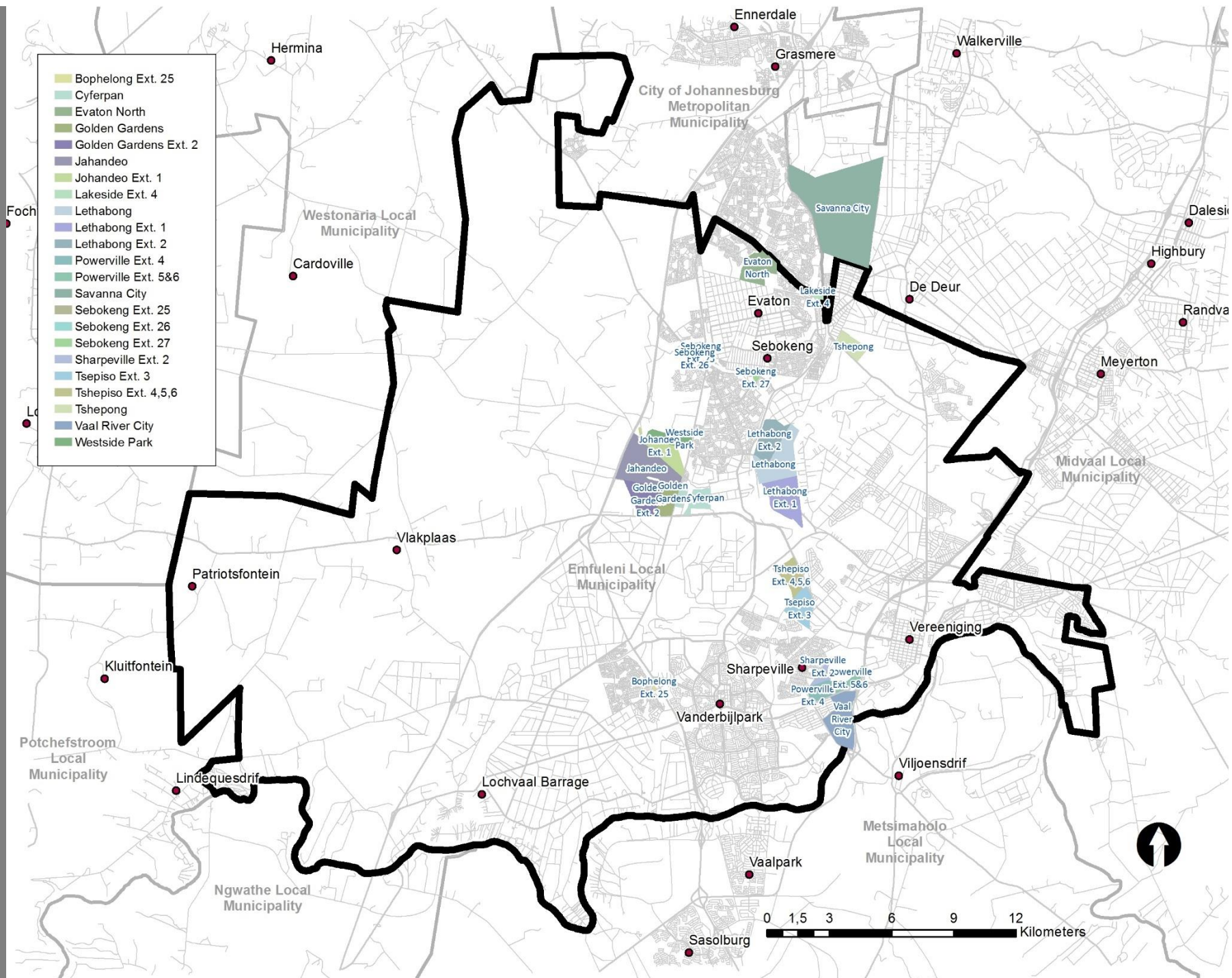


FIGURE 20 | INFORMAL SETTLEMENTS

FIGURE 21 | HOUSING PROJECTS



2.8.2. INFORMAL HOUSING

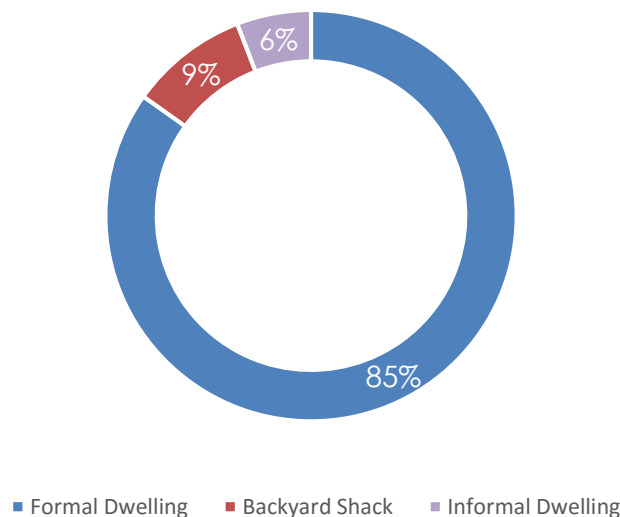


DIAGRAM 11: INFORMAL HOUSING SHARE
Source: Census 2011

With regard to informal housing, Emfuleni had approximately 35,000 informal dwelling units located within informal settlements in 2011, which have been estimated to have increased to about 36,000 units by 2017. Most of these informal settlements are located within Sebokeng and Boipatong. The spatial distribution of the informal settlements within Emfuleni is illustrated on Figure 19.

TABLE 20: NUMBER AND TYPE OF INFORMAL DWELLINGS 2011 AND 2017

Year	Backyard Shack	Informal Dwelling	Total Dwelling Units
2011 (Census)	21372	13395	34767
2017 (Estimate)	22579	14152	36731

Source: Derived from Census 2011

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

As depicted by the diagram above, most informal structures within Emfuleni are backyard shacks, covering approximately 9% of the total formal/ informal housing stock. This translates to approximately 23,000 backyard shacks in 2017. The informal dwelling units located within informal settlements in Emfuleni account for approximated 6% of the total formal/ informal housing stock. This translates to approximately 14,000 informal dwellings in informal settlement in Emfuleni in 2017. The Table below lists the informal settlement located within Emfuleni and the areas that each of these settlements cover. Informal settlements cover nearly 500ha of land within Emfuleni.

TABLE 21: LIST OF INFORMAL SETTLEMENTS 2017

Name	Size (ha)
Cape Gate	12
Chris Hani	17
Frances Informal Settlement	1
Hlala Kwabafileyo	12
Khaya lethu	1
New Village Ext. 2 Informal	7
New Village	9
Polomiet	19
Sebokeng Unit 12 Small Farms	7
Sebokeng Unit 17	7
Sebokeng Unit 12 Kanana	2
Sebokeng Unit 20	1
Snake Park	2
Sonderwater	53
Soul City	8
Stallin	1
Tshepiso North Ext. 3 Informal	5
Winnie Park	5
Lybia	14
Sebokeng Zone 14 Informal	1
Boipatong	271
Total	455

Source: Urban Dynamics Gauteng, 2017

2.8.3. AFFORDABLE HOUSING DEVELOPMENT

TABLE 22: AFFORDABLE HOUSING DEVELOPMENT

Name	Location	Status	Number of Single Residential Stands	Number of Group Residential Stands	Number of Non-Residential Stands
Bophelong Extension 25	Bophelong	Completed	141	0	8
Cyferpan	Sebokeng	Planned	2000	0	Not available
Evaton North	Evaton	Completed	2479	0	32
Golden Gardens	Sebokeng	Planned	4161	0	Not available
Johandeo Phase 2	Sebokeng	Planned	14500	0	Not available
Lakeside Extension 4	Evaton	Completed	380	0	3
Lethabong	Sebokeng	Planned	341	0	9
Lethabong Extension 1	Sebokeng	Planned	2390	2	28
Lethabong Extension 2	Sebokeng	Planned	2885	3	25
Powerville Extension 5 & 6	Sharpeville	Planned	856	0	14
Powerville Park Extension 4	Sharpeville	Planned	189	0	2
Sharpeville Ext 2	Sharpeville	Planned	Not available	Not available	Not available
Sebokeng Extension 25 (Sonderwater)	Sebokeng	Completed	473	0	4
Sebokeng Extension 26 (Sonderwater)	Sebokeng	Completed	466	0	10
Sebokeng Extension 27	Sebokeng	Completed	169	0	1
Sebokeng Extension 28	Sebokeng	Planned	4010	0	Not available
Sebokeng Extension 30, 31 & 32	Sebokeng	Planned	3136	0	Not available
Tshepong	Sebokeng	Completed	2332	0	30
Tsipeso Extension 3	Sharpeville	Completed	1501	0	37
Tsipeso Extension 4, 5 & 6	Sharpeville	Partly completed	2528	0	28
Vaal River City	Vereeniging	Planned	Not available	Not available	Not available
Westside Park	Sebokeng	Planned	1462	0	Not available
Total Stands			46399	5	231
Savanna City	Midvaal	Planned	14600	11	251

Source: Urban Dynamics Gauteng, 2017

A number of large-scale affordable housing developments have been planned for Emfuleni in recent years, many of which have been completed. The development of these townships is driven by the Gauteng Department of Housing using the National

Housing Subsidy Scheme. The townships that have recently been completed, or are currently being planned, are depicted in the Table below.

The Table above also lists the number of residential stands provided within each of these townships. It is evident from this Table that roughly 46,000 residential stands have been made available or are being planned for affordable housing development. Savanna City, to be developed on the northern boundary of Emfuleni in Midvaal, will add an additional 14000 residential stands in close proximity of Emfuleni.

The locations of the affordable housing projects underway and proposed are illustrated on Figure 20. The township developments range in size, from townships containing about 150 residential stands to townships containing in excess of 4000 residential stands. The most notable future affordable housing projects will be the development of the Lethabong extensions, southeast of Sebokeng and the expansion of Johandeo and Golden Gardens, to the southwest of Sebokeng. The development of Savanna City, although located outside Emfuleni, will have a significant impact on the provision of affordable housing within the greater Emfuleni Region.

SECTION 3: LAND USE ESTIMATES

3.1. POPULATION ESTIMATE

Population estimates need to be based on a base year. In other words, a specific year must be chosen of which the population number is known or can be calculated to a reasonably accurate degree. This base year is used as a platform on which to calculate or project the population growth up to the current year (in this case 2017), as well as the population growth up to certain points in the future. The base year used for Emfuleni is the year 2011, which correlates with the Census 2011 year. The future population growth was calculated for 5 incremental periods up to the year 2025.

TABLE 23: EMFULENI POPULATION GROWTH 2001 TO 2010

Item	Population Estimate (2001)	Population Estimate (2011)	Population Growth Rate (%)
Rural population	76465	95847	
Urban population	581879	625806	
Total	658344	721653	0.92%

Source: Estimated from Census 2001 and Census 2011

To calculate the population growth of Emfuleni, a population growth rate of 0.92% per annum was used for the period 2011 to 2025. This population growth rate was the growth rate experienced in Emfuleni during the period stretching from Census 2001 to Census 2011, and therefore provides a realistic growth rate to benchmark future growth within Emfuleni upon.

According to the Table below, the population of Emfuleni in 2017 was estimated to be approximately 762,000 people or 245,000 households. Of the 245,000 households, approximately 209,000 households were estimated to be formal households. Emfuleni population will grow to an estimated total population of approximately 783,000 people and 252,000 households by the year 2020 and an estimated total population of approximately 820,000 people and 264,000 households by the year 2025. This is an additional 43,000 households by 2020 and an additional 30,000 households by 2025. These additional households include the informal households living within Emfuleni. Thus, the additional households equate to the approximate number of new housing units that will need to be constructed within Emfuleni by the year 2025 to accommodate the population growth, as well as eradicating the backlog within Emfuleni.

TABLE 24: EMFULENI POPULATION 2025

Item	Population Estimate (2011)	Population Estimate (2017)	Population Estimate (2020)	Population Estimate (2025)
Total Population	721653	762416	783653	820370
Formal population	613875	648550	666615	697849
Informal population	41526	43872	21936	0
Backyard population	66252	69994	34997	0
% growth		0,92	0,92	0,92
Households	232791	245941	252791	264636
Formal households	198024	209210	234426	264636
Informal households	13395	14152	7076	0
Backyard households	21372	22579	11289	0
Average household size	3,10	3,10	3,10	3,10
Household growth (incl. informal)		47916	43582	30210

Source: Estimated from Census 2011

3.2. URBAN EXPANSION

The land areas required for urban expansion within Emfuleni has been calculated based on the population growth within Emfuleni and the existing housing backlog within Emfuleni. The land area requirement was calculated for the periods 2017-2020 and 2020-2025, as depicted by the Table below. According to the Table below, Emfuleni requires approximately 1900ha of land for residential expansion up to the year 2020, and an additional 1700ha of land for residential expansion up to the year 2025. The land allocated for residential expansion in terms of the 2011 Emfuleni SDF, and will be allocated in terms of this 2017 Emfuleni SDF, is depicted by the Table below. The Table shows that an oversupply of land is made available for residential expansion during the period 2017-2020. This was primarily done to accommodate existing township development initiatives within Emfuleni. The drawback of this approach is that the areas indicated for the period 2017-2020 will be developed in a fragmented way, with infill of the in-between parcels only to occur after 2020.

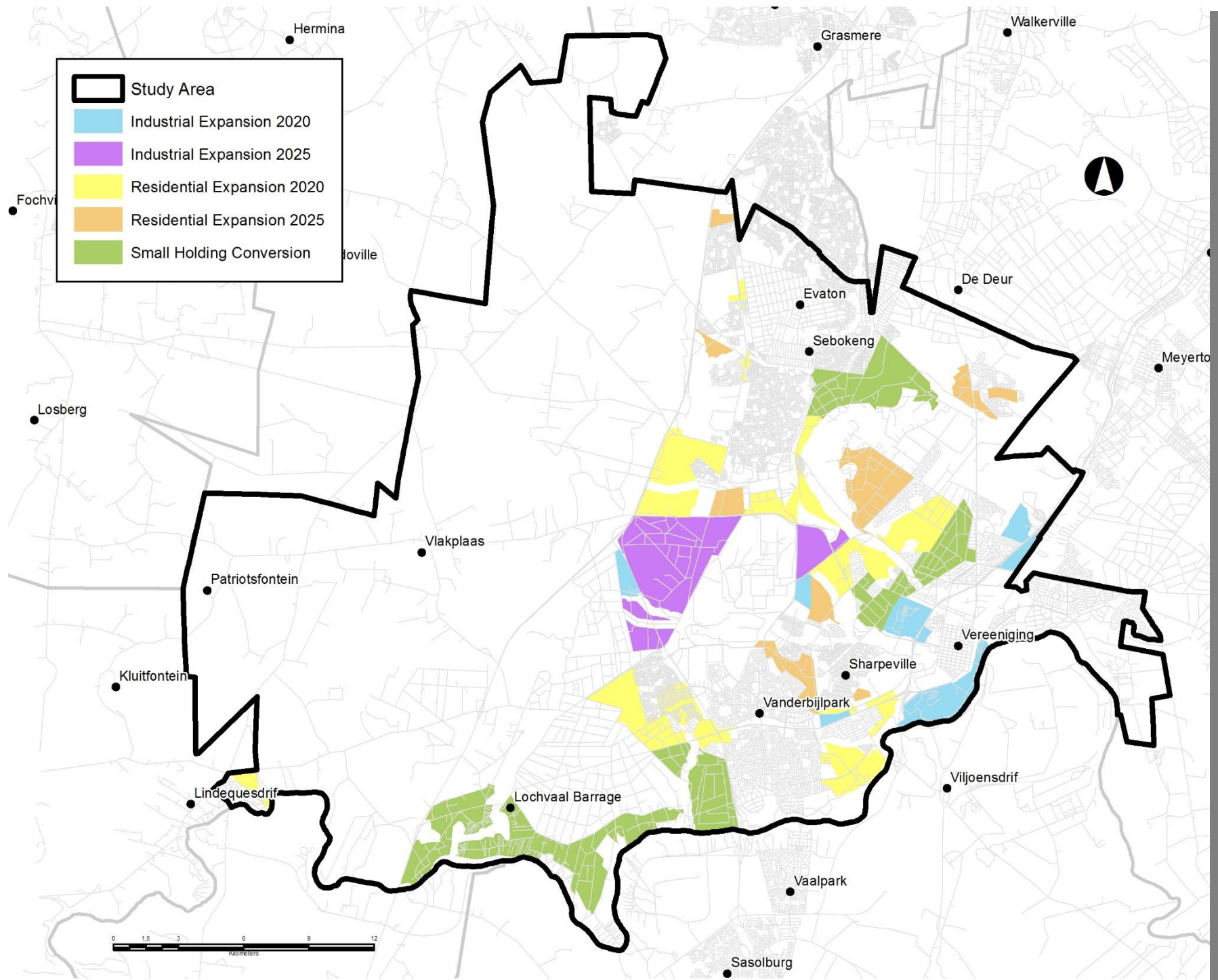


FIGURE 22 | URBAN EXPANSION

TABLE 25: LAND NEEDED FOR URBAN EXPANSION 2020 AND 2025

Area	Year 2017-2020 Need (ha)	Year 2017-2020 Allocated (ha)	Year 2020-2025 Need (ha)	Year 2020-2025 Allocated (ha)
Residential expansion	1882,3	3264,2	1596,9	1752,6
Small holdings conversion	n/a	n/a	n/a	3997,9
Industrial expansion	683,3	1068,7	234,3	500,7

Source: Urban Dynamics Gauteng, 2017

Emfuleni is an industrial-based economy and it is therefore necessary provide further industrial employment opportunities to reduce the necessity of Emfuleni population to travel large distances to access industrial sector employment opportunities in other parts of Gauteng. Consequently, the industrial expansion areas needed to support continued industrial growth within Emfuleni were calculated. Taking into account the existing industrial areas found within Emfuleni, it was calculated that Emfuleni requires approximately 680ha of land for industrial expansion up to the year 2020, and an additional 230ha of land for industrial expansion up to the year 2025. The land allocated for industrial expansion is depicted by the Table above, which exceeds the industrial land needed. The land allocated was based on utilizing existing vacant industrial land and providing additional industrial land in specific locations to consolidate the currently fragmented urban area.

The land required for residential and industrial expansion, as set out in the Table above, was spatially allocated to Emfuleni on Figure 22, in order to determine whether Emfuleni has enough land to absorb the need for residential and industrial expansion up to 2025. Allocating the land for residential and industrial expansion within Emfuleni took into account a number of factors that were set out in the Status Quo section of the report. Geotechnical constraints played a role in determining the expansion possibilities within Emfuleni, which included dolomite in the Roshnee area. Environmental constraints were also taken into account, such as the ridges, environmental sensitive areas, and hydrological corridors. Infrastructure development was also a guiding factor, such as the potential to access existing bulk municipal services networks, and the integration of residential expansion and public transport. Based on the aforementioned, the areas identified for residential and industrial expansion are as follows:

a. Period 2010-2015

The primary aim for the period 2017 to 2020 is to allow for the development of existing affordable and bonded housing initiatives within Emfuleni to proceed. This includes the completion of the Golden Gardens and Johandeo extensions west of the Sebokeng CBD, the Lethabong extension east of the Sebokeng CBD, and the Tsepiso extension north of Sharpeville. This period also allows for the development of bonded housing within the Sonlandpark area and bonded housing

development north of Emerald Casino. The Lethabong and Tsepiso extensions, as well as the development of the Sonlandpark area, will enable the densification of the Vereeniging-Johannesburg commuter railway line corridor, as envisaged in the Development Concept. This corridor is further reinforced by allowing the densification of the agricultural holdings located within this corridor, such as Unitas Park and Roods Gardens. Industrial area expansion within the period 2017 to 2025 basically involves using up existing industrial land within Emfuleni. This includes the vacant land located south of the Powerville industrial area and the vacant industrial land within Leeuwkuil industrial area.

b. Period 2015-2020

The period 2020-2025 aims to further consolidate and densify the development triangle situated between the Vanderbijlpark, Sebokeng and Vereeniging CBDs. This includes residential expansion in the Cyferpan, Sonlandpark and Boipatong areas. The further densification of agricultural holdings areas, such as Mantevrede and Unitas Park during the period 2020 to 2025, is also encouraged. The densification of the agricultural holdings and residential expansion areas in the Sonlandpark area will further strengthen the Vereeniging-Johannesburg commuter railway line corridor, as envisaged in the Development Concept. Industrial area expansion within the period 2020 to 2025 involves expansion of the industrial belt stretching from Mittal up to the Vereeniging-Johannesburg railway line. This includes the development of vacant land situated between Mittal and Boipatong and the development of vacant land in the Cyferpan area.

3.3. LAND USE BUDGET

Whereas the above deals with the land areas needed for urban expansion, the Land Use Budget deals with the composition of these land areas. In other words, the Land Use budget provides estimates with regards to the number of community facilities, business space and housing units that are needed within Emfuleni by the year 2025. From the onset, it has to be emphasized that the following Land Use Budget is only a rough estimate of the number of community facilities, business space and housing units needed by the year 2025. The estimates given only serve as guidelines for officials to make land use development decisions from day-to-day. It is not a tool to conclusively prove or disprove the viability of a specific land use proposal for a specific area, nor does it take into account the often-non-empirical views and needs of communities. The Land Use Budget has calculated the need for community facilities, business space and housing as follows, as depicted by the Table below:

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

TABLE 26: RESIDENTIAL LAND USE BUDGET 2020 AND 2025

Land Use	Existing 2017			Need 2020			Backlog 2017-2020			Need 2025			Backlog 2020-2025		
	no.	ha	m ²	no.	ha	m ²	no.	ha	m ²	no.	ha	m ²	no.	ha	m ²
POPULATION AND HOUSEHOLDS															
Population	762416			783653						820370					
Households	245941			252791						264636					
Formal Households	209210			234426						264636					
Informal Households	36731			18365						0					
RESIDENTIAL AND SUPPORTING USES															
Housing	203046	9338,2		234426	10675,8		31380	1337,7		264636	11789,6		30210	1113,7	
Housing Bonded	64917	5895,5		75016	6726,5		10100	831,0		82037	7306,8		7021	580,3	
Flats	4945	41,2		6001	50,0		1056	8,8		6563	54,7		562	4,7	
Cluster Housing	2381	95,2		3751	150,0		1370	54,8		4922	196,9		1171	46,9	
Detached Housing	57590	5759,0		65264	6526,4		7674	767,4		70552	7055,2		5288	528,8	
Housing Affordable	138129	3442,7		159409	3949,4		21281	506,7		182598	4482,8		23189	533,4	
Walk-Ups	482	6,0		1594	19,9		1113	13,9		3652	45,6		2058	25,7	
Semi-Detached Housing	900	18,0		3188	63,8		2288	45,8		7304	146,1		4116	82,3	
Detached Housing	136748	3418,7		154627	3865,7		17879	447,0		171643	4291,1		17015	425,4	
Educational	225	809,6		182	679,8		22	99,9		205	767,4		23	87,6	
Primary School	146	408,8		117	328,2		13	35,3		132	370,5		15	42,3	
Secondary School	76	364,8		59	281,3		6	30,3		66	317,6		8	36,3	
Tertiary Institution	3	36,0		6	70,3		3	34,3		7	79,4		1	9,1	
Health	38	221,2		55	57,5		26	6,5		57	60,2		3	2,7	
Clinic	26	5,2		52	10,4		26	5,2		55	10,9		2	0,5	
Hospital	12	216,0		3	47,0		0	1,3		3	49,2		0	2,2	
Community	16	164,7		104	207,7		88	43,0		109	217,4		5	9,7	
Library	3	1,2		39	15,7		36	14,5		41	16,4		2	0,7	
Post Office	3	0,6		39	7,8		36	7,2		41	8,2		2	0,4	
Police Station	8	8,0		20	19,6		12	11,6		21	20,5		1	0,9	
Emergency Service Centre	2	2,4		7	7,8		5	5,4		7	8,2		0	0,4	
Cemetery		152,5			156,7			4,2			164,1			7,3	
Business		322,1	1288417		345,9	1383722		23,8	95305		378,1	1512201		32,1	128479
Retail		247,8	991090		266,1	1064401		18,3	73311		290,8	1163232		24,7	98830
Private Office		74,3	297327		79,8	319320		5,5	21993		87,2	348970		7,4	29649
Open Space		1524,8			1567,3			42,5			1640,7			73,4	
Active		457,4			470,2			12,7			492,2			22,0	
Passive		1067,4			1097,1			29,7			1148,5			51,4	
Transit Station	15	7,5		20	9,8		5	2,3		21	10,3		1	0,5	
Streets		2601,5			2844,2			326,7			3121,4			277,2	
TOTAL AREA		14989,6			16388,0			1882,3			17985,0			1596,9	

Source: Urban Dynamics Gauteng, 2017

a. Housing

The Table above illustrates that approximately 31,000 housing units will need to be developed within Emfuleni to accommodate the population growth within Emfuleni by 2020. An additional 30,000 housing units will need to be developed within Emfuleni to accommodate the population growth within Emfuleni up to the year 2025. These housing units will have to be developed to accommodate the population growth within Emfuleni, as well as to eradicate the existing housing backlog within Emfuleni by the year 2025.

b. Community Facilities

The Land Use Budget has calculated the number of community facilities needed to support the envisaged population growth within Emfuleni up to the year 2025. According to the Land Use Budget, Emfuleni area will require 13 primary schools, 6 secondary schools, 26 clinics, 36 libraries and 12 police stations to eradicate the existing backlog and support its population growth up to the year 2020. Emfuleni will require an additional 15 primary schools, 8 secondary schools, 2 clinics, and 2 libraries and 1 police station to support its population growth up to the year 2025. Note that it was determined that there currently exists an oversupply in primary and secondary schools within Emfuleni. Although it can be argued that these additional schools can accommodate Emfuleni's future population growth, additional school facilities were nevertheless provided for in the Land Use Budget. This is to ensure that the schools are developed within the new residential areas envisaged, which are within walking distance of the children that will utilize these schools.

c. Business

The viable retail and office floor area that can be accommodated within a given geographical area depends on the spending capital of the people living in that area. In turn, the spending capital depends on the socio-economic position of the people living in that area. The potential retail and office floor area to support the current population within Emfuleni area was calculated based on the socio-economic position of people living within the area, as set out in the socio-economic section of this report. Taking the above into account, the additional retail and office space that could potentially be developed within Emfuleni area up to the year 2020, based on the estimated population growth of the region, is approximately 95,000m², of which approximately 73,000m² can be allocated to retail. An additional 128,000m² of additional retail and office space can potentially be develop within Emfuleni area by the year 2025, of which approximately 98,000m² can be allocated to retail.

d. Open Space

Open space can be classified as active and passive open space. The former involves recreation and sport facilities. The latter involves natural areas, such as ridges and river flood areas. According to the Land Use Budget, Emfuleni requires approximately 12ha of active open space to support its population up to the year 2020 and an additional 22ha to support its population up to the year 2025.

TABLE 27: INDUSTRIAL LAND USE BUDGET 2020 AND 2025

Land Use	Existing 2017			Need 2020			Backlog 2017-2020			Need 2025			Backlog 2020-2025		
	no.	ha	m ²	no.	ha	m ²	no.	ha	m ²	no.	ha	m ²	no.	ha	m ²
Industrial	967	3924,0		1168	4545,2		201	621,2		1313	4758,1		145	213,0	
Heavy Industrial	284	2844,0		323	3227,1		38	383,1		324	3235,5		1	8,5	
Commercial	99	497,0		118	590,9		19	93,9		133	666,1		15	75,3	
Light Industrial	583	583,0		727	727,2		144	144,2		856	856,5		129	129,2	
Open Space		392,4			454,5			62,1			475,8			21,3	
TOTAL AREA		4316,4			4999,7			683,3			5234,0			234,3	

Source: Urban Dynamics Gauteng, 2017

e. Industrial and commercial

The industrial and commercial land that is proposed for Emfuleni was based on the existing per capita and industrial land ratio and is depicted by the Table above. Taking the aforementioned into account, approximately 380ha of heavy industrial land, 93ha of commercial land, and 144ha of light industrial land can be allocated within Emfuleni by 2020. An additional 8ha of heavy industrial land, 75ha of commercial land, and 129ha of light industrial land can be allocated within Emfuleni by 2025. As was discussed in a previous section, most of the land required for heavy industrial, commercial and light industrial uses between 2017 and 2020 can be absorbed by the existing industrial land located within Emfuleni.

SECTION 4: DEVELOPMENT VISION

4.1. SWOT ANALYSIS

An analysis was conducted to determine the primary strength, weakness, opportunity and constraint affecting Emfuleni, as depicted by the Table below. This analysis concluded the following:

a. Strength

A primary strength of Emfuleni is the fact that it has more than enough land for urban expansion than is needed, thus not placing pressure on environmentally sensitive areas or high-potential agricultural land for urban development. Most of this available land also has geotechnical conditions suitable for urban development. Only small portions of Emfuleni contain dolomite, which can easily be avoided due to the availability of land within Emfuleni for urban expansion. In addition, Emfuleni has a strong nodal structure, including 3 central business districts and an extensive road network, both of which provide the basic structure for future urban development and expansion within the municipal area.

b. Weakness

The greatest weakness of Emfuleni, from a spatial point of view, is the fact that urban development within Emfuleni has occurred in a fragmented manner. This trend continues to this day, with no attempt to fill in undeveloped areas within Emfuleni. Fragmented development has many drawbacks, such as expensive bulk municipal services infrastructure development costs, long travel distances, poor public transport support and low thresholds to support the development of community facilities and retail space. Another weakness of Emfuleni is the fact that much of the high-potential agricultural soils that are located within Emfuleni are used for urban residential purposes, rather than commercial farming activities. Because of this, GDARD requires the rigorous protection of the Agricultural Hub from urban development, which they located in the southwestern quadrant of Emfuleni.

TABLE 28: SWOT ANALYSIS

Strengths	Weaknesses
<ul style="list-style-type: none"> • More than enough land available for urban expansion • A strong nodal structure • Land that is geo-technically suited for urban development • Large tracts of high-potential agricultural soils • Well-development community facilities network • An extensive road network 	<ul style="list-style-type: none"> • Small stand sizes hamper commercial farming of high-potential agricultural soils • Fragmented development and poor integration of settlements • Lack of a municipal bus network • No metropolitan Central Business District defining the metropolitan area
<ul style="list-style-type: none"> • A commuter railway line serving Vereeniging and Sebokeng • Development of the Sebokeng CBD • Land for infill development between Vanderbijlpark, Vereeniging and Sebokeng • Tourism potential associated with Sharpeville and the Vaal River 	<ul style="list-style-type: none"> • A declining heavy-industrial sector • Lack of employment opportunities • No regional open space network or lattice • Poorly maintained road network
Opportunities	Threats

Source: Urban Dynamics Gauteng, 2017

c. Opportunity

A primary opportunity within Emfuleni is the commuter railway line that links Vereeniging and Sebokeng to Johannesburg. This commuter railway line provides much-needed, long-distance public transport to the northern settlements within Emfuleni. The opportunity exists to further densify the land abutting this commuter railway line, and in doing so, strengthening the role of this commuter railway line within Emfuleni. Densification of this railway line can specifically occur within the Sonlandpark area, but also to the east of Sebokeng. Developing both sides of the railway line will potentially double the commuters that use this line, which makes it a necessary strategy to follow.

Another opportunity within Emfuleni involves the strengthening of the Sebokeng CBD. This emerging central business district already has significant regional facilities, such as the Sebokeng Hospital, the Sebokeng Stadium and 2 large shopping centres. In addition, it has enough land available for its further development and densification. This land should be used for land uses that will strengthen its central business district function, such as additional retail facilities, office uses and higher-density residential uses, such as walk-ups. In turn, the strengthening the Sebokeng CBD will strengthen the Vereeniging-

Johannesburg commuter railway line and provide a strong anchor for the eastwards expansion of Emfuleni along the Vereeniging-Johannesburg commuter railway line.

d. Threats

The primary threat to Emfuleni is most likely the lack of employment opportunities within Emfuleni. This is largely associated with a decline in industrial and commercial activities within Emfuleni. Emfuleni has a large population and it is therefore imperative that Emfuleni reaches a growth level where it can sustain most of its population through industrial and business activities located within Emfuleni. This can partly be addressed on a spatial level by making enough land available for industrial and business development. But it also requires an effective Local Economic Development (LED) strategy.

Another major threat involves the poorly maintained road network and the expansion of the municipal services network capacity to cater for future urban densification and expansion. If these infrastructural issues are not dealt with in a proactive manner, it will stifle economic growth and housing development within Emfuleni. In addition, the absent of a regional open space lattice needs to be addressed to ensure the environmental integrity of Emfuleni is maintained in the midst of urban development and expansion.

4.2. DEVELOPMENT VISION

The vision for spatial development of Emfuleni aims to address the challenges identified above in a holistic manner, which can provide the bases for defining objectives and making proposal for the spatial development of Emfuleni. The vision defined is as follows:

'To develop Emfuleni into a public transport oriented structure that provides an efficient urban form that promotes equitable access opportunities, the cost-effective provision and use of municipal services infrastructure, and support the socio-economic development of local communities'

Practically, the vision deals with affordable housing development, nodal development, infrastructure development and public transport provision. This needs to be implemented in a manner that achieves broader development goals relating to sustainable development, poverty alleviation, and the attraction of economic opportunities to Emfuleni.

4.3. DEVELOPMENT OBJECTIVES

The Emfuleni SDF proposals need to adhere to a set of objectives, which aim to address the weaknesses and threats and harness the strengths and opportunities relating to Emfuleni. The following development objectives need to be met by the Emfuleni SDF proposals:

Objective 1: Create an efficient urban form

Urban efficiency deals with the relationship between places of work and places of residence. In particular, it deals with the movement of people and goods between places of work and places of residence. It follows logically that the key to urban efficiency is directly related to urban structure and the transportation linkages that bind this urban structure together. In addition, such an urban structure must deal effectively with the social, economic and environmental demands placed on the urban structure.

Objective 2: Increase density and compactness

Urban development within Emfuleni has occurred in a fragmented manner in the past. Fragmented urban development has many drawbacks, such as expensive bulk infrastructure development costs, long travel distances, poor public transport support and low population thresholds to support the development of community facilities and retail space. To an extent, the reason for this is that Emfuleni has so much land available for urban development. To address fragmented urban development within Emfuleni, it is imperative that the parcels of land within Emfuleni that contribute to the densification and compaction of Emfuleni be made available for development. It also requires that peripheral land, which does not have the potential to be densified and compacted, be excluded for urban development using an Urban Development Boundary.

Objective 3: Integrate land use and transportation

Urban development within Emfuleni has not only occurred in a fragmented manner, but it has also often occurred in a manner that does not relate to the existing and future transportation infrastructure serving Emfuleni. Specifically, this relates to the Vereeniging-Johannesburg commuter railway line, which was largely ignored as a structuring element guiding urban development. Despite this, the potential remains to integrate land use development with the Vereeniging-Johannesburg

commuter railway line. Practically, this involves developing both sides of the commuter railway line and urbanizing the land located between Vereeniging and Sebokeng.

Objective 4: Establish sustainable social-economic development

Sustainable social-economic development involves providing communities access to economic opportunities and social amenities. The economic aspect of sustainable development requires the development of industrial, commercial and business areas in localities that allow equitable access to employment opportunities and other economic activities. The social aspect of sustainable development requires the development of the full range of social amenities, such as schools and clinics. These social amenities need to be developed in localities that make them accessible to the communities they are intended to serve.

Objective 5: Protection of open space and high-potential agricultural soils

A way to integrate and densify urban areas is to deliberately protect ecologically sensitive areas and high-potential agricultural land. By protecting such areas, urban areas are prohibited to sprawl freely and are therefore forced into denser urban structures. However, ecologically sensitive areas and high-potential agricultural land must not be protected to the extent that it prohibits the integration of fragmented urban areas.

Objective 6: Promote urban renewal of established areas

Promote urban renewal in the primary CBD of Emfuleni, such as the Vereeniging and Vanderbijlpark CBDs. Also, promote urban renewal in the residential areas surrounding the CBDs. To enable urban renewal usually require a complex set of interventions, of which two can be highlighted. Firstly, it will require limiting urban sprawl within Emfuleni to force development to reconsider the renewal of the established areas within Emfuleni. Secondly, it will require increasing the accessibility of the established areas to help them compete with newer, better located developments within Emfuleni. Introducing public transport in established areas is an effective way of improving access to these areas.

4.4. DEVELOPMENT CONCEPT

Within the regional context, as depicted conceptually by the Diagrams below, Emfuleni is situated at the southern end of the Gauteng urban conurbations. Emfuleni is tied into the rest of Gauteng and the Johannesburg and Ekurhuleni metropolitan area in particular via two north-south corridors that are aligned along the N1 and the R59 freeways respectively. These corridors also link Emfuleni to areas in between, such as Orange Farm, Soweto, Meyerton and Germiston. The N1 corridor is paralleled by a commuter railway line, which links Vereeniging to the Johannesburg CBD via Sebokeng and Orange Farm. A freight railway line links Vereeniging to Germiston, via Meyerton. In essence, Emfuleni thus forms the southern anchor of the greater Gauteng urban conurbation.

In addition to the above, Emfuleni is becoming part of an emerging metropolitan area that comprises Sebokeng, Vanderbijlpark, Vereeniging, Meyerton and Sasolburg. Together, this emerging metropolitan area already has a population of 0.9 million people. As this emerging metropolitan area grows, it will become a similar urban structure south of Johannesburg as Tshwane is north of Johannesburg. It is important to view Emfuleni as part of this emerging metropolitan area in order to understand its development potential that is embedded in it, as well as to make planning decisions that would facilitate the emergence of this metropolitan area.

Based on the regional context and the fact that Emfuleni forms part of an emerging metropolitan area, a development concept is proposed that aims to strengthen the role of the Emfuleni area as the southern anchor of the Gauteng urban conurbation. The Development Concept, which is illustrated by the Diagrams below, is made up of the following elements:

a. Urban infill and consolidation

Currently, urbanization within Emfuleni is highly fragmented. It is therefore imperative that future urban development and expansion within Emfuleni be done in a manner that achieves urban consolidation, density and compactness. There are many opportunities for infill development and the consolidation within Emfuleni, but two areas in particular stand out. The first is a large tract of land located between Sebokeng and Vereeniging (in the Sonlandpark region including Roodt's Gardens, van der Merwe's kroon and Unitas Park Agricultural Holdings), which has the potential for infill development. The development of this land parcel will help consolidate the existing fragmented urban structure and help strengthen the existing commuter railway line corridor stretching from Vereeniging to Evaton.

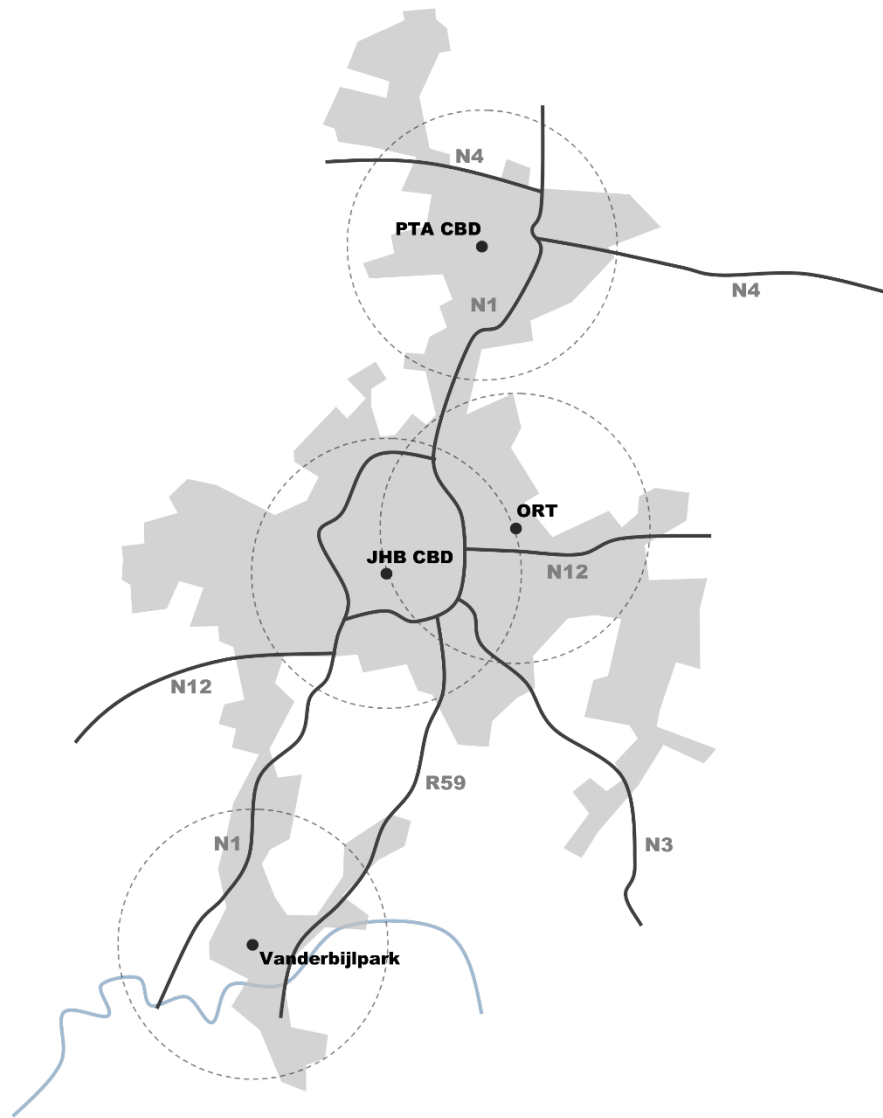


DIAGRAM 12: REGIONAL CONTEXT

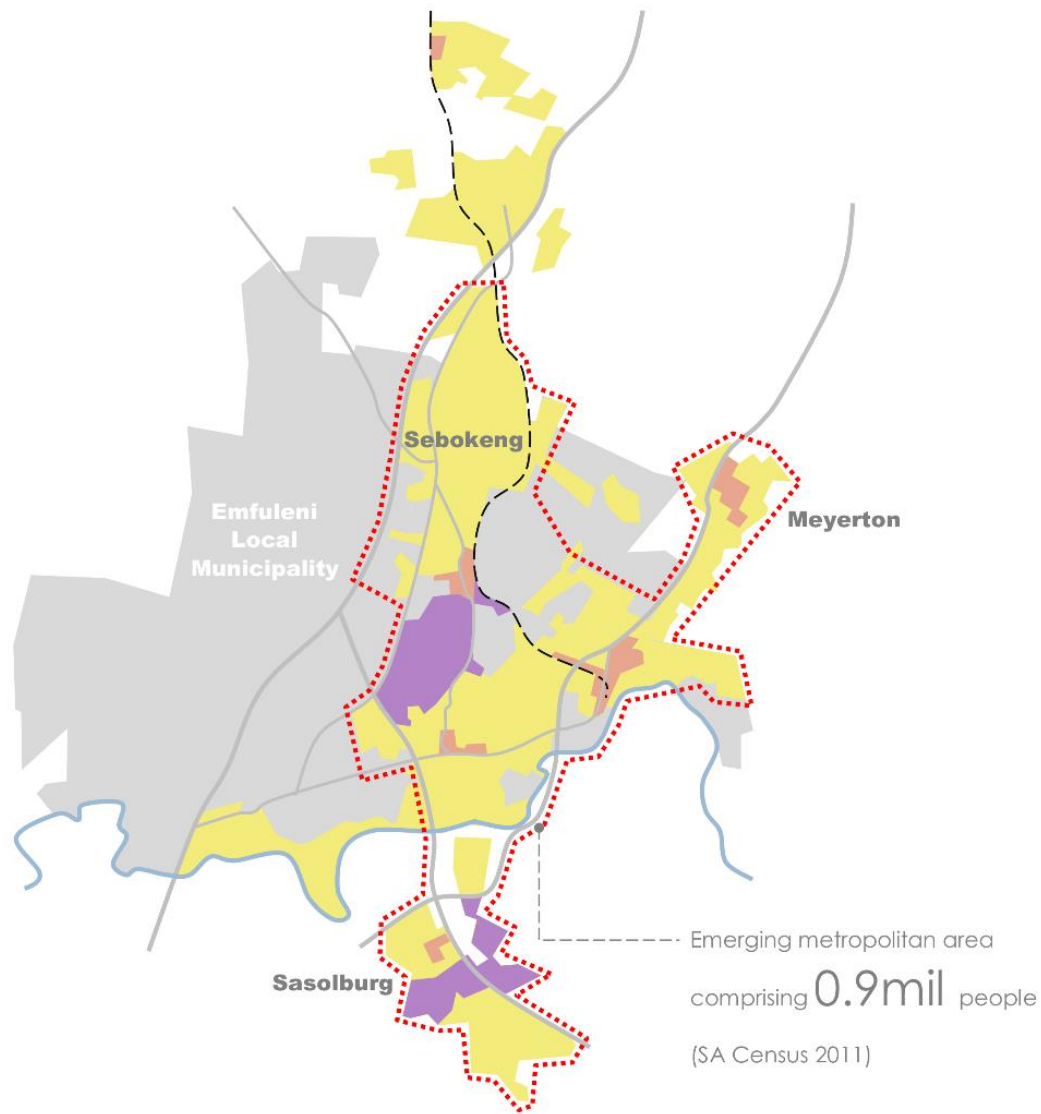


DIAGRAM 13: EMERGING METROPOLITAN AREA

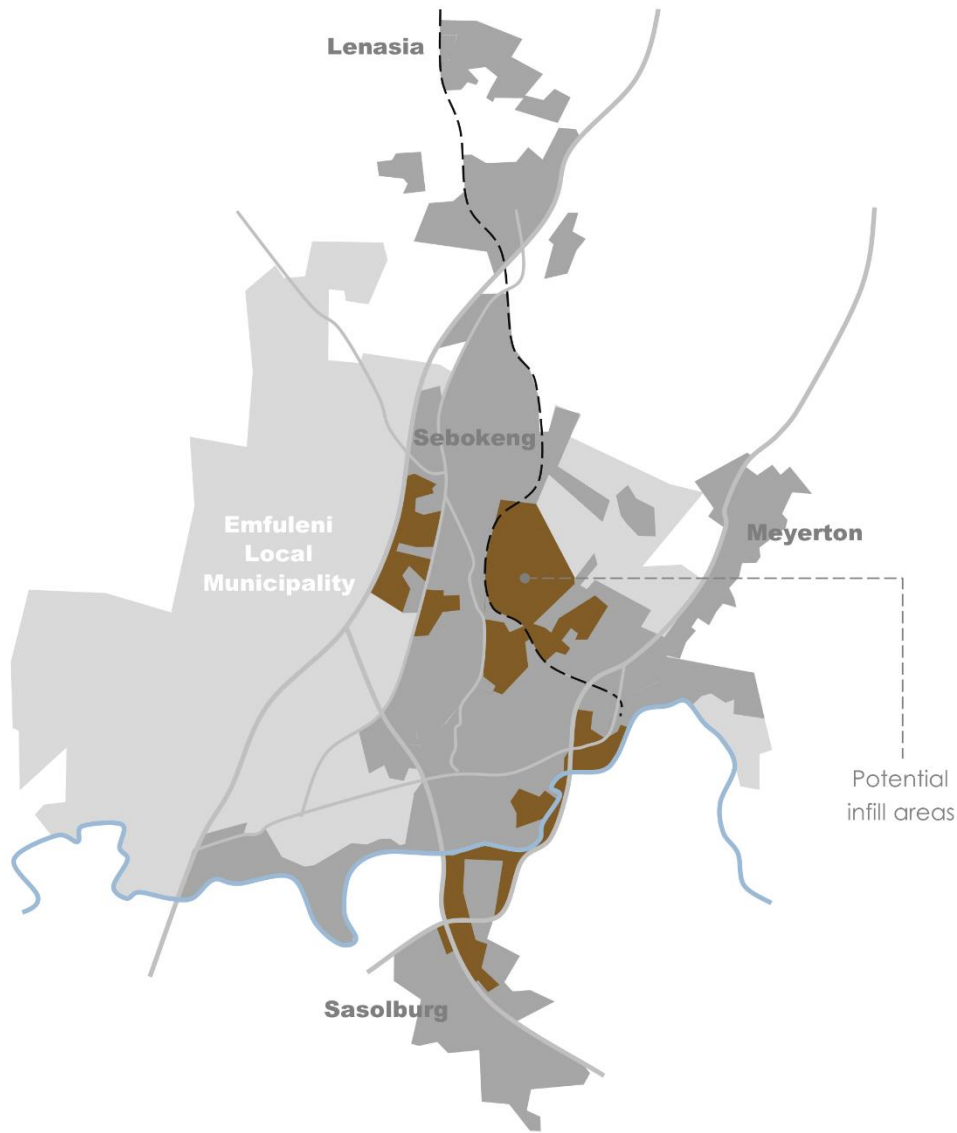


DIAGRAM 14: POTENTIAL INFILL AREAS

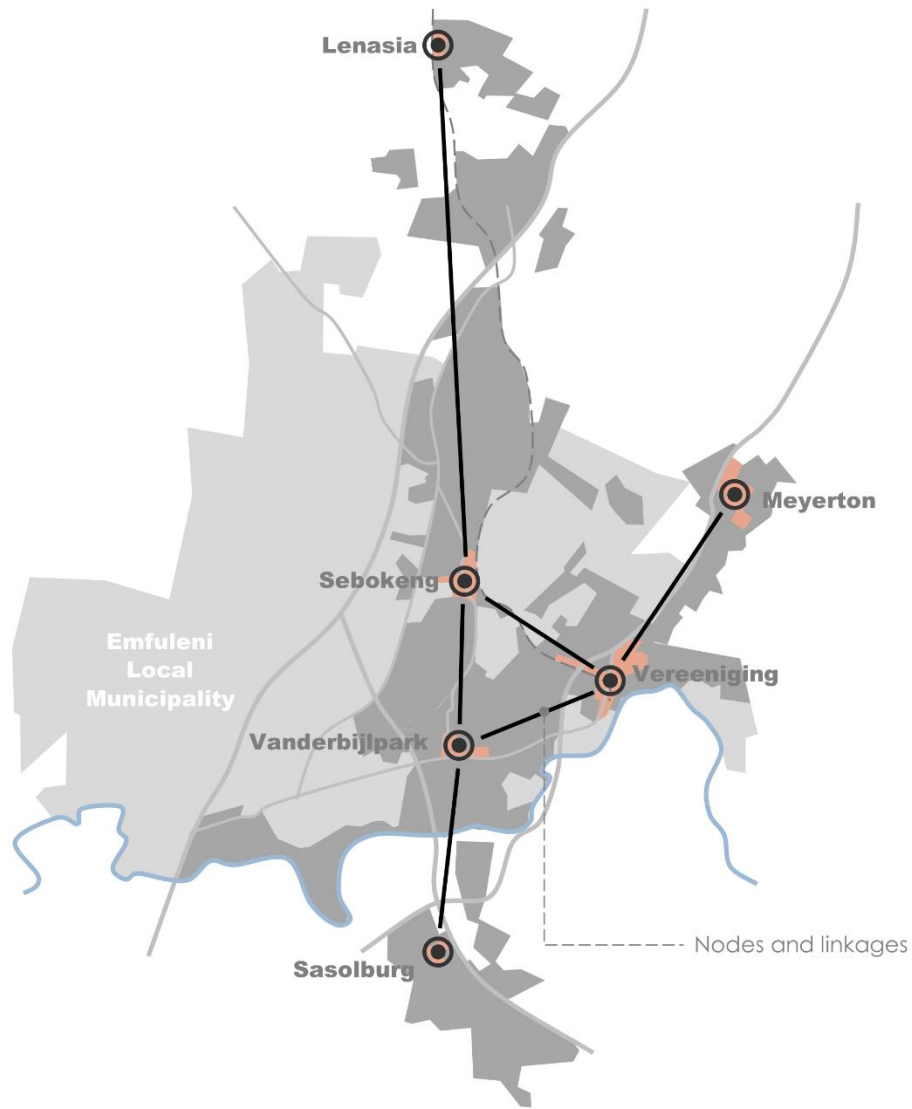


DIAGRAM 15: MOVEMENT PATTERN

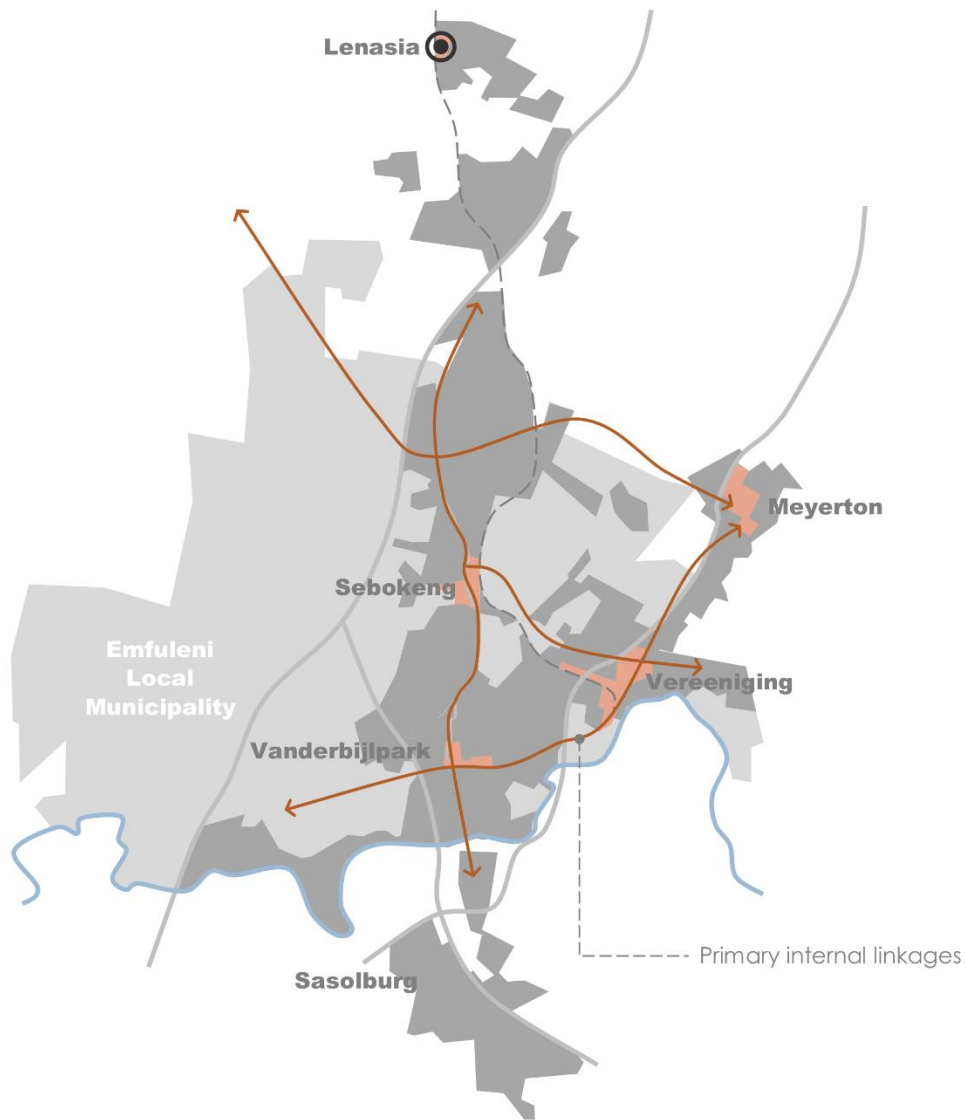


DIAGRAM 16: PRIMARY INTERNAL LINKAGES



DIAGRAM 17: PROPOSED BUS NETWORK

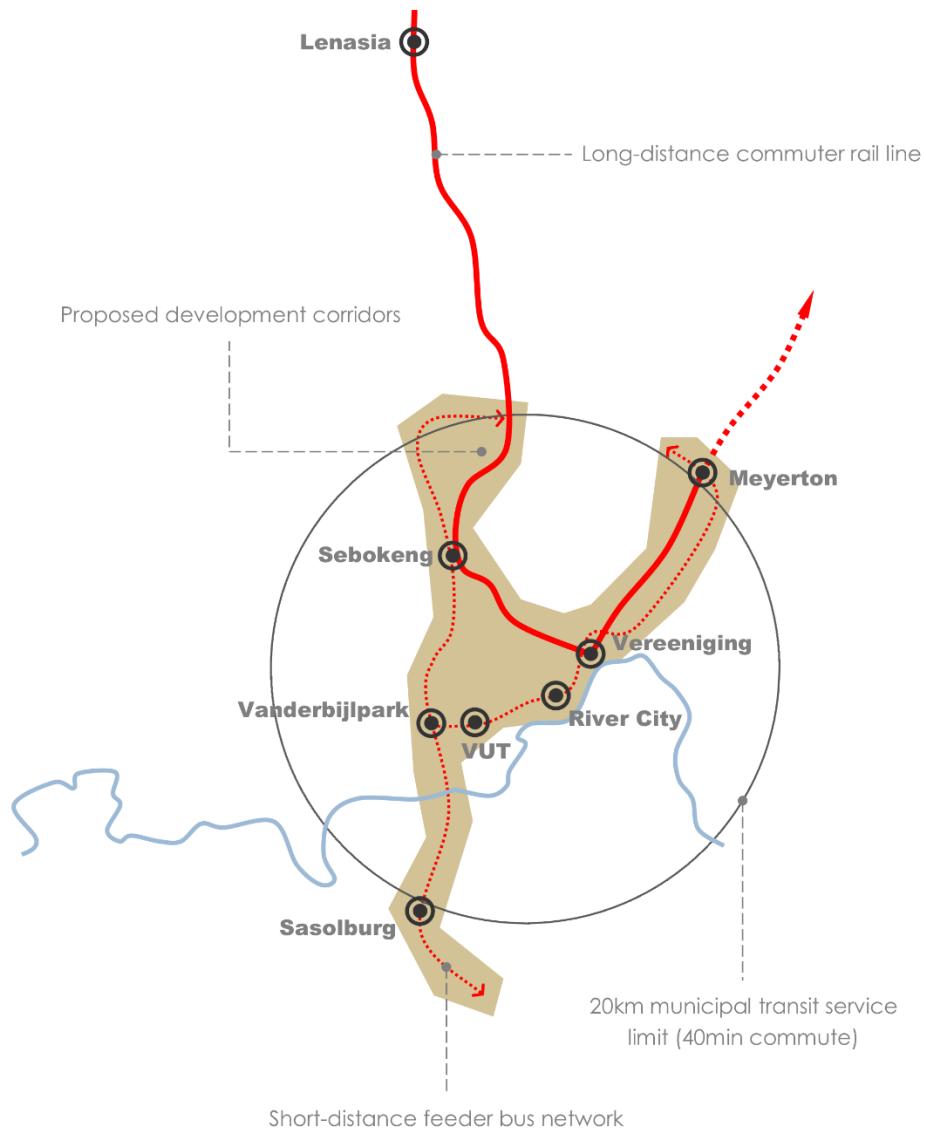


DIAGRAM 18: PROPOSED CORRIDORS

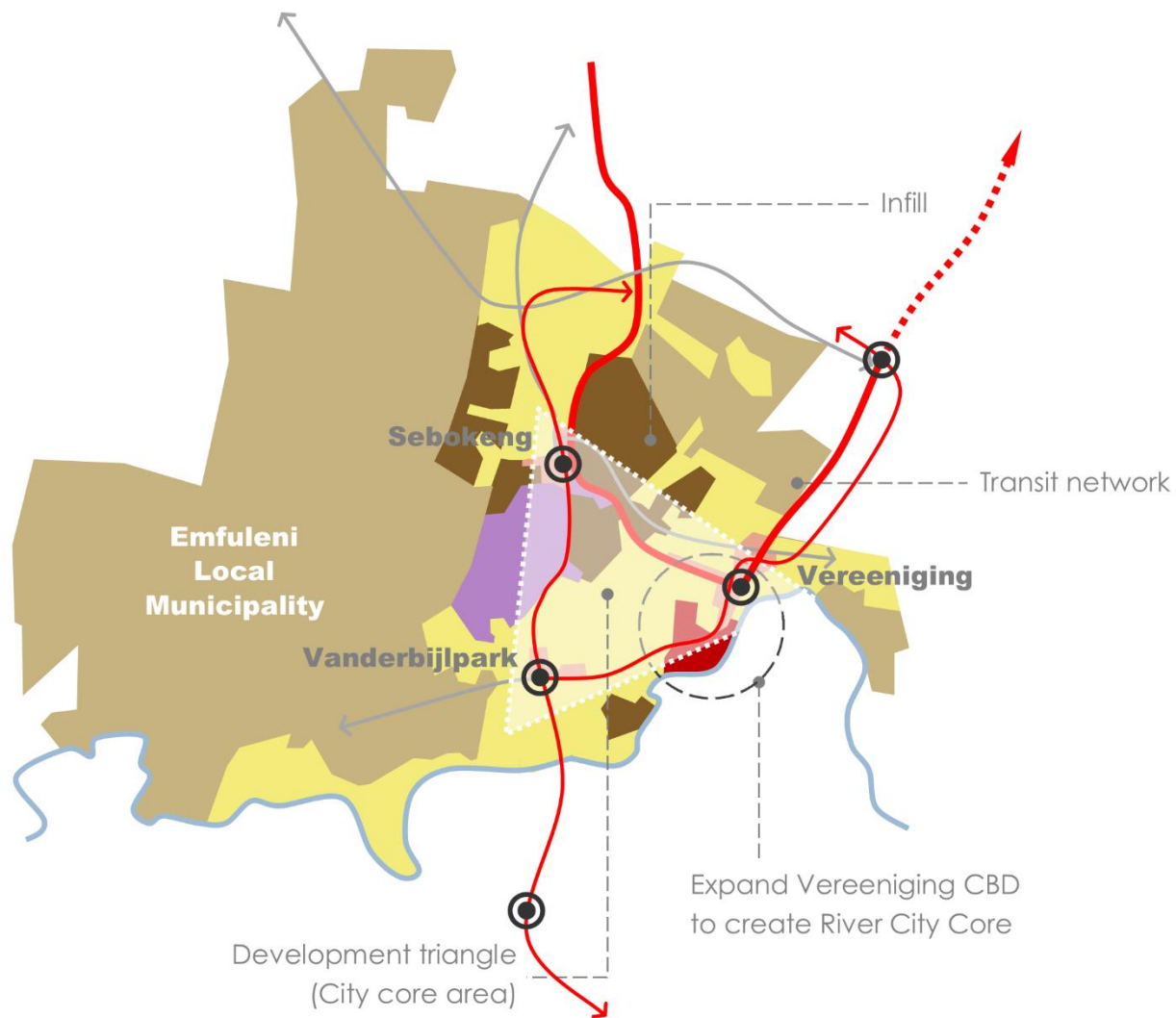


DIAGRAM 19: DEVELOPMENT CONCEPT

Secondly, there is an opportunity for infill development along the Vaal River, between Vanderbijlpark and Sasolburg. If Emfuleni is considered without the provincial boundary and only as a functional urban area, the linkage between Vanderbijlpark and Sasolburg is obvious. Filling in the area between Vanderbijlpark and Sasolburg will place the Vaal River at the centre of this emerging metropolitan area, making it a true river city. It will be the only river city in Gauteng, which will give it a unique characteristic within the Gauteng urban conurbation.

b. Movement pattern and transportation structure

As mentioned when discussing the regional context, Emfuleni is tied into the rest of Gauteng via two north-south road corridors that are aligned along the N1 and the R59 freeways respectively. In addition to these roads, a primary internal road network serves Emfuleni that connects its nodal structure to the rest of Emfuleni. These primary internal roads include the K83 that connects Evaton to Meyerton, the K53 that connects the Sebokeng CBD to the Vanderbijlpark CBD, the K55 that connects the Sebokeng CBD to the Vereeniging CBD, and the K174 that connect the Vanderbijlpark CBD to the Vereeniging CBD. The network forms a triangle between the Sebokeng CBD, the Vereeniging CBD, and the Vanderbijlpark CBD. This triangular structure forms the bases for the development of a public transport system serving this emerging metropolitan area.

c. Nodal structure

Currently, Emfuleni is served by two established Central Business Districts: the Vanderbijlpark CBD and the Vereeniging CBD. The Sebokeng CBD, situated at Sebokeng hostels and hospital, is an emerging Central Business Districts within Emfuleni. These Central Business Districts form a triangle within Emfuleni that must become the focal area for urban development within Emfuleni. This can be done by consolidating urban development and expansion within this triangle. If developed appropriately, this triangular structure will not only become the focal area of Emfuleni, but also the focal area of the emerging metropolitan area that includes Meyerton and Sasolburg. The focal area within the triangle will be the Vereeniging CBD. The Vereeniging CBD is the terminus for the Johannesburg-Vereeniging commuter railway line and it is therefore the regional gateway to Emfuleni. Vereeniging must therefore be strengthened by expanding it toward the Vaal River (the River City Concept). The Vaal River will provide the element that attracts public and private sector investment to this part of Emfuleni, which in turn will establish Vereeniging as the primary core area of Emfuleni.

d. Rail densification and proposed bus network

Developing the public transport network that serves the mentioned emerging metropolitan area can help create the spatial structure proposed above by becoming the backbone of the spatial structure. The first part of creating this public transport network will involve increasing the viability of the only existing public transport system serving Emfuleni, namely the Johannesburg to Vereeniging commuter railway line. To enable this will require the densification of land on both sides of the railway line at its commuter railway stations, using higher-density residential typologies. In addition to this, it will be necessary to create a secondary public transport system that feeds the commuter railway stations with commuters. This secondary public transport system can comprise of a bus network that links the various nodal areas in Emfuleni (including the Meyerton and Sasolburg CBDs) to the commuter railway stations. Because this system will serve three municipal areas (Emfuleni, Midvaal and Sasolburg), the costs of the development and operation of the system can be shared by all three municipalities, making the development and operation of the system more affordable.

SECTION 5: DEVELOPMENT FRAMEWORK

5.1. SPATIAL STRUCTURE

Land use development proposals for Emfuleni are presented in this section of the Emfuleni SDF. These land use proposals were made, taking into account a number of factors, such as access to public transport, the creation of a sustainable urban environment and the protection of natural resource, such as high-potential agricultural soils. The development potential of Emfuleni was determined using the Land Use Budget, presented in a previous section of this report and should be read in conjunction with the land proposals made in this section of the report. The Spatial Development Framework is presented by Figure 23.

5.1.1. RESIDENTIAL DEVELOPMENT

Figure 23 (Spatial Development Framework Map) indicates land parcels within Emfuleni that are proposed for residential development. These land parcels were identified, taking into account a number of constraining factors into account, such as environmental sensitive areas and geotechnical conditions. Land categorized as environmentally important was deemed unsuitable for urban development and land with poor geotechnical conditions due to dolomite were considered unsuitable for urban development.

Most of the land within Emfuleni that was considered for residential development was suitable for residential development from a geotechnical perspective. Only small pockets of land situated on the north-eastern boundary of the Emfuleni were deemed unsuitable for residential development due to dolomite conditions. The environmentally sensitive areas, situated within the north-eastern quadrant of the Emfuleni and mostly comprising ridges and river, impact on residential development within this part of Emfuleni.

As depicted by the Table below, it was estimated that Emfuleni requires approximately 1900ha of land for residential development during the period 2017-2020. It requires an estimated additional 1600ha of land for residential development during the period 2020-2025. A measured oversupply of land is made available for residential development within Emfuleni to counter high land values, which is often associated with the severe restriction of land available for urban expansion.

TABLE 29: RESIDENTIAL LAND ALLOCATION

Area	Year 2017-2020 Need (ha)	Year 2017-2020 Allocated (ha)	Year 2020-2025 Need (ha)	Year 2020-2025 Allocated (ha)
Residential expansion	1882,3	3264,2	1596,9	1752,6

Source: Urban Dynamics Gauteng, 2017

Despite the fact that Emfuleni has large tracts of land available that are suitable for urban development, the thoughtless use of this land remains unacceptable. Urban expansion within Emfuleni needs to occur in a controlled and consolidated manner to prevent urban sprawl and the negative impacts associated with urban sprawl. Some negative impacts of urban sprawl include high bulk services development cost due to long infrastructure runs and high public transport costs due to low commuter patronage associate with low densities. It is therefore imperative that the land which is made available for residential purposes within Emfuleni be optimally used. This is primarily achieved by applying higher residential densities, which uses less land and consequently limits urban sprawl.

Emfuleni has large tracts of land that are potentially available for residential expansion, as well as a number of infill sites that can be utilized for residential purposes. Most of the proposed expansion areas are located along the Vereeniging-Johannesburg commuter railway line. The development of these areas for higher-density residential purposes can significantly strengthen the existing Vereeniging-Johannesburg commuter railway line and greatly assist in the viable operation of this commuter rail system. There are basically 4 residential expansion areas that have been identified within Emfuleni. These areas are depicted on Figure 23 and are as follows:

a. Johandeo, Golden Gardens and Cyferpan

Johandeo and Golden Gardens are townships that are currently being planned. These townships, including the planned Cyferpan development, is located west of the Sebokeng CBD and the K45 (Golden Highway) and basically constitute the westward expansion of Sebokeng up to the N1 freeway. Johandeo, Golden Gardens and Cyferpan are affordable housing developments. The first phases of Johandeo and Golden Gardens have been completed with the following phases in its planning stages. Golden Gardens will provide approximately 7000 housing units once completed. The first phase of

Johandeo yielded approximately 2000 housing units. Because the first stages of these townships have been implemented, bulk services have already been constructed to services these townships.

b. Lethabong and Tshepiso

Lethabong and Tshepiso is a residential expansion area that straddle the Vereeniging-Johannesburg commuter railway line. The primary advantage of this residential expansion area is that it has excellent access to road and rail infrastructure. This transportation network includes the K180 arterial, which links the expansion area to Moshoeshoe Road (K53). Moshoeshoe Road that traverses Sebokeng and the Sebokeng CBD. In addition, the Vereeniging-Johannesburg commuter railway line links this residential expansion area to Sebokeng, Orange Farm and Johannesburg to the north, and to the Vereeniging CBD in the south. Logically, this transportation network will provide good accessibility and modal choice to the residents that will reside in this residential expansion area. This makes the Lethabong and Tshepiso residential expansion area highly suitable for higher-density housing typologies (such as duplex housing and walk-ups) linked to public transport. Higher-density housing typologies can be located at the planned railway stations of the Vereeniging-Johannesburg commuter railway line, as well as next to the K180 arterial. In particular, future intersections between the K180 and collector roads can be utilized for higher-density residential purposes.

Another advantage of the Lethabong and Tshepiso residential expansion area is that it is currently the focus area for affordable housing development within the Emfuleni. Some of these developments are already at implementation stage, such as the Tshepiso Extensions, and others are already at a detailed planning stage, such the Lethabong extensions. The Lethabong extension will provide approximately 6000 affordable housing units once completed. The Tshepiso extension will provide approximately 4000 affordable housing units once completed. The first phase of Tshepiso (Extension 3) yielded approximately 1500 housing units. Bulk municipal services infrastructure has already been constructed to service the Tshepiso affordable housing development.

c. Sonlandpark

The Sonlandpark residential expansion area is located north of the K180 and comprise the parcels of land situated west and east of Sonlandpark. This expansion area includes the Unitas Park Agricultural Holdings, which can be densified by converting these agricultural holdings into cluster housing. This expansion area is largely earmarked for the longer-term expansion of Vereeniging and Sebokeng. The K180 will be the central spine serving this residential expansion area, linking this residential expansion area to Sebokeng in the north and the Vereeniging CBD in the south. This transportation spine can become the primary focus area for higher-density residential development (such as cluster housing), because of the

good accessibility that this spine will provide. The Sonlandpark residential expansion area will most likely be developed with a mixture of bonded and affordable housing developments.

d. Bophelong

The Bophelong residential expansion area straddles the P155, which intersects with the N1 freeway. The expansion area comprises two parcels of land; the one located north of Bophelong and the other located on the disused airfield located west of Bophelong. The primary advantages of this residential expansion area are that it has excellent access to road infrastructure and it is located in close proximity to the Vanderbijlpark CBD and the Mittal Steel industrial area. This locality will thus give the future residents of this expansion area good access to economic and social opportunities. Higher-density housing typologies (such as walk-ups) can be located next to the P155 arterial. In particular, future intersections between the P155 and collector roads within the expansion area can be utilized for higher-density residential purposes.

e. Lochvaal and Mantevrede

The Mantevrede Agricultural Holdings is situated on the P155 freeway. Lochvaal Barrage is situated west of these Agricultural Holdings along the Vaal River up to the N1 freeway. This is a sought-after weekend holiday area associated with the recreation value of the Vaal River. Consequently, this predominantly agricultural holdings area is coming under increasing pressure for redevelopment at higher residential densities. Development of this area will not only provide for the development of the Vaal River waterfront, but it will also enable the densification of the corridor that is emerging along the P155 freeway.

Infill sites for residential development have been identified within the existing residential areas of Vanderbijlpark and Vereeniging. An advantage of developing these infill sites are that most of them already have access the bulk municipal services infrastructure, thus only requiring limited infrastructure upgrading to develop these sites. There are primarily 3 residential infill sites that can be identified within Emfuleni. These sites are depicted on Figure 23 and are as follows:

a. Vanderbijlpark and Boipatong

The undeveloped strip of land situated between Vanderbijlpark and Boipatong has for a long period remained undeveloped, despite it being well-located land. However, various parcels of land on this strip have been developed in recent year, with few parcels of land still remaining for development. The development of the remaining parcels of land will contribute to a more compact and integrated urban structure and the development thereof should thus be

encouraged. This infill land has good access to Westinghouse Boulevard and the road linking this land to Boipatong and Sharpeville.

b. Emerald Casino

A vacant land parcel is located northeast of the Emerald Casino, which stretches up to the K174 (Barrage Road). This land is located near the Vaal River and will most likely be developed as higher-density, bonded and rental housing. As such, these housing units can become rental housing for students attending the Vaal University of Technology. Part of the land is owned (and partly used) by the North-West University and will therefore be reserved for tertiary educational purposes in future. This land has access to Hendrik van Eck Boulevard and Ascot on Vaal Road, which integrates this infill land parcel with the surrounding residential areas of Vanderbijlpark. This land parcel also has access to the emerging Secondary Urban Activity Node situated at Marco on the intersection of Barrage Road and Ascot on Vaal Road.

c. Tshepong and Roshnee

This report has indicated in a previous section that there is not enough demand for urban expansion within Emfuleni to 'fill up' and consolidate development between Sonlandpark and Roshnee. Consequently, no proposal is made to open up the land between Sonlandpark and Roshnee. However, to obtain a measure of consolidation, it is proposed that the land that is available between Roshnee and Tshepong be filled in. This proposed infill development is located on, and will have access to, the K47 and K11 intersection.

5.1.2. BUSINESS DEVELOPMENT

Emfuleni has 3 Central Business Districts (CBDs) serving the municipal area. These are the established Vanderbijlpark CBD, the established Vereeniging CBD and the emerging Sebokeng CBD. Both the Vanderbijlpark CBD and the Vereeniging CBD have large concentrations of retail and office space. Much of this retail and office space has become vacant in recent years due to the decentralization of retail and office space to suburban areas of Emfuleni, such as along Barrage Road. Steps need to be taken to revitalize these established CBDs through the upgrading of existing infrastructure.

The Vereeniging CBD needs to become the primary CBD within Emfuleni. This is necessary to establish Emfuleni as a metropolitan within Gauteng. In other word, the Vereeniging CBD must become what the Johannesburg CBD is for Johannesburg and the

Pretoria CBD in for Tshwane. To become a metropolitan area, the public transport network of Emfuleni must converge on this CBD to reinforce its position as the primary CBD within Emfuleni. The Vereeniging-Johannesburg commuter railway line terminated at the Vereeniging CBD. In addition, the Vereeniging CBD has access the K174 (Voortrekker and Barrage Road), which is a proposed public transport route serving Emfuleni.

In addition to the above, the Vereeniging CBD needs to expand to establish the Vereeniging CBD as the primary CBD within Emfuleni. The Vereeniging CBD can expand south-westwards, unto the site situated between Powerville and the Vaal River. This is the site currently planned as the River City development. It is important that this expansion area be integrated and attached to the existing Vereeniging CBD to ensure that it is developed as a single node. The Vereeniging CBD (as proposed above) will have direct access to the Vaal River and can therefore be developed as a waterfront development. This in turn will enhance the viability and attractiveness of this CBD. To enable a waterfront development, streets and buildings within the CBD and its expansion areas will need to be oriented towards the river to integrate the river with the node.

The Sebokeng CBD is an emerging Central Business District within Emfuleni. Existing land uses within this CBD, such as the Sebokeng Hospital and a newly-built regional retail centre, provide a strong platform for the further development of the CBD. The Sebokeng CBD requires further strengthening through the development of addition retail and office space within this CBD, as well as the development of higher-density housing component to complete the land use mix within the CBD.

In addition to the CBDs mentioned above, a lower-order nodal structure needs to be established within Emfuleni that taps into the public transport network. To enable this, a regional business node structure is proposed, comprising of 5 existing and 4 proposed regional business nodes. The existing regional business nodes include, amongst others, the business node located in Three Rivers, the business nodes on the K174 (Barrage Road) located at the Vaal Mall and the Bedworthpark Shopping Centre, and the business node located west of Evaton situated on the K45 (Golden Highway). The land use composition of these existing regional business nodes need to be diversified by adding uses such as office, community facilities and high-density housing to its land use mix. The new regional business nodes proposed include Sonlandpark, Boitumelo, Kwaggastroom, Roshnee and Lochvaal. Retail and office space needs to be allocated to each of these nodes in accordance with the needs of the surrounding communities, the nature of its potential consumer base, and the location characteristics of the node.

It will be necessary to design and develop the regional business nodes mentioned above in a manner that leads to the integration of these business nodes with the surrounding residential neighbourhood that it serves, as illustrated in the neighbourhood model above. This implies developing an 'open' land use arrangement, which allows pedestrians to conveniently access the business node. Creating a closed-off, security estate development within these regional business nodes will certainly not contribute to a pedestrian environment and will limit the ability of surrounding communities to access these nodes. Importantly, the proposed

business nodes must have good access to public transport facilities where possible. If these nodes have access to public transport facilities, the node layout and buildings will need to be oriented towards these facilities and the major intersections carrying road-based public transport. The regional business node structure proposed above should stimulate diversified economic development within Emfuleni and enable residential development and densification within Emfuleni. In addition, the development of these business nodes will, if dealt with correctly, enhance the character and spatial legibility of Emfuleni.

The network of activity nodes set out above can be reinforced by a system of activity spines which connect these nodes to each other. These activity spines must be concentrated along Development Corridors comprising the Municipality's major public transport routes. Because the aim of these activity spines is to link activity nodes, these activity spines are essentially continuous linear infill areas that densify certain sections of a Development Corridor. It is important to limit these activity spines within Emfuleni, because nodal development along a Development Corridor (in a string-of-beads pattern) is a more desirable spatial form than activity spines. Nodal areas are more pedestrian friendly and better focus development on public transport stations or stops. In other words, it is important to rather focus development energy on specific nodal areas than activity spines. Activity spines can contain a range of business uses, such as office, motor trade, and commercial uses. Retail uses should preferably be limited to nodal areas.

5.1.3. INDUSTRIAL AND COMMERCIAL DEVELOPMENT

As depicted by the Table below, it was estimated that Emfuleni requires approximately 700ha of land for industrial and commercial development during the period 2017-2020 and an estimated additional 240ha of land for industrial and commercial development during the period 2020-2025. An oversupply of land is made available within Emfuleni for industrial and commercial development during these periods, simply by allowing existing, undeveloped or partly developed industrial and commercial areas to develop.

TABLE 30: INDUSTRIAL LAND ALLOCATION

Area	Year 2017-2020 Need (ha)	Year 2017-2020 Allocated (ha)	Year 2020-2025 Need (ha)	Year 2020-2025 Allocated (ha)
Industrial expansion	683,3	1068,7	234,3	500,7

Source: Urban Dynamics Gauteng, 2017

Figure 23 illustrates the land parcels within Emfuleni that are proposed for industrial development. Four industrial and commercial expansion areas are proposed within Emfuleni. These industrial and commercial expansion areas are as follows:

a. Leeuwkuil

Leeuwkuil is situated west of the Vereeniging CBD. It is an established industrial area, which is still largely vacant. It is proposed that the vacant industrial stands within this industrial area become occupied before additional land is made available for industrial and commercial development within Emfuleni. Leeuwkuil should be reserved for commercial and light industrial uses. Heavy industrial uses should be excluded from this development to avoid polluting uses next to the existing and proposed residential areas neighbouring this industrial area. The location of Leeuwkuil next to the P156 (R59) makes it suitable for commercial uses, which require visual access from major roads. The Leeuwkuil industrial area has access to the K53 arterial, which connects this industrial area to the Vereeniging CBD and Sebokeng.

b. Boipatong

The proposed Boipatong industrial area is situated within the triangle bordered by the K45 (Frikkie Meyer Boulevard), K180 (Houtkop Road) and the K178 (Boy Louw Street). These roads provide this proposed industrial area excellent accessibility. The development of this industrial area will constitute the northeastward expansion of the Mittal industrial area, creating an industrial band stretching from the P155 (Golden Highway) to the Vereeniging-Johannesburg railway line. The proposed Boipatong industrial area can be made available for commercial and light industrial uses.

c. Cyferpan

The Cyferpan industrial area is a small industrial area proposed on the intersection of the K178 (Boy Louw Street) and the K45 (Golden Highway). This industrial area will in future be traversed by the PWV20 freeway. The part of this proposed industrial area located between the freeway and Mittal, can be used for heavy industrial and commercial uses. The part of this industrial area located between the PWV20 freeway and the K178 should be used for commercial and light industrial uses to enable a better interface between this industrial area and Sebokeng. Both these portions will have access to the K45 (Golden Highway).

d. Sebokeng CBD

The Sebokeng CBD comprises a small industrial area, situated on Moshoeshoe Road. This industrial area is still largely vacant, comprising only a small number of SMME-type industries. It is proposed that the vacant industrial stands within this industrial area be developed as hive-industries, which can be rented out to the local population of Sebokeng and Evaton. This will further support SMME development within this part of Emfuleni. The massing and height of these industrial buildings can effectively be used to create urban form and character within the Sebokeng CBD.

The industrial and commercial areas proposed above are intended to help generate employment opportunities in Emfuleni and thereby reducing the need for Emfuleni residents to travel large distances to access such employment opportunities in other parts of Gauteng. Providing industrial and commercial land within Emfuleni will also address the current problem in Emfuleni whereby small holding owners are applying for industrial and commercial in parts of Emfuleni that will diminishes the aesthetic and environmental qualities of the municipal area. If industrial development on agricultural holding were to be encouraged or allowed, it will negatively impact on future residential expansion within Emfuleni, as well as the ability of the municipal area to promote other industries within Emfuleni, such as tourism.

5.1.4. AGRICULTURE

As was mentioned in the Status Quo section of this report, most of the high-potential agricultural soils found within Emfuleni are located within the southwestern quadrant of Emfuleni, in the vicinity of Lochvaal Barrage and Vaal Oewer. GDARD has demarcated this region of Emfuleni as a provincial Agricultural Hub. Consequently, the properties that are located within the demarcated Agricultural Hub are designated for rural residential purposes only. Township establishment is therefore not permitted in the area; be it for residential, commercial or industrial purposes. All land uses to be permitted within this Agricultural Hub are subject to the guidelines and regulations of the Gauteng Agricultural Hub initiative.

Although the Emfuleni SDF supports the Emfuleni Agricultural Hub, it does not support the inclusion of the Mantevrede Agricultural Holdings and Lochvaal Barrage into the Emfuleni Agricultural Hub. Instead, the Emfuleni SDF supports the residential densification of the Mantevrede Agricultural Holdings and the limited residential densification of Lochvaal Barrage. The Emfuleni SDF has done so for the following reasons: (a) the existing Lochvaal Barrage Spatial Development Framework (2009) has already allowed residential densification within this part of Emfuleni, (b) there is a need for weekend holiday housing associated with the recreation value of the Vaal River, and (c) the area is no longer being used for commercial agricultural purposes.

The proposed extension of William Nicol Street up to Barrage Road will assist in opening up the Mantevrede area for residential densification. As will become apparent in a later section of this Emfuleni SDF, a regional activity node is proposed on the intersection of the P155 and Barrage Road, which is located in the Mantevrede area. The proposed extension of William Nicol Street up to Barrage Road will also assist in establishing this regional node by encouraging the development of residential-supporting land uses within this node, such as retail and office development.

The Emfuleni SDF also does not support the inclusion of the strips of land on either side of the P155 (including the Emfuleni Airport) into the Emfuleni Agricultural Hub. Instead, the Emfuleni SDF supports the development of residential, commercial, industrial and logistics uses along the road. The reason the Emfuleni SDF excludes these land parcels from the Agricultural Hub is because the P155 is a primary access road and gateway to Emfuleni from the N1 freeway. Consequently, the development pressure on these land parcels situated along the P155, which is caused by this access road, makes it unreasonable not to open up these land parcels for development.

Apart from the farmland protected as part of the Emfuleni Agricultural Hub, a number of pockets of high-potential agricultural soils are scattered throughout the rest of Emfuleni, and in particular the Sonlandpark region. The scattered nature of the high-potential agricultural soils, as well as the fact that they are located within or near existing urban areas, reduces the legitimacy of protecting these high-potential agricultural areas for agricultural purposes. As a result, it is proposed that these pockets of land be considered for urban development and expansion, as and if required by the Land Use Budget of the Emfuleni SDF. Consideration can be given to retain these pockets of high-potential agricultural soils within township layouts for urban agricultural purposes. Urban agriculture is the practice of cultivating, processing and distributing food in or around urban or peri-urban areas. Urban agriculture is generally practiced for income-earning or food-producing activities by communities. If urban agriculture is therefore considered, it should only be considered if the local communities are in need of such agricultural activities.

5.1.5. OPEN SPACE CONSERVATION

An open space system fulfils a number of functions. These functions include hazard avoidance, resource conservation, ensuring community well-being and educational (see Table below). Open space and recreation within Emfuleni can be divided into 2 categories: passive and active open space. Passive open space consists of land that is unsuitable or undesirable for urban development due to topographical factors, ecological constraints or for flood protection. Active open space involves the recreational component of the open space system and is dealt with at a later stage in this report.

TABLE 31: FUNCTIONS OF AN OPEN SPACE SYSTEM

Hazard avoidance	Resource conservation	Recreational and psychological	Educational
Open spaces must reserve flood prone areas.	Open spaces must protect water sources.	Developed and maintained open space must be provided for recreational purposes.	Open spaces must be protected for environmental education purposes.
Open spaces must reserve steep slopes and geologically unstable ground.	Open spaces must protect linked areas of conservable indigenous vegetation.	Open space must be provided for community interaction and as symbols of community identity.	Well-equipped and designed open spaces must be provided for sport education.
Open spaces should protect drinking water sources from being contaminated.		Open spaces must be protected for psychological relief from the stresses of urban live.	

Source: Urban Dynamics Gauteng, 2017

The open space network proposed for Emfuleni is depicted on Figure 24. Emfuleni contains a number of rivers, which in turn flow into the Vaal River. Apart from the Vaal River, 3 rivers are of importance within Emfuleni: the Klip River, which flows from Meyerton towards Three River, the Rietspruit, which flows past the western boundary of Sebokeng towards Lochvaal Barrage, and the Leeuspruit that flows from Carltonville into the Rietspruit. The conservation of the Rietspruit is of utmost importance. This importance is not only due to ecological reasons, but also because it provides the neighbouring communities of Evaton and Sebokeng a vital psychological connection to the natural environment.

The conservation of the Emfuleni river system is also necessary for hazard avoidance. To this end, it is imperative that the natural drainage channels and banks of all the rivers within Emfuleni, as well as their tributaries, be protected up to the 100-year flood line. This will protect Emfuleni communities from flooding; while at the same time ensure the protection of the ecological status of the river embankments, which is necessary for flood management.

Apart from the Vaal River, the Sharpeville Dam is arguably the most ecologically valuable natural area within Emfuleni, especially when considering its gateway location within Emfuleni. The conservation of this natural open space is therefore important. A characteristic of the Sharpeville Dam is that it has a rich birdlife, which needs to be protected. To do this, it is necessary to maintain reasonable open space buffer zones around the dam. In addition, it is necessary to retain a spatial linkage between the Sharpeville Dam and the Vaal River; this is despite the fact the Barrage Road already severs this linkage.

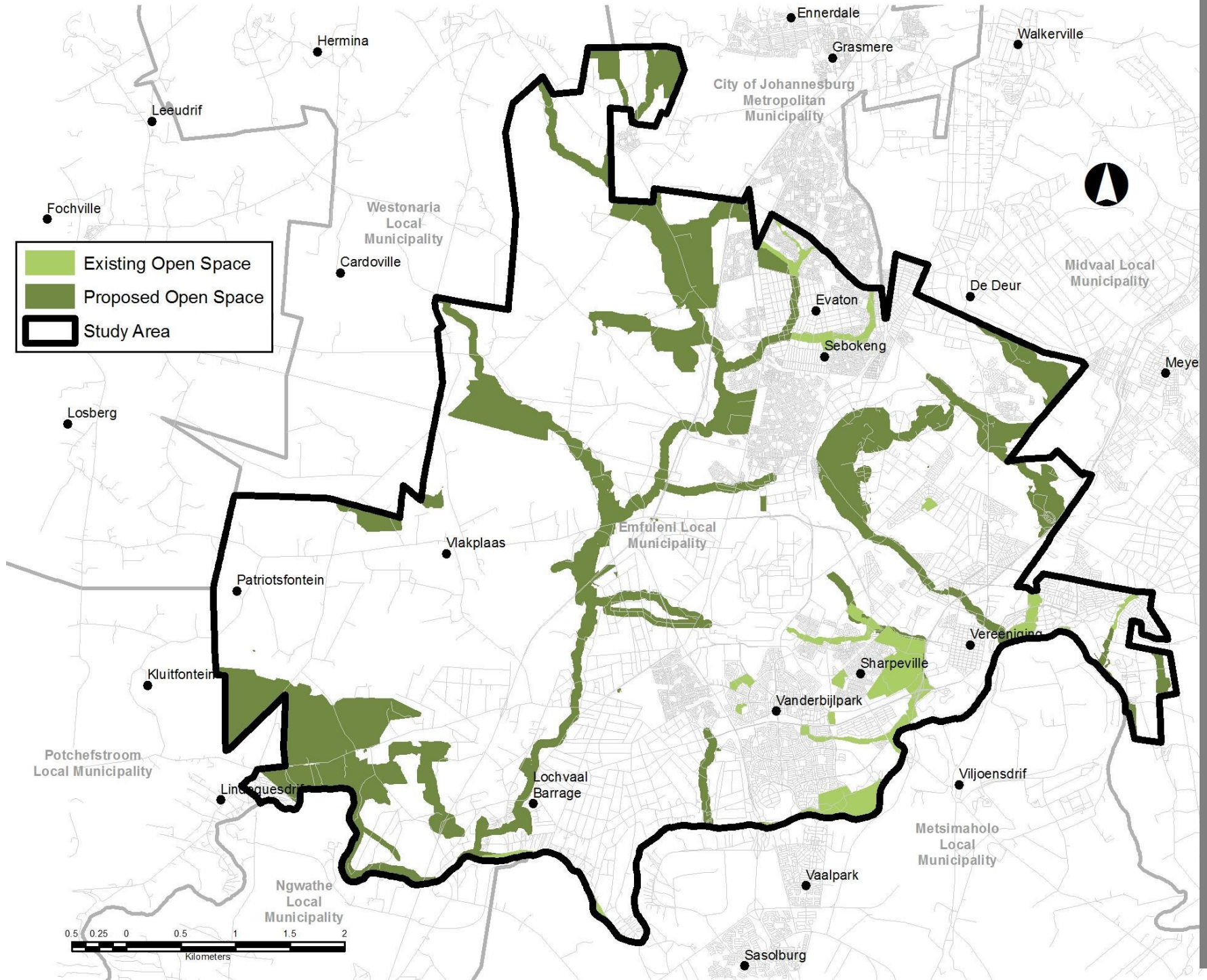


FIGURE 24 | PROPOSED OPEN SPACE NETWORK



The Emfuleni SDF proposes corridor development along Barrage Road, which could potentially affect the Sharpeville Dam and open space buffer zones around the dam. The Emfuleni SDF therefore emphasizes that land use development along the Barrage Road corridor take cognizance of the Sharpeville Dam and its buffer zone, as well as the spatial link between the Sharpeville Dam and the Vaal River. In turn, retaining and protecting the Sharpeville Dam open space will provide a suitable and aesthetically pleasing gateway to Emfuleni, which should benefit Emfuleni as a whole.

5.1.6. SDF LIMITATIONS

Although an attempt was made to point out the constraints affecting Emfuleni, it has to be stressed that localized constraints could emerge once a site that is earmarked for development is investigated in more detail. Also, it may be that the constraints are more prohibitive than assumed in this report. Such issues may surface during the EIA process, during the township establishment application process, or during the construction phase, when building foundations are investigated. The following development constraints could emerge during these phases:

- Geotechnical conditions: Good geotechnical conditions underlie most of Emfuleni that is proposed for urban development, thus not prohibiting urban development. However, it may be that localized areas within Emfuleni may have geotechnical conditions that are not suitable for building construction, or would require specialized building foundations that may increase building cost.
- Municipal services: Besides the bulk municipal services network capacity (which was not been determined in this study) there may be localized areas within Emfuleni that cannot be directly linked to the bulk network due to topographical constraints or other factors. To address this may require, for example the installation of sewerage pump stations, which could possibly become a condition for development in such areas.
- Flooding: Although the protection of floor areas within Emfuleni have been taken into account in the open space network proposed in the Emfuleni SDF, it may be that certain properties within Emfuleni, which are located outside of this open space network, are subject to flood conditions.
- Environmental constraints: Although the open space network has taken environmental constraints into account; localized environmental constraints could affect properties or portions of properties that are not located within these open spaces. Such environmental constraints could surface during site visits associated with applications for land use change.

- High-potential agricultural soils: High-potential agricultural soils to be protected have been pointed out in the Emfuleni SDF. However, this does not preclude GDARD to require the protection of localized pockets of high-potential agricultural soils, which could affect the manner and extent to which a property can be developed.

5.1.7. URBAN DEVELOPMENT BOUNDARY

Demarcating an Urban Development Boundary has numerous advantages, the primary being to prevent unchecked urban sprawl. Urban sprawl is undesirable because it increases pressure on local government resources to provide extended public transport routes and municipal services infrastructure networks. An Urban Development Boundary can also protect valuable agricultural soils and ecologically sensitive areas from urban encroachment. Demarcating an Urban Development Boundary also has drawbacks. For example, it can restrict the supply of land for urban development within a municipal area, which could inflate land prices within the Urban Development Boundary or it can place undue pressure on Municipalities to make land available for development. Care should therefore be taken when demarcating an Urban Development Boundary. A balance should be reached between providing enough land for urban development and the need for sustainable, cost-effective and managed urban development.

An Urban Development Boundary is proposed for Emfuleni, which is illustrated on Figure 25. The proposed Urban Development Boundary was first and foremost demarcated based on the Land Use Budget estimates for settlement and industrial expansion within Emfuleni. The Urban Development Boundary allows urban expansion within Emfuleni up to the year 2025. The Urban Development Boundary does not allow Emfuleni to sprawl beyond the spatial limits required by the estimated population growth of Emfuleni up to the year 2025. At the same time, it ensures that enough land is available within the proposed Urban Development Boundary to cater for the estimated growth within Emfuleni up to the year 2025. Apart from population growth, other principles used to demarcate the Urban Development Boundary include the following:

- The containment of the urban sprawl and achieving urban integration and continuity through infill development and densification
- The creation of urban corridors along public transport routes, such as Vereeniging-Johannesburg commuter railway line and Barrage Road
- The integration of existing and planned affordable housing projects with activity areas in Emfuleni
- The availability of bulk services and avoiding the cost implications of establishing new infrastructure for new townships in remote or isolated areas of the municipality

- Avoiding urban expansion over unsafe geological conditions
- The conservation of environmentally sensitive areas and the protection of high-potential agricultural soils

The demarcation and alignment of the Urban Development Boundary specifically aimed to achieve the following spatial development objectives:

a. Utilising existing municipal infrastructure

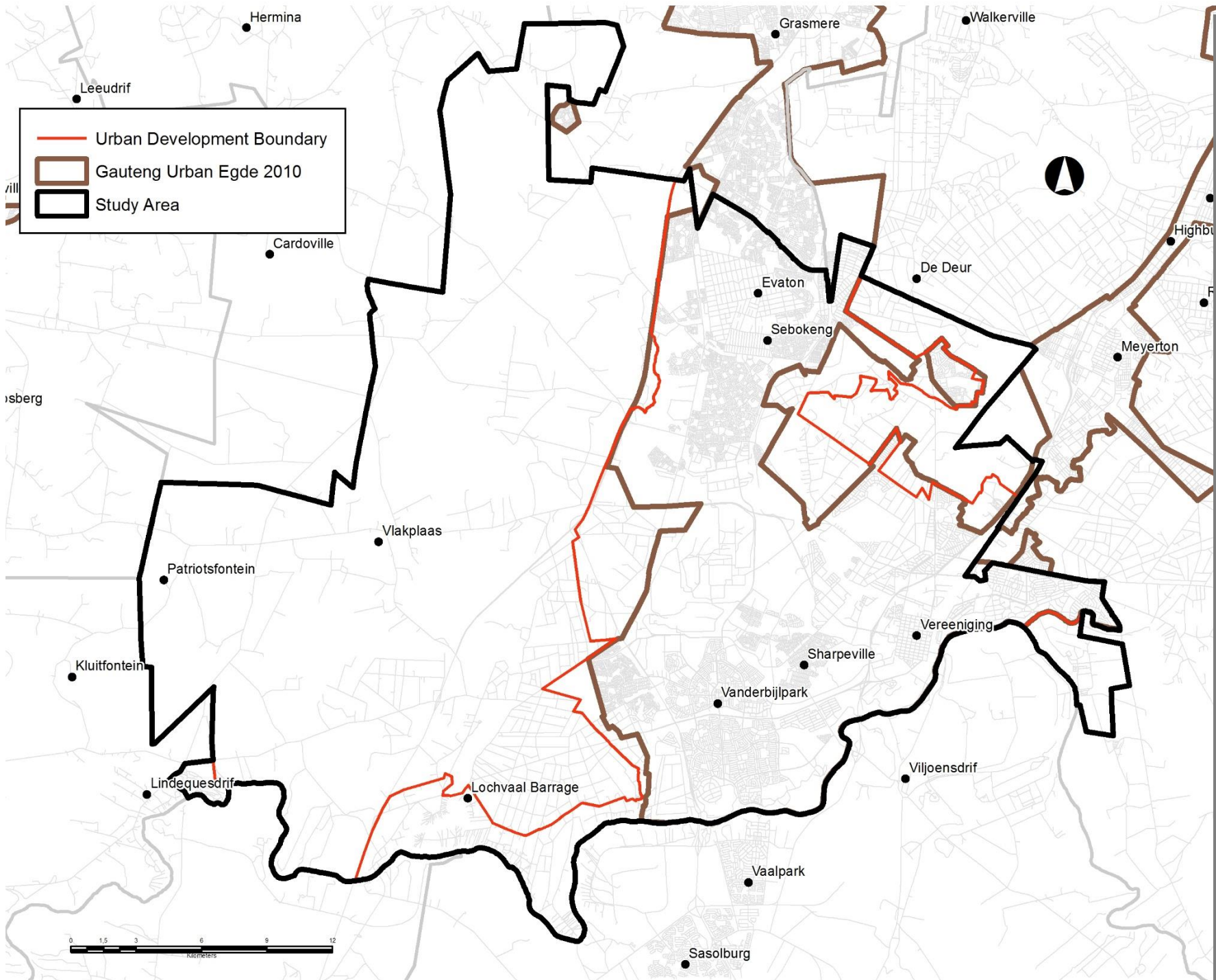
Emfuleni is currently experiencing major challenges with regard to providing municipal services to support urban expansion within the municipal area. It is therefore imperative that municipal services infrastructure expansion is rationalized in order to limit the cost of funding such expansion efforts. The Urban Development Boundary therefore aims to consolidate urban development and expansion in areas where bulk municipal services infrastructure already exists or where bulk municipal services infrastructure can easily be connected to existing bulk municipal services infrastructure network.

b. Strengthening the Vereeniging-Johannesburg commuter railway line

A primary aim of the Urban Development Boundary is to strengthen the Vereeniging-Johannesburg commuter railway line corridor, as envisaged in the Development Concept. The densification of the agricultural holdings and residential expansion areas in the Sonlandpark area in particular will strengthen this commuter railway line corridor. Therefore, the Urban Development Boundary allows for residential expansion in the Sonlandpark and Boipatong areas, and the further densification of the Unitas Park agricultural holding areas.

c. Promote the linking of Sebokeng to Vanderbijlpark

The primary aim for the Urban Development Boundary is to allow for the development of existing affordable and bonded housing initiatives within Emfuleni to proceed, especially where such developments encourage the linking of Sebokeng to Vanderbijlpark and Vereeniging. This includes, amongst others, the further development of the Sebokeng CBD, the completion of the Golden Gardens and Johandeo extensions west of the Sebokeng CBD, and the completion of the Lethabong extension east of the Sebokeng CBD.



- Urban Development Boundary
- Gauteng Urban Egde 2010
- Study Area

FIGURE 25 | URBAN DEVELOPMENT BOUNDARY



d. Limiting urban expansion along the Vaal River

The Mantevrede Agricultural Holdings and Lochvaal Barrage are situated along the Vaal River, between the N1 freeway and the P155 freeway. This is a sought-after weekend holiday area associated with the recreation value of the Vaal River. Consequently, this predominantly agricultural holdings area is coming under increasing pressure for redevelopment at higher residential densities. The Urban Development Boundary Development allows for the densification of this area in order to provide for the development of the Vaal River waterfront. This is in contraction with the Agricultural Hub Initiative of GDARD, which has identified this part of Emfuleni to be protected for commercial farming purposes. However, the Urban Development Boundary Development allows for this contradiction for the following reasons: (a) the existing Lochvaal Barrage Spatial Development Framework (2009) has already allowed residential densification within this part of Emfuleni, (b) there is a need for weekend holiday housing associated with the recreation value of the Vaal River, and (c) the area has for some time no longer been used for commercial agricultural purposes.

TABLE 32: LAND USES AFFECTED BY THE URBAN DEVELOPMENT BOUNDARY

Inside Urban Development Boundary	Outside Urban Development Boundary
Urban settlements	Extensive and intensive agriculture areas
Estate development	Conservation areas and nature reserves
Business and office nodes	Tourism facilities and related activities
Industrial and commercial areas	Agricultural holdings
Governmental uses	

Source: Urban Dynamics Gauteng, 2017

A guideline for the type of land uses to be allowed inside and outside of the Urban Development Boundary are depicted in the Table above. As a rule, the Urban Development Boundary applies to all developments requiring a township establishment application, not allowing such development beyond (outside) the Urban Development Boundary.

5.1.8. LAND USE AND TRANSPORTATION INTEGRATION

Land use and transportation integration forms the backbone of an efficient urban structure. It not only ensures the cost-effective operation of the municipal area's public transport system, but it also tends to limit urban sprawl by concentrating urban development at higher densities close to public transport routes. In addition, the mixing of land uses creates a better relationship

between areas of residence and employment, which can lead to shorter commuter distances and a better two-way use of transport infrastructure.

5.1.8.1. Transit Orientated Development (TOD)

The key to successful land use and transportation integration is obtaining higher land use densities at transit stations, such as commuter railway and bus stations. These are the points where access is obtained to the public transport systems and attempts should thus be made to optimally use these strategic locations. This can be done by locating higher-density land uses around these transit stations. This is known as Transit Oriented Development (TOD), which is essentially a node that is centred on a transit station. These higher-density land uses need to be located within walking distance of the transit station, which is generally accepted to be 400m from a station. This distance can also be considered the peripheral boundary of a TOD. In general, the elements that make up a TOD are (see Diagram below):

- A walkable design which considers pedestrians the highest form of movement
- A commuter rail station or bus station or minibus taxi rank as the central land use element of the TOD
- A mixture of land uses in close proximity of the transit station, including office, residential, retail, and community uses
- Higher-density, high-quality housing development within a 4-minute walk radius (400m) surrounding the transit station

TODs can essentially be implemented in one of two ways: TODs located within an existing township, forming part of a brownfield development, and TODs forming part of a new town development. TODs located within an existing township will involve the development of vacant stands that are within walking distance of a transit station with TOD-related uses, such as retail and higher-density housing. TODs located within existing townships are ideal for use as part of urban renewal initiatives. The Sebokeng CBD and its commuter railway station is an area that can typically be developed in this manner.

TODs associated with new-town development involves the deliberate planning, design and construction of TOD-structures as part of a new town development. Because these TODs are new developments, the opportunity exists to apply TOD principles to the design of these TODs from the start. Consequently, such TODs will better integrate land use and public transport than would TODs created within existing townships. Development of a TOD around the planned Sonlandpark commuter railway station presents such an opportunity in Emfuleni.

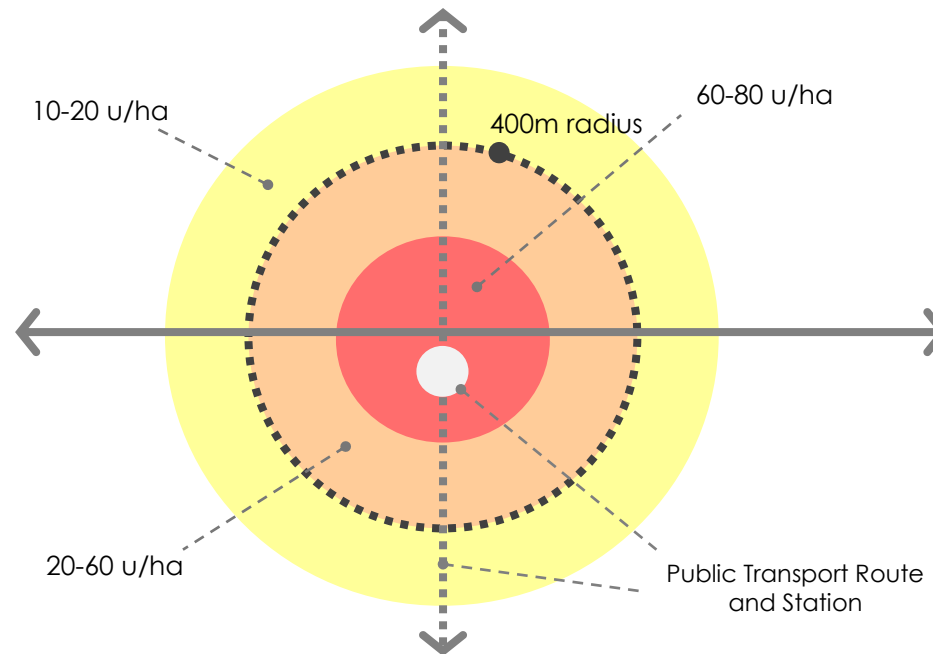


DIAGRAM 20: TOD DESIGN

Transit Orientated Developments or TODs are best applied using a string-of-beads development pattern. A string-of-beads development pattern is usually shaped by a major public transport route or commuter railway line, concentrating development (TODs) at intersections or transit stops or railway stations along the spine (see Diagram below). Consequently, the string-of-beads settlement configuration is ideal for the operation of public transport systems. Such a string-of-beads settlement patterns can potentially be developed along the Vereeniging-Johannesburg commuter railway line.

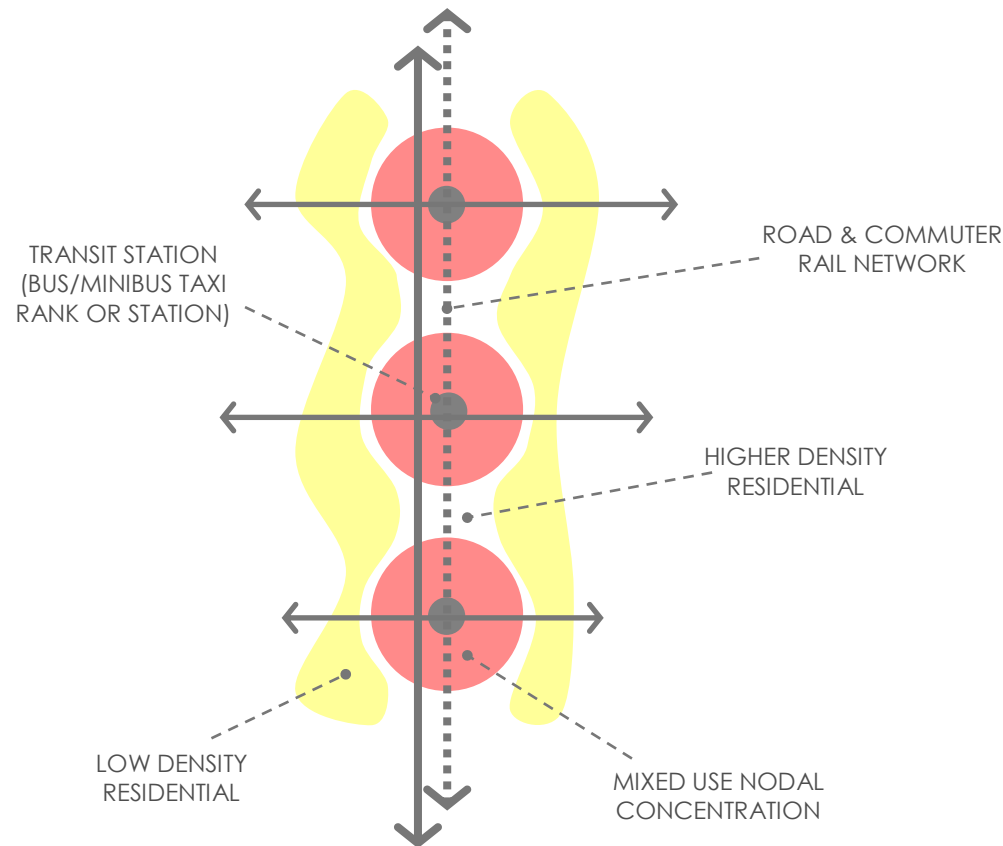


DIAGRAM 21: STRING-OF-BEADS CONFIGURATION

The scale of the string-of-beads settlement configuration can vary. At its largest scale, it can extend from one city to another. At a more local scale it can extend from one neighbourhood to the next. The degree to which this development pattern is identifiable within an urban area is often dependent upon whether it is deliberately promoted through development policies (such as the SDF) or not. Policies that aim to develop an urban area that promotes the use of public transport, often exhibits a more defined string-of-beads development pattern, than an urban area that promotes the use of private vehicles.

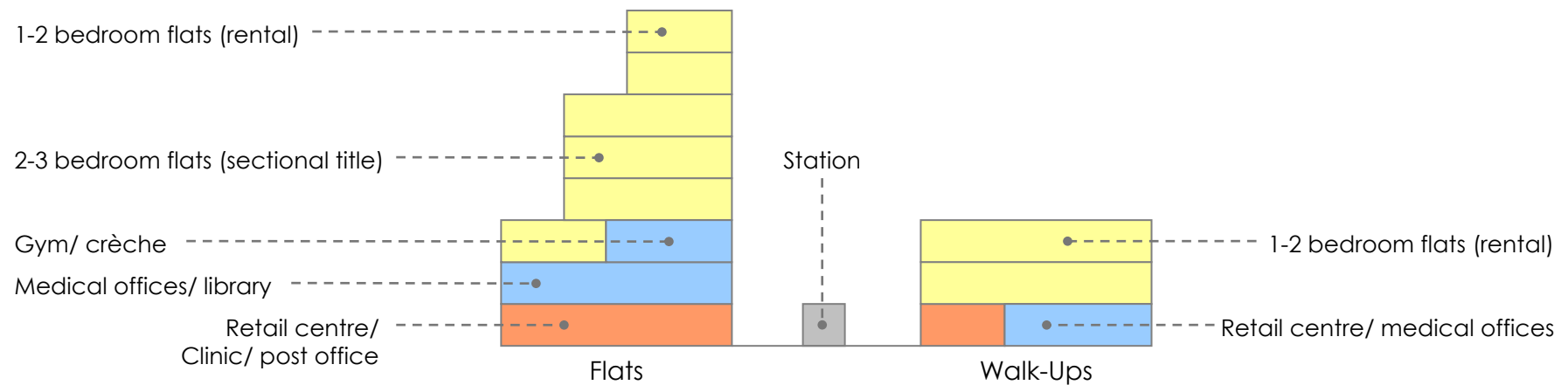


DIAGRAM 22: VERTICAL LAND USE MIXED-USE

Public transit is best supported within TODs if both higher densities and a land use mix are employed. Simply increasing densities in an area may do less to improve accessibility if not mixed with other uses, such as shops and public amenities. Land uses can be mixed horizontally or vertically. Whereas the horizontal mixing of land uses is usually found in predominantly residential areas, the vertical mixing of land uses is more suited for CBDs, where transit-accessible land is limited, not allowing the development of certain uses on ground level. The Diagram above provides a conceptual illustration of the vertical mixing of land uses.

Another key to the development of TODs is the manner in which land uses within TODs are integrated with the public transport station or stops located within these TODs. This involves creating pedestrian-friendly environments within TODs, using pedestrian walkways and public spaces, and using these pedestrian elements to link the public transport stations and stops to the surrounding land uses within the TODs. A grid road and pedestrian network best suites pedestrian movement within a TOD.

5.1.8.2. Proposed Development Corridors

As mentioned above, a string-of-beads pattern is the desirable pattern, because it enables the integration of land use and public transport. A string-of-beads pattern concentrates development along public transport corridors, terms Development Corridor (see Diagram below). Development Corridors aim to intensify and mix land use development along public transport route to support

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

and provide access to these public transport routes. Development Corridors also aim to connect residential communities to economic areas and opportunities, thus encouraging economic sustainability and growth within a municipal area.

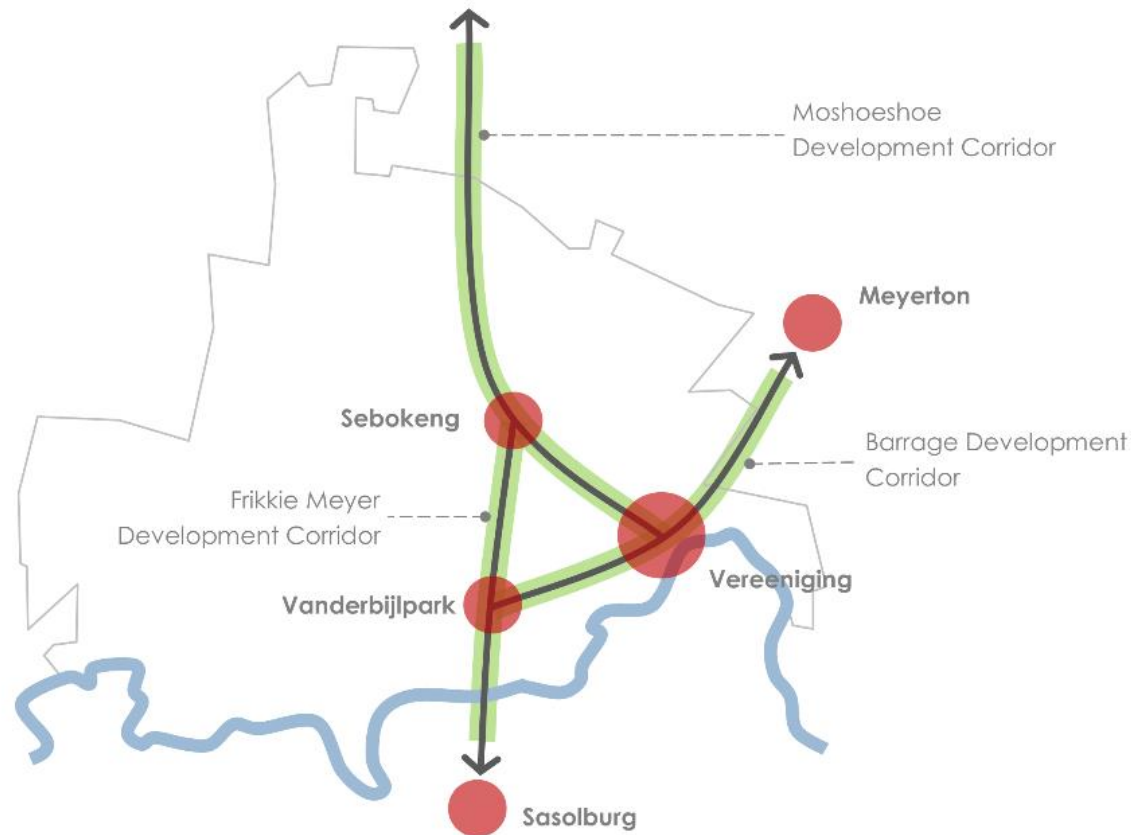


DIAGRAM 23: DEVELOPMENT CORRIDORS

The Emfuleni SDF proposes a number of Development Corridors for the Emfuleni municipal area. As explained previously by the Development Concept, these Development Corridor aim to connect the major nodes within the municipal area (such as the Sebokeng CBD and the Vereeniging CBD) and node directly outside the municipal area (such as Meyerton and Sasolburg) using

existing and planned public transport infrastructure within the region. The Development Corridors also aim to integrate outlying residential areas (such as Evaton and Sebokeng) to the economic core (Vereeniging CBD) of the municipal area. The following three Development Corridors are proposed for the Emfuleni municipal area:

a. Moshoeshoe Development Corridor

The Moshoeshoe Development Corridor is aligned along Moshoeshoe Road and the Johannesburg to Vereeniging commuter railway line. The aim of this corridor is to integrate outlying residential areas of Evaton and Sebokeng to the economic core of the municipal area, in particular the Vereeniging/ River City CBD. To enable this will require the densification of land on both sides of the commuter railway line, using higher-density residential typologies. In addition to this, it will be necessary to develop the emerging Sebokeng CBD in a major node along this Development Corridor. Smaller Nodes can be development on major intersection along Moshoeshoe Road, such as the node proposed in Evaton, and at commuter railway stations, such as the node proposed at the proposed Sonlandpark Station.

b. Vanderbijlpark Development Corridor

The Vanderbijlpark Development Corridor links the emerging Sebokeng CBD to the Vanderbijlpark CBD and to the Sasolburg CBD south of Emfuleni. The aim of this corridor is to establish a link between the mentioned activity nodes and therefor providing access to a number of economic areas in the region. It also aims to provide seamless access to the functional metropolitan area emerging within the region. Development within this corridor will require linking the street networks of Vanderbijlpark and Sasolburg across the Vaal River.

c. Barrage Development Corridor

The Barrage Development Corridor links the Vanderbijlpark CBD to the Vereeniging CBD and to the Meyerton CBD. This is the Development Corridor containing the bulk of economic activities within Emfuleni and it is expected to grow in economic strength in future. It is therefore imperative that the other corridors link to this corridor to allow all residents of Emfuleni to have access to these economic opportunities. The Barrage Development Corridor contains the proposed Vereeniging/ River City CBD, which will be the primary core area of Emfuleni and the emerging metropolitan envisaged. The Development of the River City proposal is of particular significance to the establishment of this corridor. This development will not only strengthen the Vereeniging CBD, but it will also develop a critical strip along the corridor, situated at the gateway to Emfuleni (P156/ K174 interchange)

Corridor development is the primary element of spatial development within Emfuleni. It is the only spatial configuration that can link the currently fragmented spatial structure of the greater Emfuleni region into a coherent spatial structure. Critical components of this proposed corridor development are the public transport network that is aligned along these Development Corridors, and the proposed Vereeniging/ River City CBD, that functions as the core area and focal point of the Development Corridors.

5.1.8.3. Proposed Transit Oriented Developments (TODs)



DIAGRAM 24: CORRIDOR TODs

TOD is a critical element of Development Corridors. It is TODs that give Development Corridors the string-of-beads spatial patterns, (see Diagram above). The locations of a TOD are governed by specific criteria, because the success of a TOD is largely depended upon its location. Based on the theoretical aspects set out above, the following guidelines were applied to determine suitable locations for TODs within Emfuleni area:

- TODs must be located on an existing or planned public transport route.
- TODs must utilize existing or planned transit stations or stops, such as commuter railway stations or bus stops.
- TODs should comprise vacant land areas to enable the development of transit-supporting land uses.
- Ideally, TODs should contain existing or planned kick-start facilities, such as retail centres.

Figure 26 depicts the existing and future SPTN routes and commuter rail stations within Emfuleni. As depicted by the Table below, eleven TODs are proposed for Emfuleni along the SPTN routes and at the commuter rail stations. Logically, the Vanderbijlpark CBD, the Vereeniging CBD and the Sebokeng CBD are existing TODs located within the municipal area. These TODs can be strengthened through infill development and the redevelopment of existing properties. This applies in particular to the Sebokeng CBD TOD.

The proposed southwestward expansion of the Vereeniging CBD into the site currently earmarks for the River City development, will strengthen the Vereeniging CBD to the extent that it can function as the emerging metropolitan area's primary node or core area. However, due to the size of the CBD an additional TOD can be identified serving the CBD at the River City development on Barrage Road. This will cause the enlarged Vereeniging CBD to develop a string-of-beads pattern along Barrage Road.

In addition to the above, a number of TODs are proposed at the various regional nodes proposed within Emfuleni, which also have access to the Vereeniging-Johannesburg commuter railway line or a proposed SPTN routes. The most notable of these proposed TODs is the one situated at the proposed Sonlandpark regional node and commuter railway station. This TOD will serve the greater Sonlandpark and Boipatong areas. This will be a new node, thus providing the opportunity to apply sound TOD principles to the design of this TOD from the start.

It is proposed that the TOD concept be embraced by Emfuleni and implemented over the long term. Practically, this will involve facilitating the development of land uses that support the TOD concept. Apart from the Municipal Town Planning Departments, institutions that should be involved in developing TODs are the transit agencies (Department of Transport, minibus taxi associations and bus companies), provincial departments (housing, health and education), private developers (e.g. retailers), financiers and the local community. Because the success of TODs requires committed stakeholders, these bodies should be involved in all the planning stages of TODs.

TABLE 33: PROPOSED ROUTES, STATION AND INTEGRATION

TOD Name	Public transport Route	TOD Location	Type of Land Uses Proposed
Vanderbijlpark CBD	Proposed Barrage Road and Golden Highway SPTN route	Centred on the proposed Vanderbijlpark CBD bus station	Mixed-business uses, including retail and office uses
Vereeniging CBD	Vereeniging-Johannesburg commuter railway line and Barrage Road SPTN route	Centred on the existing Vereeniging CBD commuter railway station	Mixed-business uses, including retail and office uses
River City Node (part of the Vereeniging CBD)	Proposed Barrage Road SPTN route	Centred on the proposed River City bus station	Mixed-business uses, including retail and office uses, as well as higher-density residential and community facilities
Sebokeng CBD	Vereeniging-Johannesburg commuter railway line	Centred on the Houtheuwel commuter railway station and minibus taxi rank	Mixed-business uses, including retail and office uses, as well as higher-density residential and community facilities
Bedworthpark Regional Node	Proposed Barrage Road SPTN route	Centred on the proposed Bedworthpark bus station	Mixed-business uses, including retail, big-box retail and office uses, as well as higher-density residential uses
Evaton Regional Node	Proposed Golden Highway SPTN route	Centred on the proposed Evaton bus station	Mixed-business uses, including retail and office uses, as well as higher-density residential uses
Three Rivers Regional Node	Proposed Barrage Road SPTN route	Centred on the proposed Three Rivers bus station	Mixed-business uses, including retail and office uses, as well as higher-density residential uses
Sonlandpark Regional Node	Vereeniging-Johannesburg commuter railway line	Centred on the proposed Sonlandpark commuter railway station	Higher-density residential uses and residential-supporting uses, such as retail and community facilities
Boitumelo Community Node	Proposed Golden Highway SPTN route	Centred on the proposed Boitumelo bus station	Higher-density residential uses and residential-supporting uses, such as retail and community facilities
Kwaggastroom Community Node	Vereeniging-Johannesburg commuter railway line	Centred on the Kwaggastroom commuter railway station	Higher-density residential uses and residential-supporting uses, such as retail and community facilities
Residensia Regional Node	Vereeniging-Johannesburg commuter railway line	Centred on the Residensia commuter railway station	Higher-density residential uses and residential-supporting uses, such as retail and community facilities

Source: Urban Dynamics Gauteng, 2017

5.1.8.4. Proposed Activity Spines

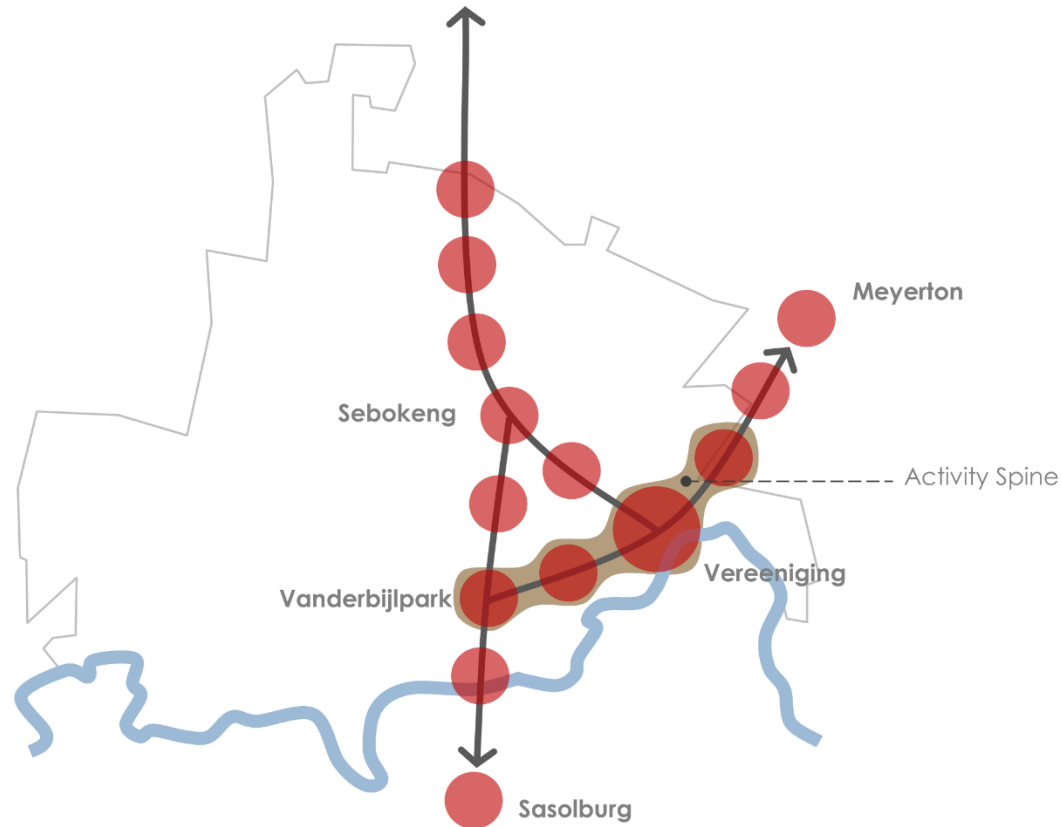


DIAGRAM 25: ACTIVITY SPINE

As mentioned above, the Emfuleni SDF has identified a number of corridors within Emfuleni. It also proposes a string of beads patterns to development these corridors. A string of beads pattern is the desirable pattern, because it concentrates development at public transport stops or station in pedestrian oriented spatial layouts. Despite this, there is a spatial tendency in Emfuleni to

develop linear strips of land along the development corridors in certain parts of Emfuleni. Such linear developments are generally considered to be a less desirable spatial form, because it tends to be vehicle oriented and therefore is difficult to pedestrianize.

Parts of Emfuleni that are under pressure for strip development include the land parcels along Barrage Road and General Hertzog Road. To avoid having to fight the pressure for strip development along these roads, the Emfuleni SDF opts to provide guidelines for the development of these strips in a manner that is still spatially acceptable. The Emfuleni SDF terms these strips Activity Spines and these are defined as: 'linear strips of land along a Development Corridor connecting activity nodes' (see Diagram above). The Emfuleni applies the following development objectives to Activity Spines:

- Activity Spines do not constitute the entire Development Corridor, but only parts thereof
- Activity Spines connect existing or proposed activity nodes by filling in the areas between the nodes
- Activity Spines are distinguishable from activity nodes in terms of land use and function
- Activity Spines are highly controlled in terms of vehicle access and aesthetic appearance

As mentioned above, Activity Spines must be distinguishable from Activity Nodes in terms of land use and function. In terms of land use, Activity Nodes tend to have retail, community and office uses, while Activity Spines tend to have higher-density residential, office, motor trade, and commercial uses. Activity Nodes tends to be more pedestrian-oriented, while Activity Spines tend to be more vehicle oriented. Activity Nodes directly connect to the public transport system operation along the corridor via its public transport station or stop, whereas Activity Spines do not necessarily.

As mentioned above, Activity Spines are linear developments that connect activity nodes. A primary advantage of Activity Spines is that it has the potential to strengthen and support Activity Nodes. In other words, Activity Spines must have a functional relationship with the Activity Nodes along the Development Corridors proposed for Emfuleni. The Activity Spines should help attract user to the Development Corridors, but the Activity Nodes should typically act as the destinations on the activity spines. The Emfuleni SDF has identified and promotes the following Activity Spines:

a. Barrage Road (K174/ R42)

Barrage Road (K174/ R42), from its intersection with the P155/ R57, up to its intersection within General Hertzog Road, has been identified as an Activity Spines. The SPTN route proposed for this Corridors Infill Area is aligned along Barrage Road, stretching from the Vanderbijlpark CBD up to the Vereeniging CBD. This area is already the focus of major development in recent years, such as the development of a number of retail shopping centre. The further development of this corridor should be encouraged by allowing higher-density residential and commercial uses to be developed along this corridor.

b. General Hertzog Road (K59/ R82)

General Hertzog Road (K59/ R82), from its intersection with the K174/ R42 up to Ring Road in Three Rivers has been identified as a Corridors Infill Area. This Corridors Infill Area currently has a number of mixed land uses, such as industrial buildings, retail centres and office building. Many of these land uses aim to provide services to the surrounding Three Rivers residential area. This Activity Spine is aligned along General Hertzog Road up, which forms part of the eastern parts of the proposed Barrage Development Corridor. A mix of land uses can be allowed along this corridor, including higher-density residential, office, community and commercial uses. Commercial and light industrial uses can only be permitted on parcels of land already zoned commercial or industrial, which are mainly situated on the western sections of General Hertzog Road.

As is evident from the location of the Activity Spines mentioned above, that they are essentially linear extensions of the existing Vereeniging CBD towards Three Rivers and towards the Vanderbijlpark CBD. As such, these Activity Spines reinforce the access routes converging on the Vereeniging CBD, thus strengthening the Vereeniging CBD as the primary nodal area or core area of the emerging Emfuleni metropolitan area.

5.2. STRATEGIC ENVIRONMENTAL ASSESSMENT

The Strategic Environmental Assessment or SEA aims to evaluate the Emfuleni SDF proposals and its impact on the natural, social and infrastructural environment. This is done in order to determine the sustainability of the urban structure proposed for Emfuleni and to propose mitigating measures to limit the negative impacts that the proposed urban structure may have on the natural, social and infrastructural environment of Emfuleni. The Table below sets out the potential environmental impacts and mitigation measures proposed for each of the SEA zones identified. The SEA zones are illustrated on Figure 25.

As can be derived from the Table below, the proposed expansion of urban areas within Emfuleni will have a significant impact on the hydrological system, as it will significantly increase surface water runoff. The municipal services network (sewer, water and electrical) will also require significant upgrading and extension to cater for the expected growth of Emfuleni. This is especially in view of the fact that the existing municipal services infrastructure network is already severely overburdened. The proper management of solid waste and the use of recycling will also be a requirement for sustainable urban development.

The geotechnical conditions do not have too much of an impact on future urban development within Emfuleni, and those areas that do have poor geotechnical conditions are largely protected through the proposed natural open space network. Planning for future public transport will require higher-density residential development near existing and planned commuter railway stations and along SPTN routes to support the viable operation of these systems. The necessary community facilities will also need to be developed to support residential expansion within Emfuleni, as envisaged in the Emfuleni SDF.

All-in-all, mitigating the impacts of urban expansion within Emfuleni largely depends on the proper and efficient management of urban development within Emfuleni. This can be done by adhering to the guidelines of the Emfuleni SDF and through the proactive development of municipal services infrastructure and public transport infrastructure.

TABLE 24: POTENTIAL ENVIRONMENTAL IMPACT AND MITIGATION MEASURES (SEA)

Element	Impact/ Mitigation	Zone 1: Evaton & Sebokeng	Zone 2: Sonlandpark & Three Rivers	Zone 3: Vanderbijlpark & Vereeniging	Zone 4: Lochvaal Barrage & Mantevrede
Natural environment	Impact:	<ul style="list-style-type: none"> Potential destruction of Rietsspruit riparian vegetation 	<ul style="list-style-type: none"> Potential destruction of Klipspruit, Klipspruit tributary and Vaal River riparian vegetation 	<ul style="list-style-type: none"> Potential destruction of natural vegetation surrounding Sharpeville Dam 	<ul style="list-style-type: none"> Potential destruction of Rietsspruit and Vaal River riparian vegetation

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Element	Impact/ Mitigation	Zone 1: Evaton & Sebokeng	Zone 2: Sonlandpark & Three Rivers	Zone 3: Vanderbijlpark & Vereeniging	Zone 4: Lochvaal Barrage & Mantevrede
	Mitigation:	<ul style="list-style-type: none"> • Include natural open space in township layout • Protection of riparian environment in township layouts up to the 100 year flood line • Develop Environmental Management Plan (EMP) for river environment 	<ul style="list-style-type: none"> • Potential destruction of ridge vegetation • Include natural open space in township layout • Protection of river and tributary riparian environment in township layouts up to the 100 year flood line • Protection of ridge vegetation through SDF • Develop Environmental Management Plan (EMP) for river and ridge environment 	<ul style="list-style-type: none"> • Include natural open space in township layout • Protection of dam vegetation through SDF and the Sharpeville Dam Biodiversity Study 2011 prepared by WSP Environment and Energy South Africa 	<ul style="list-style-type: none"> • Include natural open space in township layout • Protection of riparian environment in township layouts up to the 100 year flood line • Protection of natural areas as originally set out in Lochvaal Barrage SDF 2009 prepared by Kagisano • Develop Environmental Management Plan (EMP) for river environment
Hydrological system	Impact:	<ul style="list-style-type: none"> • Moderate increase of runoff into Rietspruit • Tarring of Evaton and Sebokeng gravel roads will increase runoff volumes 	<ul style="list-style-type: none"> • Large increase of runoff into Klipspruit tributary 	<ul style="list-style-type: none"> • Large increase of runoff into Sharpeville Dam • Tarring of Sharpeville and Boipatong gravel roads will increase runoff volumes • Potential industrial pollutant runoff into Sharpeville Dam and Vaal River 	<ul style="list-style-type: none"> • Limited increase of runoff into Rietspruit and Vaal River
	Mitigation:	<ul style="list-style-type: none"> • Implementation of storm water management plan linked to road network • Take into consideration the cumulative impact of runoff on larger hydrological system • Take into consideration the increased runoff 	<ul style="list-style-type: none"> • Implementation of storm water management plan linked to road network • Take into consideration the cumulative impact of runoff on larger hydrological system • Take into consideration the increased runoff 	<ul style="list-style-type: none"> • Implementation of storm water management plan linked to road network • Take into consideration the cumulative impact of runoff on larger hydrological system • Take into consideration the increased runoff 	<ul style="list-style-type: none"> • Implementation of storm water management plan linked to road network • Take into consideration the cumulative impact of runoff on larger hydrological system • Take into consideration the increased runoff

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Element	Impact/ Mitigation	Zone 1: Evaton & Sebokeng	Zone 2: Sonlandpark & Three Rivers	Zone 3: Vanderbijlpark & Vereeniging	Zone 4: Lochvaal Barrage & Mantevrede
		intensity caused by climate change impacts	intensity caused by climate change impacts	intensity caused by climate change impacts	intensity caused by climate change impacts
Agricultural potential	Impact:	<ul style="list-style-type: none"> Possible urban development on pockets of high-potential agricultural soils 	<ul style="list-style-type: none"> Possible urban development on pockets of high-potential agricultural soils 	<ul style="list-style-type: none"> Implementation of stringent industrial pollution control measures Possible urban development on pockets of high-potential agricultural soils 	<ul style="list-style-type: none"> Higher residential densities on high-potential agricultural soils Urban development within and contradictory to Agricultural Hub initiative
	Mitigation:	<ul style="list-style-type: none"> Consider retaining pockets of high-potential agricultural soils in township layouts and use of urban agricultural purposes 	<ul style="list-style-type: none"> Consider retaining pockets of high-potential agricultural soils in township layouts and use of urban agricultural purposes 	<ul style="list-style-type: none"> Consider retaining pockets of high-potential agricultural soils in township layouts and use of urban agricultural purposes 	<ul style="list-style-type: none"> Protect high-potential agricultural soils as originally set out in Lochvaal Barrage SDF 2009 prepared by Kagisano
Geotechnical	Impact:	<ul style="list-style-type: none"> No anticipated impact 	<ul style="list-style-type: none"> Possible residential development on pockets of dolomite 	<ul style="list-style-type: none"> Possible residential development on pockets of dolomite 	<ul style="list-style-type: none"> No anticipated impact
	Mitigation:	<ul style="list-style-type: none"> Subject to detailed geotechnical investigation during township establishment 	<ul style="list-style-type: none"> Subject to detailed geotechnical investigation during township establishment 	<ul style="list-style-type: none"> Subject to detailed geotechnical investigation during township establishment 	<ul style="list-style-type: none"> Not applicable
Municipal Services Infrastructure (water, sewer and electrical)	Impact:	<ul style="list-style-type: none"> Increased strain on wastewater treatment works capacity Increased strain on water reservoir capacity Increased strain on electrical substation capacity 	<ul style="list-style-type: none"> Increased strain on wastewater treatment works capacity Increased strain on water reservoir capacity Increased strain on electrical substation capacity 	<ul style="list-style-type: none"> Increased strain on wastewater treatment works capacity Increased strain on water reservoir capacity Increased strain on electrical substation capacity 	<ul style="list-style-type: none"> Increased strain on wastewater treatment works capacity Increased strain on water reservoir capacity Increased strain on electrical substation capacity

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Element	Impact/ Mitigation	Zone 1: Evaton & Sebokeng	Zone 2: Sonlandpark & Three Rivers	Zone 3: Vanderbijlpark & Vereeniging	Zone 4: Lochvaal Barrage & Mantevrede
	Mitigation:	<ul style="list-style-type: none"> Develop planned regional wastewater treatment works to cater for urban expansion as envisaged in Emfuleni SDF Prevent sewer effluent spillage into Rietspruit Plan for sufficient water reservoir capacity to enable urban expansion as envisaged in Emfuleni SDF Plan for sufficient electrical substation capacity to enable urban expansion as envisaged in Emfuleni SDF 	<ul style="list-style-type: none"> Develop planned regional wastewater treatment works to cater for urban expansion as envisaged in Emfuleni SDF Prevent sewer effluent spillage into Klipspruit and Vaal River Plan for sufficient water reservoir capacity to enable urban expansion as envisaged in Emfuleni SDF Plan for sufficient electrical substation capacity to enable urban expansion as envisaged in Emfuleni SDF 	<ul style="list-style-type: none"> Develop planned regional wastewater treatment works to cater for urban expansion as envisaged in Emfuleni SDF Prevent sewer effluent spillage into Sharpeville Dam and Vaal River Plan for sufficient water reservoir capacity to enable urban expansion as envisaged in Emfuleni SDF Plan for sufficient electrical substation capacity to enable urban expansion as envisaged in Emfuleni SDF 	<ul style="list-style-type: none"> Develop planned regional wastewater treatment works to cater for urban expansion as envisaged in Emfuleni SDF Prevent sewer effluent spillage into Rietspruit and Vaal River Plan for sufficient water reservoir capacity to enable urban expansion as envisaged in Emfuleni SDF Plan for sufficient electrical substation capacity to enable urban expansion as envisaged in Emfuleni SDF
Solid waste	Impact:	<ul style="list-style-type: none"> Increased solid waste due to urban expansion 	<ul style="list-style-type: none"> Increased solid waste due to urban expansion 	<ul style="list-style-type: none"> Increased solid waste due to urban expansion and densification of established areas Increased solid waste due to new industrial development 	<ul style="list-style-type: none"> Increased solid waste due to urban expansion
	Mitigation:	<ul style="list-style-type: none"> Provision of sufficient airspace on existing and planned landfill sites within Emfuleni area Encourage recycling of waste streams at source to reduce solid waste volumes 	<ul style="list-style-type: none"> Provision of sufficient airspace on existing and planned landfill sites within Emfuleni area Encourage recycling of waste streams at source to reduce solid waste volumes 	<ul style="list-style-type: none"> Provision of sufficient airspace on existing and planned landfill sites within Emfuleni area Encourage recycling of waste streams at source to reduce solid waste volumes Provide a landfill site and airspace at the site for possible hazardous 	<ul style="list-style-type: none"> Provision of sufficient airspace on existing and planned landfill sites within Emfuleni area Encourage recycling of waste streams at source to reduce solid waste volumes

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Element	Impact/ Mitigation	Zone 1: Evaton & Sebokeng	Zone 2: Sonlandpark & Three Rivers	Zone 3: Vanderbijlpark & Vereeniging	Zone 4: Lochvaal Barrage & Mantevrede
Roads and storm water	<p>Impact:</p> <ul style="list-style-type: none"> Significantly expanded road network and associated increase in storm water runoff Tarring of gravel roads in township areas will increase runoff volumes <p>Mitigation:</p> <ul style="list-style-type: none"> Construction of storm water infrastructure linked to the road network Improvement of existing storm water network serving township areas Tarring gravel road to improve access and storm water management 	<ul style="list-style-type: none"> Significantly expanded road network and associated increase in storm water runoff 	<ul style="list-style-type: none"> Significantly expanded road network and associated increase in storm water runoff Construction of storm water infrastructure linked to the road network 	<p>waste steams from industrial areas</p> <ul style="list-style-type: none"> Significantly expanded road network and associated increase in storm water runoff Tarring of gravel roads in township areas will increase runoff volumes Construction of storm water infrastructure linked to the road network Improvement of existing storm water network serving township areas Tarring gravel road to improve access and storm water management 	<ul style="list-style-type: none"> Limited expansion of existing road network and associated increase in storm water runoff Construction of storm water infrastructure linked to the road network
Community facilities	<p>Impact:</p> <ul style="list-style-type: none"> Enough schools, but needs other types of community facilities, such as clinics and libraries <p>Mitigation:</p> <ul style="list-style-type: none"> Facilitate the development of lacking community through consultation with relevant provincial government bodies, such as the Department of Health 	<ul style="list-style-type: none"> Need for all types of community facilities required to serve new residential areas 	<ul style="list-style-type: none"> Need for all types of community facilities required to serve new residential areas Older township areas have enough schools, but needs other types of types of community facilities, such as clinics and libraries 	<ul style="list-style-type: none"> Need for all types of community facilities required to serve new residential areas Older township areas have enough schools, but needs other types of types of community facilities, such as clinics and libraries Facilitate the development of community through consultation with relevant provincial government bodies, such as the Department of Education 	<ul style="list-style-type: none"> Township establishment on small holding rarely achieve thresholds of the provision of stands for schools and community facilities Facilitate the development of community through consultation with relevant provincial government bodies, such as the Department of Education

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Element	Impact/ Mitigation	Zone 1: Evaton & Sebokeng	Zone 2: Sonlandpark & Three Rivers	Zone 3: Vanderbijlpark & Vereeniging	Zone 4: Lochvaal Barrage & Mantevrede
Public transport	Impact:	<ul style="list-style-type: none"> Use open space system as possible locations for recreational facilities, subject to environmental sensitivity Development of SPTN routes will increase access and use of road-based public transport Increased used of public transport will contribute to the reduction of greenhouse gas emissions 	<ul style="list-style-type: none"> Use open space system as possible locations for recreational facilities, subject to environmental sensitivity Development of SPTN routes will increase access and use of road-based public transport Increased used of public transport will contribute to the reduction of greenhouse gas emissions 	<ul style="list-style-type: none"> Use open space system as possible locations for recreational facilities, subject to environmental sensitivity Development of planned commuter railway line will increase access and use of public transport Increased used of public transport will contribute to the reduction of greenhouse gas emissions 	<ul style="list-style-type: none"> Identify and acquire small holdings for the development of schools and community facilities Not applicable
	Mitigation:	<ul style="list-style-type: none"> Encourage the development of higher-density housing abutting the proposed SPTN routes 	<ul style="list-style-type: none"> Encourage the development of higher-density housing abutting the proposed SPTN routes 	<ul style="list-style-type: none"> Encourage the development of higher-density housing in the vicinity of existing and planned commuter railway stations 	<ul style="list-style-type: none"> Not applicable

Source: Urban Dynamics Gauteng, 2017

5.2. INFRASTRUCTURE DEVELOPMENT

Infrastructure development forms of backbone of urban development, densification and expansion. The reason for this is that infrastructure development provides the access, the capacity and the opportunities for urban development, densification and expansion.

5.2.1. TRANSPORTATION

Developing Emfuleni's transportation infrastructure is dealt with in terms of the road network and public transport network. Whereas the road network primarily refers to provincial and metropolitan roads, the public transport network refers to the public transport routes and stations that make up the transportation network. Figure 26 illustrates the transportation infrastructure development proposals made for Emfuleni.

-  Study Area
-  TOD
-  Proposed Bus Stop
-  Existing Station
-  Proposed Station
-  Existing Railway Line
-  Existing Freeway
-  Planned Freeway
-  Existing Distributor
-  Planned Distributor
-  Future SPTN
-  Proposed SPTN

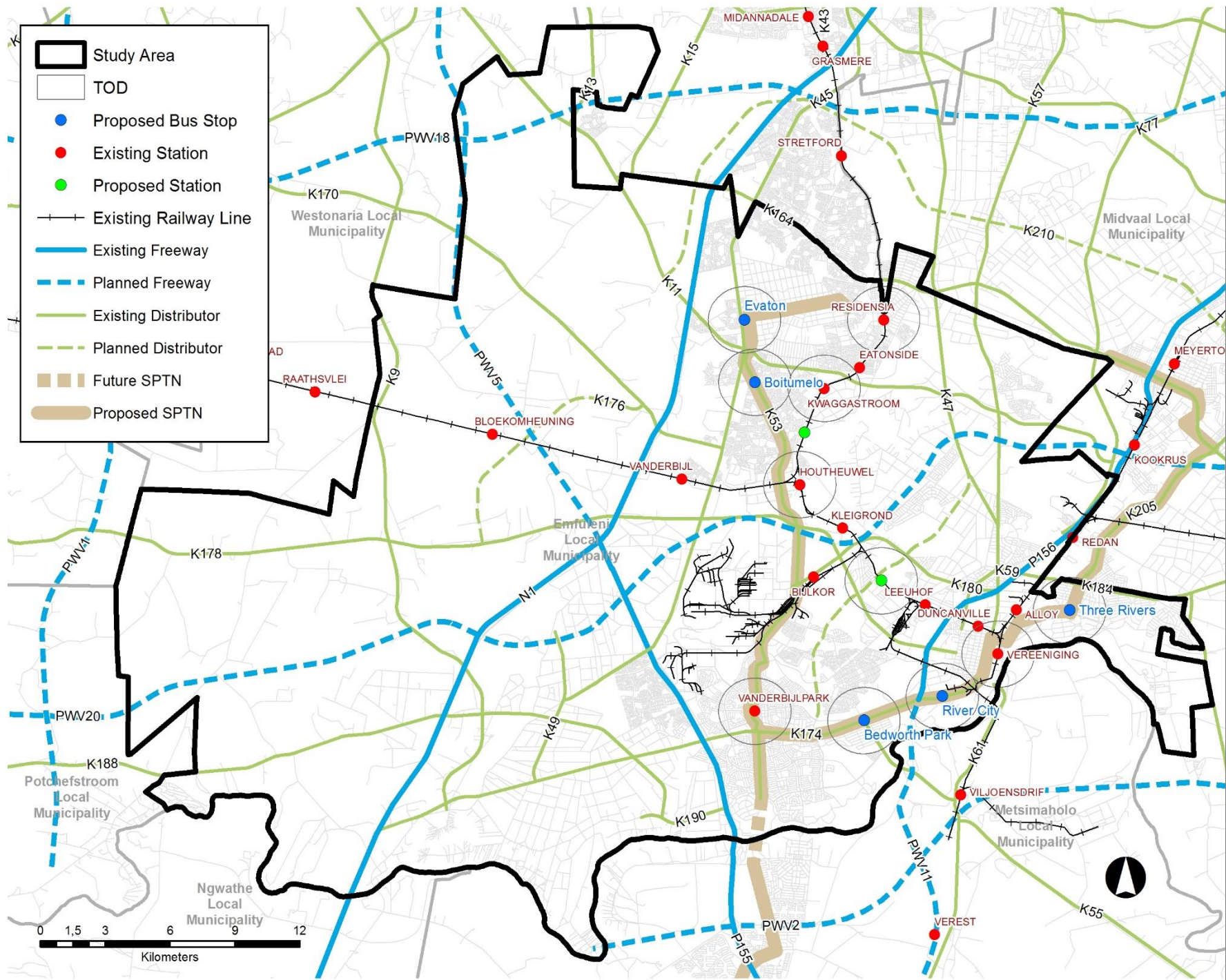


FIGURE 26 | PROPOSED TRANSPORT NETWORK

5.2.1.1. Road Network Classification

The South African Road Classification and Access Management Manual is an official requirement for National, Provincial and Municipal Authorities to implement. The South African Road Classification and Access Management Manual deals with 2 related issues: functional classification and access management:

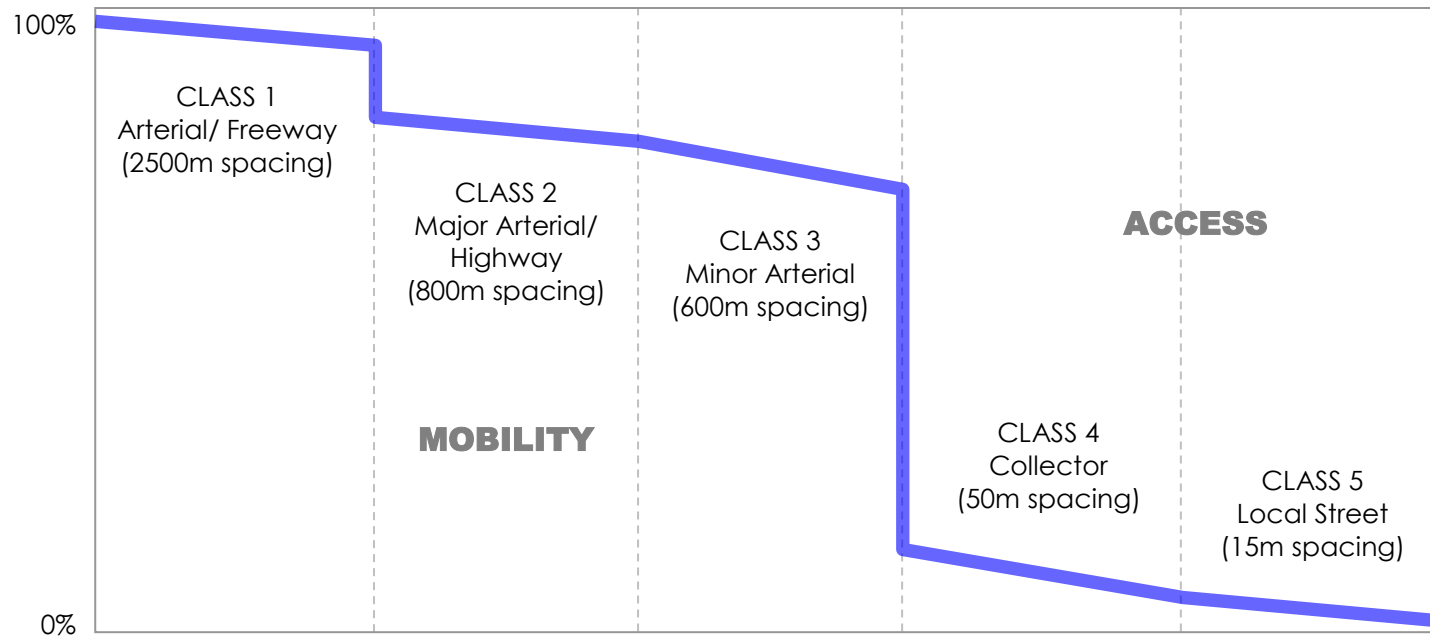


DIAGRAM 26: ROAD CLASSIFICATION AND ACCESS MANAGEMENT

a. Functional Classification

According to the South African Road Classification and Access Management Manual, it is not possible for a road to efficiently perform more than one function at a time. It must either function as a mobility road or as an access street. As mentioned in a previous paragraph, mobility roads give priority to long distance, high speed, vehicle movements. They typically consist of strategic through routes and arterials. Access streets give priority to vehicular access, pedestrians, buses and minibus taxis, parking and loading. They are the short distance, low speed collector streets.

b. Access Management

According to the South African Road Classification and Access Management Manual, access management on mobility roads is totally different from access management on access streets. On mobility roads, access management requires limiting access and physically separating pedestrian and vehicle flows. On access streets, access is permitted and even encouraged, traffic speeds are reduced through design measures (e.g. mini-circles), allowing parking, loading, bus and minibus taxi stops, and providing for regular pedestrian crossings.

The Diagram above illustrates the relationship between the functional classification of the road network and access management. The functional classification of the road network classifies roads according to the road's level of mobility or accessibility. It does so by classifying each road within one of five road classes (Class 1 to Class 5 roads). For example, freeways are considered Class 1 roads and collector roads are considered class 4 roads. The spacing of intersections along each of the roads within these road classes are allowed according to the classification of the road. For example, intersections on a Minor Arterial (or K-Routes) will be allowed at 600m intervals. The spacing of intersections have a direct bearing on land use development, because many land uses (such as shopping centres) require access to an intersection to function.

5.2.1.2. Road Network Development

An extensive freeway and arterial network is planned for Emfuleni (as was set out in the Status Quo section of this report), characterized by strong north-south and east-west linkages. Although most of these roads are in place, there remain a few roads to be developed that will improve the accessibility within Emfuleni, especially within the area where future urban expansion is envisaged. Planned provincial freeways and arterials, as well as proposed municipal collector roads, which are necessary to unlock the development potential of Emfuleni, are as follows:

a. Arterial construction

Most of the arterial network planned for Emfuleni has been developed. Of greater concern is the fact that much of this arterial network is in need of repair and even upgrading to modern K-route design standards. Barrage Road is one such a road that needs to be upgraded, especially if it is to fulfill a public transport function, as proposed in this Emfuleni SDF. The construction of the K55 arterial is of particular importance and should be given priority within Emfuleni. The K55 will provide a needed north-south linkage between the Vaal University of Technology, Sharpeville, Boipatong, and Sonlandpark. The construction of this road will enable the northward expansion of the urbanised area into the Sonlandpark region, north of the Vereeniging-Johannesburg commuter railway line, as proposed in this Emfuleni SDF. This road will also intersect within the K180, providing the access needed to develop the proposed Sonlandpark Region Node on this intersection.

TABLE 34: ROAD HIERARCHY AND DESIGN

Road Type	Road Classification	Purpose	Design	Intersection Spacing	Responsibility
Freeway	Class 1	Links towns and cities	Dual carriageway and grade separating interchanges	2500m	National and Provincial Government
Arterial	Class 2-3	Links city regions	Dual carriageway with level intersections	600m within Urban Development Boundary and 800m outside Urban Development Boundary	Provincial Government Consultation with Municipality with regard to public transport network design
Collector	Class 4	Links suburbs	Single carriageway with level intersections Allow for public transport facilities, such as lay-bys where applicable	50m	Metropolitan and Local Municipalities

Source: Urban Dynamics Gauteng, 2017

b. Collector road construction

To a large extent, the arterial network serving Emfuleni covers most of Emfuleni and is serves the existing urban area sufficiently. A collector road network that fills the gaps left by the arterial network is therefore not necessary. A collector road needed to supplement the arterial network would be a collector road linking Lochvaal Barrage with the P155

Freeway. This collector road will provide the necessary access to allow residential densification along the Vaal River water front. Another collector road needed is a road linking Sharpeville to the proposed River City, with an interchange on Barrage Road. This will improve access to the River City, but also provide access to Sharpeville and its historical tourist attractions.

Basic design plans have been drafted for the design for the freeways and arterials planned for Emfuleni. Consequently, the road reserves have been established and are required to be incorporated in the layout plans of township establishment applications. This requirement is enforced by the Provincial government, who is responsible for the PWV road network (PWV freeways and K-routes) implementation. The proposed collector roads will not be the responsibility of the Provincial government, but will be the responsibility of the Emfuleni Municipality (see Table above). As such, it is recommended that the Municipality prepares basic design plans for the development of this collector road network and that the road reserves of these roads be protected in the layout plans affected by these road alignments.

5.2.1.3. Public transport Development

As with the road hierarchy, public transport also functions on different levels (see Diagram below). To date, public transport in Emfuleni consists of a 3-tier public transport system. Mini-bus minibus taxis are at the lowest level of the public transport network; followed the provincial (metro) busses and metro-rail at the highest level of the public transport network.

The level on which each public transport system within the public transport hierarchy functions is determined by the type of transportation system that is used, the destination that is accessed, the passenger volumes it can carry and the flexibility of the system. In other words, each system occupies a niche within the network, fulfilling a specific function which the other systems within the network cannot fulfill. Having a public transport network that contains transit systems operating on different levels and different functions provides the bases for inter-modal connectivity and interchange.

Emfuleni is a municipality with a population nearing 1 million people. In other words, Emfuleni is becoming a metropolitan area. It is therefore necessary that Emfuleni starts positioning itself for this responsibility. A key function of a metropolitan area is to provide public transport of a high standard to support its metropolitan population. Emfuleni thus needs to start identifying its public transport routes, so that it can start shaping its land use structure (which takes time) to serve this public transport network. To this end, Emfuleni can proactively promote public transport by (a) engaging with PRAZA to further develop the Vereeniging-Johannesburg commuter railway line (especially with regard to station development) and (b) identify and develop a Strategic

Public Transport Network (SPTN) to serve urban areas within Emfuleni that are not served by the Vereeniging-Johannesburg commuter railway line.

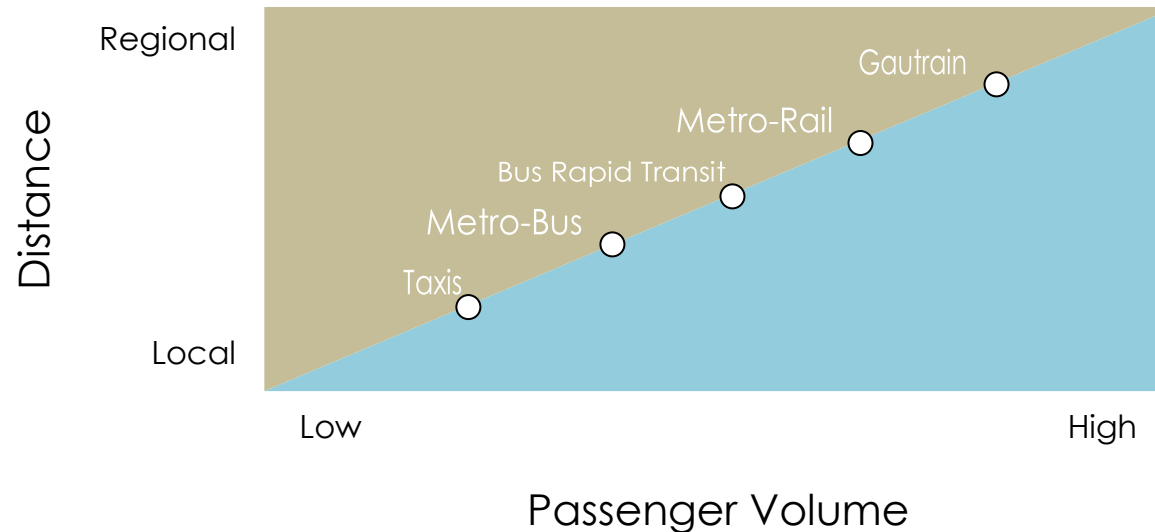


DIAGRAM 27: PUBLIC TRANSPORT HIERARCHY

As was mentioned in the status quo section of this report, Emfuleni is served by a commuter rail network that connects Emfuleni to neighbouring areas in Gauteng. Prominent station along this line is Houtheuwel Station, Residentia Station and Stredford Station. Currently, the use of this railway line as a commuter railway line is limited due to fragmented urban development and low residential densities along this railway line. Urban development along the Vereeniging-Sebokeng-Orange Farm commuter railway line will provide the necessary commuter thresholds needed to ensure the viable operation and expansion of this commuter railway line.

With regard to further developing the Vereeniging-Johannesburg commuter railway line, it is proposed the 2 new stations are developed along this line to better serve envisaged urban expansion areas within Emfuleni. The first proposed station is located at the proposed Sonlandpark Regional Node and will serve the Sonlandpark and Boipatong areas. The second proposed station is located north of Houtheuwel Station and will better serve the envisaged Lethabong extensions. The additional stations along

this commuter rail line will provide opportunities for Transit Oriented Development (TOD). This will involve focusing new higher density, mixed-use development around these commuter rail stations. The layout of the land uses in relation to the stations are of critical importance, because it will determine the level of access that commuters will have to these stations. It should be noted that the station proposals above area Emfuleni SDF proposals and not PRASA proposals at this stage.

In addition to the above, a Strategic Public Transport Network (SPTN) is proposed by the Emfuleni SDF that will serve urban areas within Emfuleni that are not served by the Vereeniging-Johannesburg commuter railway line. Two SPTN routes have been identified. The first route links Vereeniging to Sebokeng along the K53 (Moshoeshoe Road) and the K45 (Golden Highway), and then turns eastward at Evaton towards Residentia Station. This SPTN route links Evaton and the Sebokeng CBD to the Vereeniging CBD. This route can be extended southwards across the Vaal River up to Sasolburg. The second SPTN route utilizes Barrage Road (K147) and links the Vanderbijlpark CBD, the Bedworthpark Regional Node, the proposed River City Node, the Vereeniging CBD, and the Three Rivers Node. This route can be extended northeastwards up to Meyerton.

It is important to note that where an SPTN route utilizes a K-route (arterial), flexible, public transport oriented design parameters will be required, especially where this route traverses or abut an activity node. For example, pedestrian crossing and accesses will have to be addressed differently within such sections of the SPTN route. Also, the development of the SPTN route can already at this stage be planned to accommodate higher-order road-based public transport systems in future, such as the Bus Rapid Transit (BRT) system. The implementation of a BRT system can then be phased over time. The following phasing will most probably be logical:

- Phase 1: Design SPTN routes to allow long-term implementation of BRT system
- Phase 2: Start operating municipal system on SPTN route
- Phase 3: Construct major BRT stations at regional nodes
- Phase 4: Start operating BRT system
- Phase 5: Construct minor BRT stations at other locations along SPTN route
- Phase 6: Construct dedicated BRT lanes

Having a longer-term view of public transport network development will enable municipal planners to develop a land use structure that can support the envisaged public transport network in future. Municipal planners can promote the development of activity nodes at commuter railway stations and envisaged SPTN/BRT stations that would (a) apply higher land use densities, (b) a greater land use mix, and (c) a pedestrian-oriented structure. These are all critical elements needed to support the viable operation of a public transport system and station.

TABLE 35: PROPOSED PUBLIC TRANSPORT ROUTES, STATIONS AND LAND USE INTEGRATION

SPTN Route/ railway line	Nodal Area	Station or Rank or Stop	Integration Principles
Proposed Barrage Road SPTN route	Vanderbijlpark CBD	<ul style="list-style-type: none"> ○ Proposed bus station and minibus taxi rank within CBD 	<ul style="list-style-type: none"> ○ Design and locate mixed land uses at commuter railway station ○ Design and construct pedestrian walkways to facilitate access to proposed bus station and minibus taxi rank
Vereeniging-Johannesburg commuter railway line	Vereeniging CBD	<ul style="list-style-type: none"> ○ Existing Vereeniging commuter railway station ○ Proposed bus station and minibus taxi rank at commuter railway station 	<ul style="list-style-type: none"> ○ Design and locate mixed land uses at commuter railway station ○ Design and construct pedestrian walkways to facilitate access to a commuter railway station
Proposed Barrage Road SPTN route	River City Node (part of Vanderbijlpark CBD)	<ul style="list-style-type: none"> ○ Proposed bus station and minibus taxi rank within Node 	<ul style="list-style-type: none"> ○ Develop higher-density residential uses to support proposed bus station and minibus taxi rank ○ Design and construct pedestrian walkways to facilitate access to proposed bus station and minibus taxi rank
Vereeniging-Johannesburg commuter railway line	Sebokeng CBD	<ul style="list-style-type: none"> ○ Existing Houtheuwel commuter railway station ○ Existing bus station and minibus taxi rank within CBD 	<ul style="list-style-type: none"> ○ Develop higher-density residential uses to support a commuter railway station with required commuter numbers ○ Design and construct pedestrian walkways to facilitate access to commuter railway station
Proposed Barrage Road SPTN route	Bedworthpark Regional Node	<ul style="list-style-type: none"> ○ Proposed bus station and minibus taxi rank within node 	<ul style="list-style-type: none"> ○ Design and locate mixed land uses at proposed bus station and minibus taxi rank ○ Design and construct pedestrian walkways to facilitate access to proposed bus station and minibus taxi rank

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SPTN Route/ railway line	Nodal Area	Station or Rank or Stop	Integration Principles
Proposed Golden Highway SPTN route	Evaton Regional Node	<ul style="list-style-type: none"> ○ Proposed bus station and minibus taxi rank within node 	<ul style="list-style-type: none"> ○ Develop higher-density residential uses to support proposed bus station and minibus taxi rank ○ Design and construct pedestrian walkways to facilitate access to proposed bus station and minibus taxi rank
Proposed Barrage Road SPTN route	Three River Regional Node	<ul style="list-style-type: none"> ○ Proposed bus station and minibus taxi rank within node 	<ul style="list-style-type: none"> ○ Design and locate mixed land uses at proposed bus station and minibus taxi rank ○ Design and construct pedestrian walkways to facilitate access to proposed bus station and minibus taxi rank
Vereeniging-Johannesburg commuter railway line	Sonlandpark Regional Node	<ul style="list-style-type: none"> ○ Proposed Sonlandpark commuter railway station ○ Proposed bus station and minibus taxi rank at commuter railway station 	<ul style="list-style-type: none"> ○ Design and locate mixed land uses at proposed commuter railway station ○ Design and construct pedestrian walkways to facilitate access to the proposed commuter railway station
Proposed Golden Highway SPTN route	Boitumelo Community Node	<ul style="list-style-type: none"> ○ Proposed bus station and minibus taxi rank within node 	<ul style="list-style-type: none"> ○ Design and locate mixed land uses at proposed bus station and minibus taxi rank ○ Design and construct pedestrian walkways to facilitate access to proposed bus station and minibus taxi rank
Vereeniging-Johannesburg commuter railway line	Kwaggastroom Community Node	<ul style="list-style-type: none"> ○ Existing Kwaggastroom commuter railway station 	<ul style="list-style-type: none"> ○ Develop higher-density residential uses to support a commuter railway station with required commuter numbers
Vereeniging-Johannesburg commuter railway line	Residensia Community Node	<ul style="list-style-type: none"> ○ Existing Residensia commuter railway station 	<ul style="list-style-type: none"> ○ Develop higher-density residential uses to support a commuter railway station with required commuter numbers

Source: Urban Dynamics Gauteng, 2017

As alluded to above, the efficient functioning of the public transport system within Emfuleni will not only require a well-developed public transport network, but will also require a well-developed public transit stations and stops that are strategically located along the public transport routes. The major public transit stations and stops should preferably be located within the nodal areas identified in the Spatial Development Framework (see Figure 23). Many of the existing, planned and proposed nodes will be served by the existing and proposed commuter railway stations of the Vereeniging-Johannesburg commuter railway line. These include, amongst other, the Residensia Station, Houtheuwel Station, Vereeniging Station and the proposed Sonlandpark Station. Where nodal areas are served by a road-based public transport network (SPTN), such as the Vanderbijlpark CBD, the Bedworthpark Regional Node and the Evaton Regional Node, a bus station and minibus taxi rank should make up the public transit station serving such a node. It is proposed that major transit stations and stops within Emfuleni be located at localities set out in the Table above, which correspond with the Transit Oriented Developments (TODs) proposed for Emfuleni. Pick-up and drop-off stops can be placed at 400-600m intervals along the SPTN routes.

To ensure the optimal use of each public transit station and stop, it will have to be integrated through competent design with surrounding land uses. This design will need to focus on pedestrian movement and how pedestrians exchange between the transit facility and the surrounding land uses. Competent building design is also necessary to ensure land use and transportation integration and will have to be applied to buildings (e.g. retail centres and walk-ups) bordering these transit stations.

5.2.2. MUNICIPAL SERVICES

Although this study addresses the primary municipal services (water, electricity and sanitation), it does not assess the capacity of the bulk municipal services network to accommodate urban expansion and densification. Determining capacity is deemed falling outside the brief of this study. The way this study addresses the issue of bulk municipal services is to (a) promote compact urban development to limit the length and cost of bulk infrastructure runs, (b) ensure that short-term expansion areas can connect to the existing bulk network and (c) provide an indication which areas would require bulk network infrastructure in the longer-term future to enable bulk infrastructure planning. Bulk network requirements to accommodate urban expansion within Emfuleni, as set out in the Development Framework, is as follows:

a. Sewer

The municipal sewer network plays a central role in determining urban expansion possibilities, because its operation is dependent upon gravity and therefore topography. Topography has therefore been taken into account in the location of

proposed urban expansion areas to limit the need for sewer pump stations. Most of the proposed urban expansion will take place within the proposed development triangle, anchored by the Sebokeng CBD, the Vanderbijlpark CBD and the Vereeniging CBD. Most of the area will drain towards the Leeuwkuil Waste Water Treatment Works serving Sharpeville. The proposed urban expansion areas located near Sebokeng will drain to the Sebokeng Waste Water Treatment Works. The long-term solution includes the elimination of sewer pump stations and the construction of a new gravity pipe next to the Klip and Vaal Rivers. This works will replace the 3 Emfuleni waste water treatment works (Sebokeng, Leeuwkuil and Rietspruit), as well as Midvaal's waste water treatment works that serves Roshnee. The proposed design capacity of the planned regional Waste Water Treatment Works will be 150 MI/day up to the year 2025. The site for the location of the planned Waste Water Treatment Works has been identified and approved, awaiting implementation.

b. Electricity

Electricity is an essential service and is a catalyst for development in the Emfuleni area. Emfuleni Local Municipality provides 75% of its electricity supply to industrial enterprises and 25% of its electricity supply to domestic users. The highest maximum demand registered within Emfuleni to date was 390MW. Although the Municipality has been able to provide all developers with electricity to date, the low level of investment in the upgrading, refurbishment and expansion of the bulk electricity infrastructure network has led to a situation where new developments can no longer be accommodated without major capital investments in bulk electricity infrastructure. This is a situation that needs to be urgently addressed. The Emfuleni SDF has determined that the Emfuleni population will increase significantly over the next 10 years. This population needs to be housed and employment opportunities need to be created to employ this increasing population. This requires the expansion of the bulk electrical network and its capacity, especially within the proposed development triangle, anchored by the Sebokeng CBD, the Vanderbijlpark CBD and the Vereeniging CBD.

c. Water

The distribution of potable water, collection of wastewater and the treatment of waste water are outsourced by the Emfuleni Local Municipality to private contractors. In addition to these functions, the private contractors are responsible for the maintenance of the water services system, including maintenance and running costs. Emfuleni borders the Vaal River and therefore extracts water from the river for consumption within Emfuleni. However, only a small amount of the required quantity extracted from the Vaal River and purified (0.2 MI/day). Most potable water required by Emfuleni is largely supplied by Rand Water (205 MI/day). The bulk water network is old and it is overworked due to the demand for potable water. Despite this, it is imperative that the network be upgraded and expanded to cope with the urban

expansion, envisaged by the Emfuleni SDF. Expansion of the bulk water network into the proposed development triangle, anchored by the Sebokeng CBD, the Vanderbijlpark CBD and the Vereeniging CBD, will be of particular importance.

5.3. PUBLIC REALM

Creating a sustainable urban environment involves creating balanced communities in terms of employment opportunities, social amenities and recreation facilities. In other words, it involves supporting residential development with other land use types, such as schools, clinics, retail facilities, office development and public parks.

5.3.1. NODAL DEVELOPMENT

Community, recreation and economic facilities should be clustered, rather than dispersed, in order to (a) stimulate the viability of these activities, (b) create strong focal points with which the surrounding communities can identify and (c) create a more ordered spatial structure. To achieve this concentration of facilities, a hierarchy of nodes should be created within Emfuleni.

The Table below depicts the number of proposed and existing nodes within Emfuleni. It is evident that Emfuleni can accommodate 3 primary nodes (CBDs) which are the Sebokeng CBD, the Vanderbijlpark CBD and the Vereeniging CBD. The locations of the other nodes proposed for Emfuleni were guided by the following principles:

- The nodes aimed to strengthen the existing nodal structure, thus aimed to latch onto existing facilities.
- Where possible, a node was located in an area with enough vacant land for its further development.
- Nodes were located near public transport routes (bus and minibus taxi) and planned commuter rail stations.
- Nodes were placed in locations that make them pedestrian-accessible to the communities they intend to serve.

The composition of each node within the nodal hierarchy must take into account certain key variable, such as its intended function of the node; the size of the population its serves and its geographical location. For example, a lower-order community node must contain uses that are required at a neighbourhood level, such as a clinic and a library. By the same token, a regional community node must contain uses that reflect its region function, such as a municipal information centre.

5.3.2. BUSINESS ACTIVITY

It is important that land use strategies are developed that recognize the need to stimulate economic growth and job creation within Emfuleni. These land use strategies must focus institutional support and private sector spending to achieve the aforementioned. In turn, this will create economic potential and provide opportunities for local communities to participate in local economic development.

5.3.2.1. Business Centre Hierarchy

Business activities should be concentrated, rather than dispersed in order to stimulate the viability of these activities. To achieve this, business activity should be clustered within nodes. The following Table provides the proposed composition of each business node within the business node hierarchy proposed for Emfuleni.

a. Municipal node (CBDs)

A municipal node is a node of city-wide significance and can therefore develop a strong retail, entertainment and office component. The retail component can accommodate 2 or more regional shopping centres or retail floor area equaling that of two regional shopping centres. The entertainment component should include entertainment venues of municipal significance. A primary node can accommodate a large office component, providing office space for large-scale businesses.

b. Regional node

A secondary / regional business node can accommodate a regional shopping centre and two or more community shopping centres or retail floor area equaling that of a regional shopping centre and two or more community shopping centres. In addition, a secondary / regional node can accommodate entertainment venues of regional significance. The office component can provide office space for medium-scale businesses.

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TABLE 36: BUSINESS CENTRE SIZE AND COMPOSITION

Node hierarchy	Total retail area	Total office area	Minimum trade area	Minimum access requirements	Composition
Municipal node (CBDs)	>80,000m ²	10,000m ² +	8km	Access to freeway, arterial and major public transport route	Two or more regional shopping centres Entertainment venues of municipal significance Cluster of office buildings catering for large-scale businesses
Regional node	25,000 - 75,000m ²	10,000-20,000m ²	4km	Access to arterial and major public transport route	A regional shopping centre and two or more community shopping centres Entertainment venues of regional significance. Cluster of office buildings catering for medium-scale businesses
Community node	<30,000m ²	<10,000m ²	2km	Access to major collector road and public transport route	A community shopping centre and two or more neighbourhood shopping centres Entertainment venues of local significance Cluster of office buildings catering for small-scale businesses
Neighbourhood node	<12,000m ²	<4,000m ²	1km	Access to major collector road	One or more neighbourhood shopping centres Entertainment venues of local significance One or more buildings catering for small-scale businesses
Specialised node	Undetermined	Undetermined	n/a	Access to major collector road and preferably a public transport route	A specific land use type that is not necessarily found in or considered desirable as part of a typical activity node. Examples include industrial areas, educational campuses, larger institutional complexes, and recreational complexes.

Source: Urban Dynamics Gauteng, 2017

c. Community node

A community node will require a community shopping centre and two or more neighbourhood shopping centres, or a total retail area similar to that of a community shopping centre and two or more neighbourhood shopping centres. In addition, a community business node can accommodate local entertainment venues, as well as a cluster of office buildings catering for local, small-scale businesses.

d. Neighbourhood node

A neighbourhood node will require one or more neighbourhood shopping centres, or a total retail area similar to that of a neighbourhood shopping centre. In addition, a neighbourhood node can accommodate entertainment venues of local significance and one or more buildings catering for small-scale businesses.

e. Specialised node

A specialized node accommodated specific land use types that are not necessarily found in or considered desirable as part of a typical activity node. Examples include industrial areas, educational campuses, larger institutional complexes, and recreational complexes.

TABLE 37: PROPOSED ACTIVITY NODES

Node	Recommended Size in Gross Leasable Area (GLA)	Node Name	Centers in Node
Municipal	>80,000m ²	Vanderbijlpark CBD	Various centers
		Vereeniging CBD	Various centers
		Sebokeng CBD	Various centers
Regional	>25,000m ² to 75,000m ²	Bedworthpark	Bedworthpark Pick and Pay Hyper Powerville Park Makro
		Evaton	Evaton Mall
		Mantevrede	Vaal Mall
		Sonlandpark	None
		Three Rivers	River Square Henberg at Bashee Street East

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Node	Recommended Size in Gross Leasable Area (GLA)	Node Name	Centers in Node
		Other	ABSA at Bashee Street West Euro Spar at Assegai Street Fourways at Blackwood Street Philips Centre at Umtata Street Progress Café at Genl Hertzog Road Shoprite Centre at Umtata Street Washington Post at Springcol Shopping center at CW2 Checkers Hyper Arcon Park Riverside Boulevard Pick and Bay Vanderbjil at SE2 Carter Street Centre at SW5 Spar Centre at SE6 Palms Center at SE1
Community	15,000m ² to 30,000m ²	Boitumelo Kwaggastroom Lochvaal Residentia Roshnee Other	None None None None Various centres CE1 center CE2 center Crossing Road Centre at Peacehaven Garden Pavilion along Joburg Road Erven 598-620, 888, 894, 895 in CW6
Neighbourhood	7,000m ² to 12,000m ²	Other	CE5 center CW1 center CW3 centre Erf 438 at CE1 Erven 273,274 at CE2 Boy Louw Street Gardens Brand Muller Nursery along Joburg Road Erven 486, 487, 506, 483, 478 at CW2 Suikerbos Centre along Flamingo

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Node	Recommended Size in Gross Leasable Area (GLA)	Node Name	Centers in Node
Specialised	7,000m ² to 50,000m ² 7,000m ² to 50,000m ² 7,000m ² to 50,000m ² 50,000m ² to 1,000,000m ² 7,000m ² to 50,000m ² 7,000m ² to 50,000m ²	Other	Waldrift Centre along Andesite Street Welcome Café Centre in Arcon Park Duncanville Centre along Senator Road Maximes Hotel Centre at Peacehaven Wavell Centre along Patton Street Emerald Casino Riviera Hotel Mario along Milani Road Barnyard along General Hertzog Road Arcelor Mittal Vaal University of Technology North-West University

Source: Spatial Planning Section, Emfuleni Local Municipality, 2013

Retail Centre Classification:

Classification	Size (m2)
Local centre	1000-5000
Neighbourhood centre	5000-10000
Community Centre	10000-30000
Small Regional Centre	30000-60000
Regional Centre	60000-100000
Super-Regional Centre	>100000

The Table above provides list of all the activity nodes proposed within Emfuleni, as well as the shopping centres currently found within these nodes. The nodes identified above align with the business node hierarchy and composition proposed above. The nodes that contribute to the development of the Development Corridors proposed by the Emfuleni SDF for Emfuleni, have been named. This is to enable the located of these nodes to be identified on Figure 27.

5.3.2.2. Business Centre Development

To ensure the viability of proposed business activities within Emfuleni, it is important to (a) link the business areas proposed for Emfuleni to the Land Use Budget, and (b) develop a retail hierarchy to ensure the orderly and logical development of retail facilities within Emfuleni. The Table below provides a list of business nodes that can accommodate additional retail and office space development within Emfuleni. These nodes are all located along the proposed Development Corridors. Thus, the further development of these nodes will also contribute to the development of the Development Corridors at large. These nodes are not all the nodes identified within Emfuleni, as depicted by the previous Table, but only the nodes the have future development potential and promote the spatial structure desired within Emfuleni.

TABLE 38: PROPOSED RETAIL AND OFFICE FLOOR AREA ALLOCATION (2017-2025)

Node	Node Classification	Allocation 2017-2025		Existing 2017		Available 2017-2025	
		ha	m ²	ha	m ²	ha	m ²
Vanderbijlpark CBD	Municipal	65,0	260052	65,0	260052	0,0	0
Retail (0% of total)		50,0	200040	50,0	200040	0,0	0
Private Office (0% of total)		15,0	60012	15,0	60012	0,0	0
Vereeniging CBD	Municipal	132,8	531284	132,8	531284	0,0	0
Retail (0% of total)		102,2	408680	102,2	408680	0,0	0
Private Office (0% of total)		30,7	122604	30,7	122604	0,0	0
Sebokeng CBD	Municipal	21,5	85937	10,3	41180	11,2	44757
Retail (20% of total)		18,9	75608	10,3	41180	8,6	34428
Private Office (20% of total)		2,6	10329	0,0	0	2,6	10329
Bedworthpark	Regional	22,4	89749	19,9	79420	2,6	10329
Retail (0% of total)		19,9	79420	19,9	79420	0,0	0
Private Office (20% of total)		2,6	10329	0,0	0	2,6	10329
Evaton	Regional	12,0	47958	6,4	25580	5,6	22378
Retail (10% of total)		10,7	42794	6,4	25580	4,3	17214
Private Office (10% of total)		1,3	5164	0,0	0	1,3	5164
Mantevrede	Regional	20,3	81061	14,0	56100	6,2	24961
Retail (10% of total)		18,3	73314	14,0	56100	4,3	17214
Private Office (15% of total)		1,9	7746	0,0	0	1,9	7746
Sonlandpark	Regional	9,9	39593	0,0	0	9,9	39593
Retail (20% of total)		8,6	34428	0,0	0	8,6	34428
Private Office (10% of total)		1,3	5164	0,0	0	1,3	5164

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Node	Node Classification	Allocation 2017-2025		Existing 2017		Available 2017-2025	
		ha	m ²	ha	m ²	ha	m ²
Three Rivers	Regional	16,9	67704	16,9	67704	0,0	0
Retail (0% of total)		13,0	52080	13,0	52080	0,0	0
Private Office (0% of total)		3,9	15624	3,9	15624	0,0	0
Boitumelo	Community	4,9	19796	0,0	0	4,9	19796
Retail (10% of total)		4,3	17214	0,0	0	4,3	17214
Private Office (5% of total)		0,6	2582	0,0	0	0,6	2582
Kwaggastroom	Community	4,9	19796	0,0	0	4,9	19796
Retail (10% of total)		4,3	17214	0,0	0	4,3	17214
Private Office (5% of total)		0,6	2582	0,0	0	0,6	2582
Lochvaal	Community	4,9	19796	0,0	0	4,9	19796
Retail (10% of total)		4,3	17214	0,0	0	4,3	17214
Private Office (5% of total)		0,6	2582	0,0	0	0,6	2582
Residentia	Community	2,8	11189	0,0	0	2,8	11189
Retail (5% of total)		2,2	8607	0,0	0	2,2	8607
Private Office (5% of total)		0,6	2582	0,0	0	0,6	2582
Roshnee	Community	2,8	11189	0,0	0	2,8	11189
Retail (5% of total)		2,2	8607	0,0	0	2,2	8607
Private Office (5% of total)		0,6	2582	0,0	0	0,6	2582
Total		321,3	1285104	265,3	1061320	51,0	203988
Retail		258,8	1035222	215,8	863080	38,7	154928
Private Office		62,5	249883	49,6	198240	12,3	49060

Source: Urban Dynamics Gauteng, 2017

Figure 27 illustrates the location of the existing and proposed primary, secondary / regional and community business nodes identified within Emfuleni. A total of 3 primary business nodes exist within Emfuleni. These primary business nodes comprise the existing Vanderbijlpark CBD, the existing Vereeniging CBD and the emerging Sebokeng CBD. The retail and office space existing within the Vanderbijlpark CBD and the Vereeniging CBD is deemed sufficient, so no additional retail and office space is provided. However, an additional 34,428m² of retail space and 10,329m² of office space is allocated to the Sebokeng CBD to further strengthen this emerging Central Business District.

A secondary / regional business nodes and community business nodes have been identified within Emfuleni, of which some of them are newly proposed nodes: Sonlandpark, Boitumelo, Kwaggastroom, Roshnee and Lochvaal. Retail and office space has been allocated to each of these nodes in accordance with the needs of the surrounding urban environment, the nature of its

potential consumer base, and the location characteristics of each node. Based on these nodal characteristics, the following regional business nodes need mention:

a. Sonlandpark node

This node is a regional business node located on the Development Corridor proposed along the Vereeniging-Johannesburg commuter railway line. Thus, creating a node with a substantial retail and office component can greatly contribute to the establishment of this corridor. A total 34,428m² of retail space and 5,164m² of office space is allocated to the Sonlandpark node.

b. Bedworthpark node

This regional business node not only serves the surrounding residential areas, such as Sharpeville, but it also functions as a 'gateway' into the Vanderbijlpark area via the K174 (Barrage Road). A large office component was therefore provided to fully utilize the 'entrance' characteristics of this node. An additional 10,329m² of office space is allocated to the Bedworthpark node, which can be allocated along Barrage Road. No additional retail space is allocated to this node due to the large retail centres already existing within this node.

c. Evaton node

This node has the potential to increase its role in serving the northern parts of Sebokeng and Evaton. It is therefore proposed that this node be significantly strengthened to a regional business node. An additional 17,214m² of retail space and 5,164m² of office space is allocated to the Evaton Node.

In addition to the above, it is recommended that the granting of additional retail space within Emfuleni also be done based on the recommendations of a detailed retail study that accompanies each individual application for retail rights within Emfuleni. In turn, such a detailed retail study must be conducted in a manner that adheres to the objectives and guidelines set out in this Emfuleni SDF, especially with regard to the distribution of retail space between the various nodes. In other words, a single node should not be allocated a disproportionate amount of retail space that would be to the detriment of other nodes.

Apart from the activity nodes set out above, business activity can also be located along the activity spines proposed for Emfuleni. However, it is important not to focus all the development energy in Emfuleni on these Activity Spines, but rather focus most of this development energy on the Activity Nodes within Emfuleni. Specifically, it is proposed that retail development be limited to the

Activity Nodes, because node is more pedestrian and transit oriented than Activity Spines. The Activity Spines can accommodate land use that are more vehicle oriented, such as office, motor trade, and commercial uses

5.3.3. SOCIAL FACILITIES

Residential development requires the support of other land use types, such as schools and clinics, in order to create complete and sustainable residential environments. Such social facilities must be located in such a way that they are accessible to the residential communities they serve. This is best achieved using the social nodes proposed for Emfuleni, which will cluster these social facilities in central locations.

5.3.3.1. Social Facility Hierarchy

The composition of each social node within the nodal hierarchy must contain social facilities that are suited to the function of that particular node within the nodal hierarchy. The proposed composition of each social node within the nodal hierarchy is depicted in the Table below and should serve as a guideline for the design and development of these nodes.

a. Municipal social node

A municipal social node, providing higher-order social services, serves a region within the municipal area. With regard to educational facilities, a municipal node should accommodate a region's tertiary educational facilities, as well as a number of primary and secondary schools. With regard to health care, the municipal social node should provide the region's hospital(s), as well as other higher-order and specialized medical facilities. Other social facilities to be provided in such a node include a large community hall, police station and emergency service centre. These facilities are all highest-order facilities when compared to similar facilities provided in lower-order nodes.

b. Regional social node

A regional social node should serve a number of suburbs and should provide medium-order social services to the suburbs they serve. A regional node should at least comprise a secondary school, 2 primary schools, a community centre and a

library. It can also accommodate a day hospital and a police station, only on a slightly smaller scale than those provided in a municipal social node.

TABLE 39: SOCIAL FACILITY COMPOSITION

Nodal Hierarchy	Service Area Radius	Size	Proposed composition
Municipal social node	8km	30ha	1 tertiary education facility 1 secondary schools 2 primary schools 1 hospital 1 large-scale post office 1 large-scale library 1 large-scale community hall 1 large-scale police station 1 emergency service centre
Regional social node	4km	20ha	2 secondary schools 3 primary schools 1 day hospital 1 medium-scale post office 1 medium-scale library 1 medium-scale community hall 1 small-scale police station
Community social node	1-2km	15ha	1 secondary schools 2 primary schools 1 clinic 1 small-scale post office 1 small-scale library 1 small-scale community hall

Source: Urban Dynamics Gauteng, 2017

c. Community social node

Community social nodes should provide low-order social services within a suburb. A social node should at least comprise a secondary school and a primary school, but can also contain a clinic and a post office.

5.3.3.2. Social Facility Development

The Land Use Budget (Section 3) calculated the number of social facilities required within Emfuleni to support the envisaged population increase within Emfuleni. The regional social nodes should preferably be placed at existing or proposed regional business nodes to allow for the development of a one-stop-shop land use arrangement. The locations of community social nodes must be identified during the township establishment. The guiding principle in this case should be to place social nodes centrally within existing or planned residential neighbourhood to allow these nodes to be within walking distance of the households living within these neighbourhoods. In doing so, these nodes can become the focal points around which residential neighbourhoods can be develop. Community social nodes must contain community-level social facilities, such as schools and clinics.

In order to develop the social infrastructure required within Emfuleni, Emfuleni will have to work in close relationship with the Provincial governmental bodies concerned with the development and management of social facilities, such as the Gauteng Department of Health and Welfare, and the Department of Education. The responsibility of Emfuleni will be to ensure that the necessary stands for social facilities are provided and that these stands are strategically placed within nodal areas. The construction and management of the relevant buildings will be the responsibility of the provincial government departments concerned.

Providing social facilities within small holding areas that are being converted into higher-density cluster developments are often problematic. One of the reasons for this is the fact that individually, the cluster developments do not reach the threshold for providing any social facilities. However, collectively, these cluster developments develop large numbers of housing units, without any of these cluster developments being required to provide stands for schools or stands for other type of social facility. The result is that these small holding areas lack the most basic social facilities, such as schools and clinics.

Considering the fact that much of the land within Emfuleni that is set aside for urban expansion comprises small holding, such as Unitas Park, Lochvaal Barrage and Mantevrede, poses the danger that township establishment on these smallholdings do not yield the necessary household thresholds to enforce developers to provide social facilities, such as schools. Should this be the case, it is proposed that Emfuleni pro-actively identifies properties that are suitable for the location of social nodes within these small holding areas. Emfuleni will need to purchase these properties and develop the social facilities on these properties when urban expansion within the vicinity of these properties necessitates the development of such facilities.

5.3.4. OPEN SPACE & RECREATION

Open space and recreation within Emfuleni can be divided into 2 categories: passive and active open space. Passive open space consists of land that is unsuitable or undesirable for urban development due to topographical, ecological constraints or for flood protection. Active open space involves the recreational component of the open space system. It provides parks and sport facilities throughout an urban area for use by residents, local sports clubs and schools. Passive open space was dealt with in a previous section of this report and active open space is dealt with below.

5.3.4.1. Active Open Space Development Principles

Formulating principles for the development of active open spaces can help ensure that standards of quality and usefulness are achieved in the planning, design and management of such spaces. The following development principles need to be taken into account when developing active open spaces:

a. Linking a use to open space

Active open spaces (or parks) that do not have a deliberate use linked to them are often not of value to a local community and often become dumping ground as a consequence. It is therefore imperative that a use be linked to an active open space to ensure the utilization of these spaces. One of the best ways of utilizing active open spaces within urban areas is to develop recreational facilities or sports facilities on these spaces.

b. Type of facilities provided

When planning active open spaces, it is important that appropriate recreation (or sport) facilities are provided. Often recreational facilities are provided that do not fulfill the needs of the community, usually because they are not the preferred recreational types. To prevent the provision of inappropriate recreational facilities, the recreational preferences of a local community must be established before planning and developing a recreational facility.

c. Maintenance of active open spaces

An important factor in determining the success of active open spaces is the maintenance thereof. Past experience has proved that active open spaces that are not maintained often lose their practical value to local residents. Therefore, it can be argued that larger and fewer active open spaces that are maintained are more useful than smaller, more numerous active open spaces that are not.

d. Accessibility of active open spaces

When locating active open spaces, it is important to ensure that these spaces are accessible to the community it serves. This implies locating an active open space within walking distance of most of the people living within a community. Locating an active open space centrally will also ensure the continued presence of people in the vicinity of such a facility, which would protect such space from vandalism.

e. Urban form and function

In order to enhance the focal function of active open spaces, it is imperative that attention is given to the design of these active open spaces. For example, the planting of trees along the periphery of an active open space will enhance the identity and attractiveness of this space. If active open spaces are integrated through design with surrounding facilities, it will enhance the usage of these spaces. For example, placing an active open space next to or close to a primary school will allow the space to supplement school sport facilities.

5.3.4.2. Active Open Space Hierarchy

The limited funds available for the construction of active open spaces necessitate a critical appraisal of the generally accepted standards and norms applicable to active open space development. An approach based on practical considerations rather than on accepted norms should be followed. One of the most practical ways of utilizing open spaces is to use these spaces as sport or recreation facilities. This connects a deliberate use to open spaces, ensuring they serve a specific community need.

Taking into account the above, a 3-tier recreational node hierarchy is proposed for Emfuleni. The composition of these recreational nodes should serve as a guideline for the design and development of active open spaces within Emfuleni, but can

differ depending on the recreational preferences of local communities. The proposed recreational node hierarchy and its composition are depicted in the Table below.

a. Municipal recreational node

A municipal recreational node should provide recreation facilities that are significant on a municipal level, usually with a stadium comprising the central facility within such a node. In addition to the stadium, such a node should contain other highest-order recreations facilities, such as practice rugby or soccer fields, a cricket oval, tennis courts, a swimming pool and a multi-purpose indoor sports centre. Such an active open space must also include a parking area and must be accessible to and from a large bus and minibus taxi terminus. A municipal recreational facility can be the base of citywide sports club.

TABLE 40: ACTIVE OPEN SPACE COMPOSITION

Nodal Hierarchy	Service Area Radius	Size	Proposed composition
Municipal recreational node	8km	20ha	1 rugby or soccer and athletic stadium 3 practice rugby or soccer fields 1 cricket oval 6 tennis courts 2 netball courts Swimming pool Multi-purpose indoor sport centre
Regional recreational node	4km	15ha	1 rugby or soccer field and athletic track 2 practice rugby or soccer fields 4 tennis courts
Community recreational node	2km	10ha	1 rugby or soccer field and athletic track 2 tennis courts Children's playground

Source: Urban Dynamics Gauteng, 2017

b. Regional recreational node

A regional recreational node should provide regional sport facilities, typically a number of rugby or soccer fields. The rugby or soccer fields can double as a cricket oval. Such a recreational facility can serve as the base for regional sports clubs.

c. Community recreational node

A community recreational node will serve local neighbourhoods and should therefore comprise local recreational facilities, such as a rugby or soccer field and a few tennis courts. These recreational facilities can supplement the recreation facilities of schools and should therefore be located in close proximity of school clusters.

5.3.4.3. Active Open Space Development

Emfuleni has a number of open spaces, as mentioned in the status quo section (Section 2) of this report. In addition, the Land Use Budget (Section 3) calculated the recreational space required within Emfuleni to support the envisaged population increase. This additional recreation space need should be accommodated within primary, regional and community recreational nodes, as set out in the Table above.

The regional recreation nodes must occupy central locations within Emfuleni area, which will allow these nodes to be accessible from various residential areas. Where possible, these regional recreational nodes must be located within or next to the open space corridors identified within this report. This will allow synergies between these active (recreational) open spaces and the passive open space corridors proposed for Emfuleni.

Apart from the abovementioned regional recreation node, a number of community recreation nodes have been proposed for Emfuleni. Specific locations for these nodes are not proposed. Instead, the locations of these nodes are left to the township establishment process, whereby such nodes can be included into the layouts drafted for proposed residential areas. The rule of thumb in this case is to (a) place these community recreational nodes in accessible locations and (b) place these nodes next to or within the open space corridor, if feasible.

As with community facilities, urban expansion into small holding areas poses the danger that township establishment on these small holdings do not yield the necessary household thresholds to require developers to provide recreational facilities as part of their developments. Should this be the case, it is proposed that Emfuleni pro-actively identifies properties within small holding areas that are suitable for the location of recreational nodes. Emfuleni will then need to purchase these properties and develop recreational facilities on them when urban expansion within these small holding areas necessitates the development of such facilities.

5.4. HOUSING DEVELOPMENT

Housing is a strong form-giving element that can impact substantially of the development of an urban area. For example, housing can be used as an infill land use, which could enable the integration of a fragmented urban area. Also, housing can provide the necessary land use densities to support public transport and retail centre development.

5.4.1. HOUSING TYPOLOGIES

Housing types can be categorised according to level of attachment. Level of attachment refers to the vertical and horizontal attachment of buildings. There is a tendency, when addressing the housing demand, especially for the affordable housing sector of the population, to provide freestanding units with little or no level of attachment. There is little exploration of the benefits of other housing typologies, such flats, walk-ups, row housing and semi-detached units.

The following discussion on typologies is not exhaustive, but rather focuses on housing and density types that are appropriate for Emfuleni. The Table below provides an easy-reference summary of the attributes of the different housing typologies and how it compares with the attributes of other housing typologies.

a. Detached housing

Detached units are standalone structures situated on a single, individually registered stand. This is the most commonly used housing type within Emfuleni and is used for bonded and well as affordable housing. As a bonded housing typology, detached housing is often used in estate development, with added security fencing and communal facilities to achieve some of the advantages that are usually associated for cluster housing developments. As an affordable housing unit, the design of this housing typology is usually limited to the requirements of the government housing subsidy scheme.

As is evident from the above, the densities of this housing type vary dramatically, depending on its use. As bonded housing, this housing typology is usually located on stands generally 1000m² in size and achieve an average nett density of 10u/ha. As an affordable housing option, this housing typology is usually located on stands of approximately 200m² and achieve nett densities of approximately 50u/ha. Such densities (both bonded and to a lesser extent affordable) do not promote the efficient use of land and do not promote the viable operation of public transport systems. Consequently, this housing

type should not be promoted is close proximity of public transport routes, but should rather be use in peripheral areas of developments.

In terms of infrastructure costs, this housing typology is the most expensive housing option. The low densities and large stand sizes of this housing type result in large street frontages, which result in long infrastructure runs. This housing type is the least complicated to construct, resulting in relatively low construction costs, when compared to other housing typologies.

TABLE 41: BONDED AND AFFORDABLE HOUSING TYPOLOGIES

Housing Typology	Nett Density	Stand Size	Building Height	Parking Ratio	Tenure Options	Subsidy Options
<i>Bonded Housing</i>						
Detached housing	10 u/ha	1000m ²	2 storey	2 bays/u	Full title	n/a
Cluster housing	25 u/ha	400m ²	1 storey	1 bay/u	Full title or sectional title	n/a
Flats	160 u/ha	n/a	6 storey	1 bay/u	Rental or sectional title	Institutional subsidy
<i>Affordable Housing</i>						
Detached housing	50 u/ha	200 m ²	1 storey	1 bay/u	Full title	Project-linked subsidy
Semi-detached	60 u/ha	160 m ²	1 storey	1 bay/u	Full title	Project-linked subsidy
Walk-ups	150 u/ha	n/a	3 storey	0.7 bay/u	Rental or sectional title	Institutional subsidy

Source: Urban Dynamics Gauteng, 2017

b. Cluster Housing

Cluster housing developments are exclusively used as bonded housing and are characterized by housing units located within a housing complex, which shares communal facilities and a perimeter security wall. These housing units can either be detached or attached to one another, thus sharing at least one wall of the unit. This housing type does not exclude a second and third storey. Ground access, a private garden and on-site parking is possible with the housing typology.

Cluster houses are usually located on stands of smaller size than those used for detached housing. These smaller stand sizes are often achieved through the use of shared walls. Stand sizes typically range from 400m² and yield a nett density of approximately 25u/ha. The smaller stand sizes translate to substantial infrastructure cost savings, making cluster housing more cost-effective than detached housing units. Shared walls also reduce the construction costs of the buildings, compared to detached housing units.

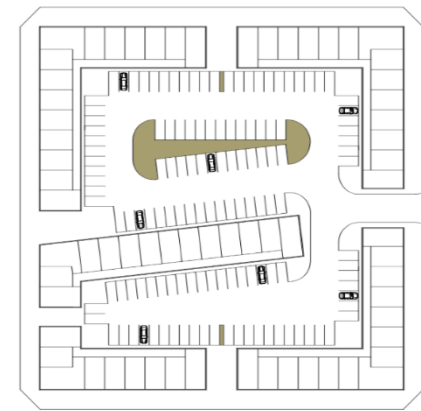
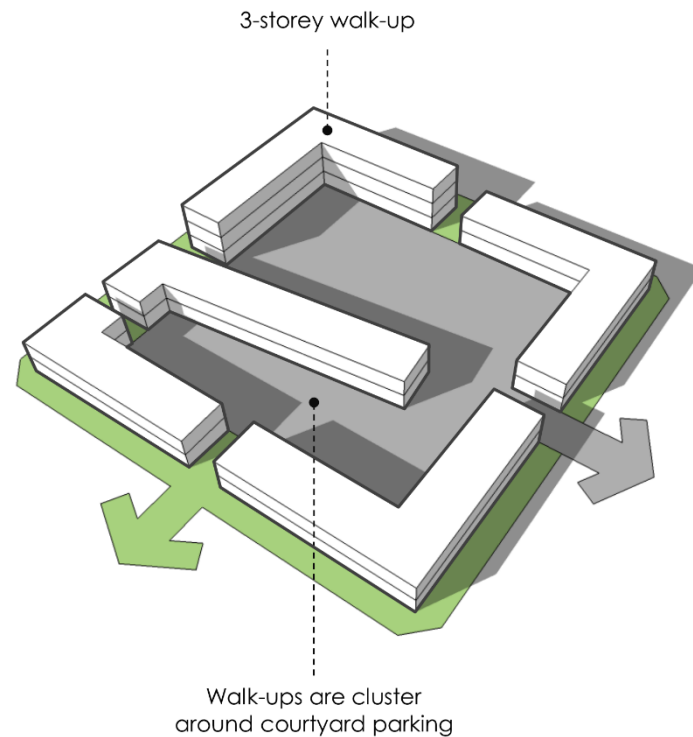
The smaller stands and higher densities achieved by this housing typology, compared to that of detached housing units, make it more suitable as a public transport related development. Although it does not create the desired densities that would significantly boost public transport patronage, it is a better option than detached units. In a sense, this housing typology creates a balance between creating detached or semi-detached housing units and achieving higher densities that are more transport related. This housing typology is preferably located along public transport routes, but not next to public transport stations, which would require higher-density housing options.

c. Semi-Detached Housing

Semi-detached housing is a suitable affordable housing option and involves 2 housing units attached to one another, thus sharing at least one wall of the unit. This housing type does not exclude a second storey. Ground access, a private garden and on-site parking is possible with the housing typology.

Semi-detached houses are usually located on individually registered stands of smaller size than those used for single detached housing. These smaller stand sizes are achieved through the use of shared walls. Stand sizes are typically 160m² and yield a nett density of approximately 60u/ha. The smaller stand sizes translate to substantial infrastructure cost savings, making semi-detached housing more cost-effective than detached housing units. Shared walls also reduce the construction costs of the buildings, compared to detached housing units.

The smaller stands and higher densities achieved by this housing typology, compared to that of single detached housing units, make it more suitable as a public transport related development. Although it does not create the desired densities that would significantly boost public transport patronage, it is a better option than detached units. In a sense, this housing typology creates a balance between creating affordable housing units (within the subsidy range) and achieving higher densities that are more transport related.



Unit size: 40-60m²
Height: 2-3 storeys
Density: 150 units/ha
Parking ratio: 0.7 bays per unit

DIAGRAM 28: WALK-UP CONFIGURATION

d. Walk-ups

Walk-ups provide a low-rise, higher-density housing option and are suitable as an affordable housing option. It is only at this level of density that it really becomes beneficial for public transport and the cost-effective operation of public

transport. With nett densities of approximately 150u/ha, this housing typology places enough commuters within walking distance of public transport stations to ensure the viable operation of a public transport system. Also, residents living in walk-up apartments are usually of a household income bracket that uses public transport as their means of transport, which implies a mutually beneficial relationship between walk-up housing and public transport.

This housing type involves individual housing units stacked on top of each other up to 3 storeys high and is located on a single stand. Consequently, full title ownership is not possible. Such units are either sold off as sectional title units or applied as rental units. What distinguishes walk-up from flats is the fact that walk-up units are accessed via a staircase. The gardens surrounding the building are in communal ownership and use. On-site parking is possible in the form of a parking lot. At a density of 150u/ha, a parking ration of 0.7 bays/u area achieve on ground level, thus not requiring expensive underground parking to be constructed.

This housing typology is cheaper to build than flats, because it does not require costly lifts or costly construction methods to construct. In addition, the higher densities obtained by walk-ups compared to detached and semi-detached housing, make substantial infrastructure costs saving possible. This cost saving not only applies to municipal infrastructure (water, sanitation and electricity), but also to the provision of roads. Despite this cost-saving, walk-up units cost substantially more than conventional affordable housing typologies and require a top-up of the government housing subsidy to construct.

e. Flats

Flats are the highest density housing typology and are most suited as rental housing. As with walk-ups, this housing typology comprises housing units stacked on top of each other. The difference between flats and walk-ups is the height of the buildings, with flats exceeding 3-storeys and walk-ups not. Consequently, flats have to be served by a lift, whereas walk-up only need be served by a staircase. The configuration of a block of flats excludes full title ownership as a tenure option, leaving sectional title and rental as the only tenure options. The gardens of the building are communal and on-site parking is provided using parking lots and garages.

An advantage of flats is the infrastructure cost savings that is made possible by its high occupation densities. These cost savings are partly negated by the costs involved in the construction of this more structurally complicated building, as was discussed under 'walk-ups' above.

The primary advantage of flats relates to the use and operation of public transport systems. Because flats achieve nett densities of 160u/ha within close proximity of public transport stations, it can significant increase the number of commuters

living within walking distance of a public transport system, thus boosting patronage of the transportation system. Taking into account that the households that use public transport are also the households that typically occupy flats, creates a direct relationship between this housing typology and public transport.

5.4.2. HOUSING DENSITY

One of the critical factors in developing our cities into sustainable urban environments is the development of new residential areas at higher densities than in the past. In this regard, the higher densities are important for several reasons:

- Higher densities lead to a significant saving in land cost per unit, because less land is needed and land is used more efficiently.
- One of the main arguments for encouraging higher densities is the cost-efficient provision of infrastructure. Low density means longer infrastructure runs and therefore higher cost for installation and maintenance of infrastructure.
- Efficient public transport requires medium to high densities to allow frequent and efficient services. Low densities with long walking distances cannot support public transport effectively.
- Community facilities, such as schools and health clinics, are difficult to reach for many people at low densities.
- Density is significant for the economic performance of a city. High population density means a high level of access to economic opportunities.

It is imperative that at least part of the future residential need within Emfuleni be addressed using higher density housing typologies. Not only this, these higher density housing developments need to be linked to existing or planned public transport infrastructure in order to support the viable operation of these public transport systems. For example, it is essential to encourage the necessary residential densities that are required to support the Vereeniging-Johannesburg commuter railway line and stations. Higher-density housing need to be located within walking distance of commuter railway stations to establish a link between these housing units and the commuter rail system.

In addition to the above, the development of higher-density housing must aim to promote the development of sustainable communities by incorporating the development of the necessary community facilities and open space to support these higher-density housing developments. In other words, this requires an integrated approach to higher-density residential development; whereby community facilities and transportation are developed as part and parcel of high-density residential development.

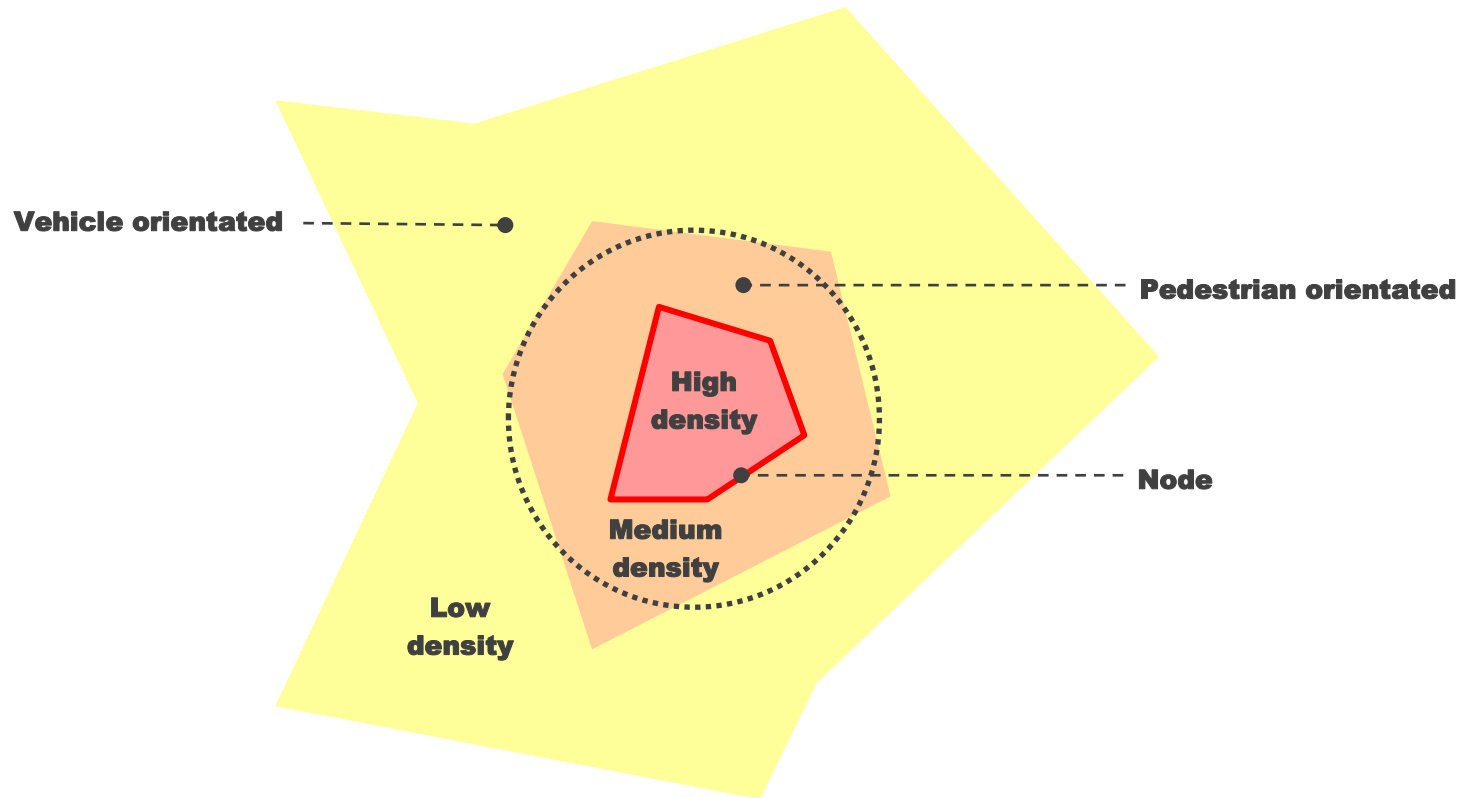


DIAGRAM 29: NODE DENSITY DISTRIBUTION

The Diagram above and the Table below guides the allocation of housing density within and around activity nodes. This is done to ensure that a centrifugal densification pattern is achieved around nodes, with the highest housing densities located within the nodes and lower housing densities located around the nodes. Such a density pattern allows the maximum utilization of existing engineering infrastructure, promotes compact city development, and ensures suitable density thresholds are achieved to support public transport, which typically serve nodal areas.

TABLE 42: RECOMMENDED RESIDENTIAL DENSITY WITHIN AND OUTSIDE ACTIVITY NODES

Density	Municipal node	Regional node	Community node	Neighbourhood node	Specialised node
High Density	60 to 150 u/ha within a node	50 to 80 u/ha within a node	40 to 60 u/ha within a node	40 to 60 u/ha within a node	40 to 60 u/ha within a node
Medium Density	20 to 60 u/ha within 400m from the centre of a node	20 to 50 u/ha within 300m from the centre of a node	20 to 40 u/ha within 200m from the centre of a node	20 to 40 u/ha within 100m from the centre of a node	20 to 40 u/ha within 200m from the centre of a node
Low Density	0 to 20 u/ha beyond 400m from the centre of a node	0 to 20 u/ha beyond a 300m from the centre of a node	0 to 20 u/ha beyond a 200m from the centre of a node	0 to 20 u/ha beyond a 100m from the centre of a node	0 to 20 u/ha beyond a 200m from the centre of a node

Source: Spatial Planning Section, Emfuleni Local Municipality, 2017

Although the Emfuleni SDF makes all attempts to achieve a densification pattern that is centred on Emfuleni's existing and proposed nodal structure, it may be that in some instances there is no alignment between the nodal densification pattern proposed above and the SDF proposals made on the Spatial Development Framework Map (Figure 23). If this is the case, the density recommendations of the Table above shall take precedence over any density recommendation reflected in Figure 23 (Spatial Development Framework Map).

5.4.3. AFFORDABLE HOUSING DEVELOPMENT

Affordable housing is a critical and central component of spatial development within Emfuleni. If developed correctly, affordable housing can contribute to the development of sustainable and livable urban environments. To achieve such urban environments does not have to do with the cost of affordable housing development as much as it has to do with the design of these housing units and the willingness of developers to 'go the extra mile' to achieve more livable residential environments.

5.4.3.1. Development Approach

In the past, the Provincial Department of Housing considered that the best way to address the housing backlog was to adopt a strategy that was based on chasing numbers: a mass housing approach. Through this approach, houses were built where land could be acquired cheaply and this usually perpetuated urban sprawl and unsustainable development. In recent years, realities in the provision of housing have brought about a shift in the housing strategy. Now the challenge is to go beyond the simple provision of houses and build communities and create conditions that promote sustainability.

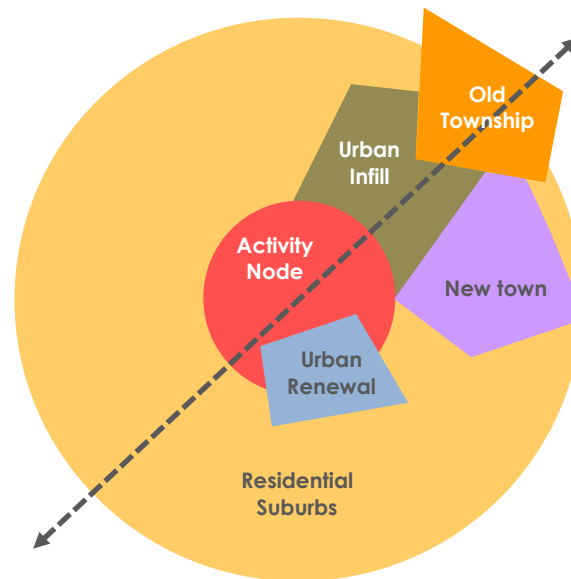


DIAGRAM 30: AFFORDABLE HOUSING DEVELOPMENT APPROACH

Building communities that promote sustainability requires applying different housing development approaches, which consider and utilize different urban locations for affordable housing development. As depicted by the Diagram above, the following affordable housing approaches can be considered:

a. New town

Although new town development involves a mass housing approach, the way it is structured today differs significantly from how it was structured a decade ago. Today the emphasis is on providing a mix of housing typologies and tenure types. Also, achieving transportation integration and linking these housing developments with employment, shopping and community nodes is considered a priority.

b. Urban infill

Urban infill development involves developing affordable housing within existing urban areas on well-located land. Such housing developments are typically located on undeveloped land located between existing suburbs. Urban infill development also tends to utilize undeveloped land located on prominent transportation spines or public transport routes. These transport facilities give these affordable housing developments good access to employment opportunities and social amenities. In turn, the affordable housing developments can be used to increase residential densities along the transportation spines and public transport routes to support these transport systems.

c. Urban renewal

The development of edge city housing developments in recent years have led to an exodus of businesses from most traditional CBDs within Gauteng. This resulted in property depreciation and urban corrosion within these CBDs, as well as escalating municipal maintenance cost and declining revenue level within these CBDs. The urban renewal affordable housing approach aims to development new, higher-density affordable housing units within decaying CBDs to breathe new life into these decaying nodal areas. In turn, these localities places affordable housing in close proximity of the employment opportunities and social amenities found within these nodal areas.

5.4.3.2. Affordable Housing Approach Applied

It should be evident from the above that the affordable housing development challenge is to go beyond the simple provision of houses and to build communities that promote urban sustainability and livability. Central to sustainability is the issue of location, which involves building houses on well-located land that is close to job opportunities and the necessary social amenities. Consequently, housing projects must adhere to very specific location criteria. This will necessitate housing developments in

Emfuleni to be located on well-located and expensive land, which preferably has access to public transport, rather than on cheap land located on the outskirts of Emfuleni.

It is also important to point out that no single approach would fully address the affordable housing backlog within Emfuleni. All the three planning approaches mentioned above are necessary. For example, the new town approach is necessary because it is the only approach that can address the huge housing backlog within Emfuleni. So too, it is necessary to renew the decaying CBDs by adding a higher-density residential component to these nodes.

TABLE 43: HOUSING DEVELOPMENT APPROACH

Development Approach	Typologies	Possible Development Areas
New town	Detached housing	Golden Gardens
Urban infill	Semi-detached	Johandeo
	Semi-detached	Lethabong
	Walk-ups	Tsipeso
Urban renewal	Semi-detached	Sebokeng CBD
		Proposed regional nodes
	Walk-ups	Vereeniging CBD
	Flats	Vanderbijlpark CBD

Source: Urban Dynamics Gauteng, 2017

The approach set out above can be applied within Emfuleni in terms of housing typology mix and geographical distribution, as set out in the Table above. First and foremost, the decaying CBD and nodal area proposed within Emfuleni need to be developed with higher-density housing typologies, such as semi-detached housing and walk-up units. These higher-density housing units are needed to support the business components located within these nodes, as well as the public transport facilities provided within these nodes. The CBDs are the nodal areas most suitable for the development of walk-up and flats. Other nodal areas can use alternative higher-density housing options, such as semi-detached. For example, the Sonlandpark regional node proposed at the proposed Sonlandpark commuter railway station will be suited for the development of semi-detached housing units.

Using higher-density residential development can also be effectively used as infill development within Emfuleni. Many vacant or underutilized stands exist within the triangle anchored by the Vanderbijlpark CBD, the Vereeniging CBD and the Sebokeng CBD, which can be used for infill housing. In particular, vacant or underutilized stands located next to the proposed SPTN routes within the triangle can be utilized for higher-density affordable housing, such as semi-detached housing units. The parts of Emfuleni that

do not have direct access to nodes and public transport infrastructure (which is earmarked for residential expansion up to the year 2025) can be developed with more conventional affordable housing typologies. However, it is recommended that layout design and building design be innovatively used to create livable affordable housing environments. The following general aspects need to form the basis for the design and development of affordable housing within Emfuleni:

a. Create a housing typology mix

Create a housing typology mix that will cater for a wide range of households and income groups. Applying a housing typology mix will also enable a better interface between an affordable housing development and neighbouring land uses.

b. Creating a housing tenure mix

Creating a housing tenure mix that will cater for a wide range of households and income groups. One will most probably find that many households living in Emfuleni, who requires affordable housing, are not South African citizens. Such households are not eligible for a housing subsidy and are therefore reliant on rental housing for accommodation. Rental housing can be applied in many different ways, such as providing a second dwelling for rent on a property developed under the housing subsidy scheme.

c. Link higher-density housing to public transport

Link the affordable housing developments to the public transport network serving Emfuleni. This involves developing higher-density housing along SPTN routes and at commuter railway stations. Semi-detached housing units can effectively be used for this purpose, because the cost of developing such units is very similar to the costs of developing more conventional affordable housing units.

5.5. TOWNSHIP MODERNISATION

In many respects, certain sectors within Gauteng has not progressed at the same pace as other sectors within Gauteng. For example, the re-litisation of old township areas have been neglected as new townships have been created, and industrial development has diminished in importance, while industries such as the retail sector have boomed. This has led to a situation where attention (at Provincial level) needs to be given to these neglected sectors within Gauteng.

5.5.1. MODERISATION PROGRAMME

Over the next fifteen years the Gauteng Provincial Government aims to take steps to make Gauteng an integrated city-region characterised by social cohesion and economic inclusion. To achieve this, the Province has adopted the Transformation, Modernisation and Re-industrialisation Programme. The programme has the following 9 pillars:

- Radical economic transformation
- Decisive spatial transformation
- Modernisation of the public sector
- Accelerated social transformation
- Re-industrialisation
- Modernisation of public transport infrastructure
- Modernisation of the economy
- Taking the lead in Africa's new industrial revolution
- Modernisation of human settlements and urban development

These pillars are all applicable to the Emfuleni SDF in some way or another. However, the following three pillars in particular are important, because they have a direct spatial bearing.

a. Re-industrialisation

A primary focus of the Transformation, Modernisation and Re-industrialisation Programme is on the reindustrialisation of the Gauteng economy through strategic infrastructure development. This includes the local manufacture of buses and trains. In order to boost local employment and economic inclusion, the programme will procure goods and services from township enterprises.

b. Modernisation of public transport infrastructure

This pillar of the programme includes the rollout of public transport infrastructure across the province. The aim is to create cities that will be a combination of modern public transport modes, integrated and sustainable human settlements that are socially and economically inclusive and promote urban green development.

c. Modernisation of human settlements and urban development

As mentioned, an aim of the programme will be to create cities that are a combination of modern public transport modes, integrated and sustainable human settlements that promote urban green development. The renewal of old towns and inner-city regeneration will be a key focus of the programme. With regard to existing human settlements, the programme will aim to invest in the renewal of old townships. This will include the renewal of decaying social and economic infrastructure within these townships. The programme will also ensure that all township roads and streets are tarred, and that all hostels are turned into family units.

5.5.2. PROGRAMME APPLICATION

Taking into account the pillars set out in the Transformation, Modernisation and Re-industrialisation Programme, the Emfuleni SDF needs to identify ways of enabling the implementation of the programme in Emfuleni. Because the Emfuleni SDF is a spatial-guiding document, it is necessary that the ways of implementing the programme be spatially-based. There are the following ways to implement the pillars set out in the Transformation, Modernisation and Re-industrialisation Programme within Emfuleni:

a. Land use rehabilitation

The older townships in Emfuleni have nodes that have been established as part of these townships. Most of the nodes have not developed into viable nodal areas and, in many cases, have not modernised to keep up with the development of new nodes, such as shopping centre clusters. These nodes often have old and dilapidated buildings that are in need of renovation. Often, many of the stands within these nodes have not been developed, resulting in low building densities within these nodes. These low intensities prohibit these nodes to become long-term viable and sustainable nodes.

Not all the nodes fitting the nodal profile set out above are suited for modernization, simply because not all these nodes are located in viable position. These nodes are often not located on high-order road intersections or near transit facilities. These locations make these nodes non-competitive with more modern nodes and therefore not suitable for further investment. Two old-township nodes have been identified within Sebokeng that have the potential to be modernized due to suitable locations. The first is the light-industrial node located within the Sebokeng CBD, on the intersection of Moshoeshoe Road and Houtkop Road. This node is not only located on a high-order road intersection, but it also has access to the existing Houtheuvel commuter railway station and forms part of the emerging Sebokeng CBD. These attributes make this light-industrial node highly suitable for modernization-investment.

The second identified node is located at the Residentia commuter railway station, located east of Evaton. This node is located on Sebe Road, which is a road spine that links the northern parts of Sebokeng to the Sebokeng CBD in the south. Furthermore, the Residentia commuter railway station is a prominent station within Emfuleni and should be intensified through land use development. The development of these nodes will complement the following pillars set out in the Transformation, Modernisation and Re-industrialisation Programme:

- Decisive spatial transformation
- Re-industrialisation
- Modernisation of public transport infrastructure
- Modernisation of human settlements and urban development

b. Public transport infrastructure development

The modernisation of public transport infrastructure is a central pillar of the Transformation, Modernisation and Re-industrialisation Programme. Addressing this pillar within Emfuleni involves focus on two aspects: transit oriented development next to existing commuter railway stations, and the development of bus routes to serve the township areas.

Creating transit oriented development around existing stations can, amongst others, be done using the identified land use rehabilitation areas identified at Residential and Houtheuvel stations in the section above. Transit-oriented development involves creating higher-density, mixed-use, pedestrian-focused development within 400m of a commuter railway station. In turn, creating such urban environments around these stations will help modernise these areas, as proposed in the section above.

Secondly, addressing the public transport infrastructure pillar involves developing bus routes throughout Emfuleni, much of which serves old township areas. One such proposed bus route traverses Sebokeng and Evaton along Moshoeshoe Road. This bus route will provide public transport to the outer parts of these township and will connect these townships to the commuter railway stations for modal transfer. The development of this bus route, as well as the proposed transit oriented development, will compliment the following pillars set out in the Transformation, Modernisation and Re-industrialisation Programme:

- Decisive spatial transformation
- Accelerated social transformation
- Modernisation of public transport infrastructure
- Modernisation of human settlements and urban development

c. Urban agriculture development

Consideration can be given to retain these pockets of high-potential agricultural soils within township layouts for urban agricultural purposes. Urban agriculture is the practice of cultivating, processing and distributing food in or around urban or peri-urban areas. Urban agriculture is generally practiced for income-earning or food-producing activities by communities. If urban agriculture is therefore considered, it should only be considered if the local communities are in need of such agricultural activities.

Areas that can potentially be used for urban agricultural purposes have been identified within Evaton, Sebokeng and Sharpeville. These areas are all located within the floodplains of rivers. As a result, these areas have streams running through them, which can be used to irrigate the agricultural lands. Because these urban agricultural areas are located on floodplains that traverse old township areas, implies that these urban agricultural areas can be used as an upliftment tool within these township areas. The development of the urban agricultural areas will compliment the following pillars set out in the Transformation, Modernisation and Re-industrialisation Programme:

- Radical economic transformation
- Accelerated social transformation

d. Tourism and recreation development

Although the tourism sector currently forms a relatively small part of the local economy, the sector has particularly high employment and income generating capacity. The sector is also more accessible to unskilled labour. It therefore makes sense to develop the local tourist industry, especially in areas that require economic upliftment, such as old township areas. However, this will require investment in tourism infrastructure, such as access roads and tourist facilities.

The best opportunity within Emfuleni for tourism related to old township areas in Sharpeville. Sharpeville has the Sharpeville Memorial, which commemorates the place where the Constitution and the Peace Treaty of 1902 were signed. The memorial has the potential to attract day visitors and tourists from Gauteng and abroad to the Sharpeville area. Emphasis should therefore be placed on the ongoing development of this historical site. One way of enhancing the tourist appeal of this site is to link it with the Sharpeville Dam, creating a single, interlinked tourist destination. The development of the Sharpeville Memorial/ Dam site will compliment the following pillars set out in the Transformation, Modernisation and Re-industrialisation Programme:

- Radical economic transformation
- Accelerated social transformation
- Modernisation of human settlements and urban development

5.5. TOURISM

The natural environment and tourism go hand-in-hand. Without beautiful, protected and well-managed natural environment, the tourism potential on any region will be severely diminished. Based on this point of departure, tourism development must adhere to two basic principles: quality and accessibility. Quality refers to aspects such as environmental management, availability of municipal services infrastructure for tourist facilities, land use management in tourism areas, and architectural standards of tourist facilities. Accessibility refers to the availability of transportation infrastructure, such as roads and railway lines, as well as the quality of public transport services. Attempts are made in this section to address these principles and propose ways in which tourism development can be encouraged in Emfuleni.

5.5.1. RIVER CITY CONCEPT

The Emfuleni Local Municipality views Emfuleni as a River City. This central idea stems from the fact that Emfuleni is situated on the banks of the Vaal River; the largest river flowing through Gauteng. Based on this view, Emfuleni aims to create a better connection between the city and its river environment. Up to now, much of the city has been developed without much regard for this natural feature, therefore not fully utilizing the potential of the river. Although the basic structure of the city has already been established, for example the location of the central business districts, there are spatial measures that can be implemented, which would improve the connection between the city and the Vaal River. These spatial measures are depicted by the conceptual diagram below, which comprises the following:

a. River corridor

The Vaal River should be seen as a corridor, rather than a boundary located on the edge of the city. Viewing the river as a corridor will help focus prime development of the river front and avoid locating peripheral uses, such as industrial areas, next to the river.

b. Connection

To prevent the Vaal River from becoming an exclusive resource for only those living next to the river, it will be necessary to establish linkages between the river and inland locations where possible. This will make the river more accessible to the larger Emfuleni population. This connection needs to be established on two levels. The first level involves an ecological linkage, whereby the river system function as an uninterrupted open space lattice linking urban areas to the Vaal River. The second level involves linking these urban areas to the Vaal River using pedestrian walkways and pedestrian bridges where necessary.

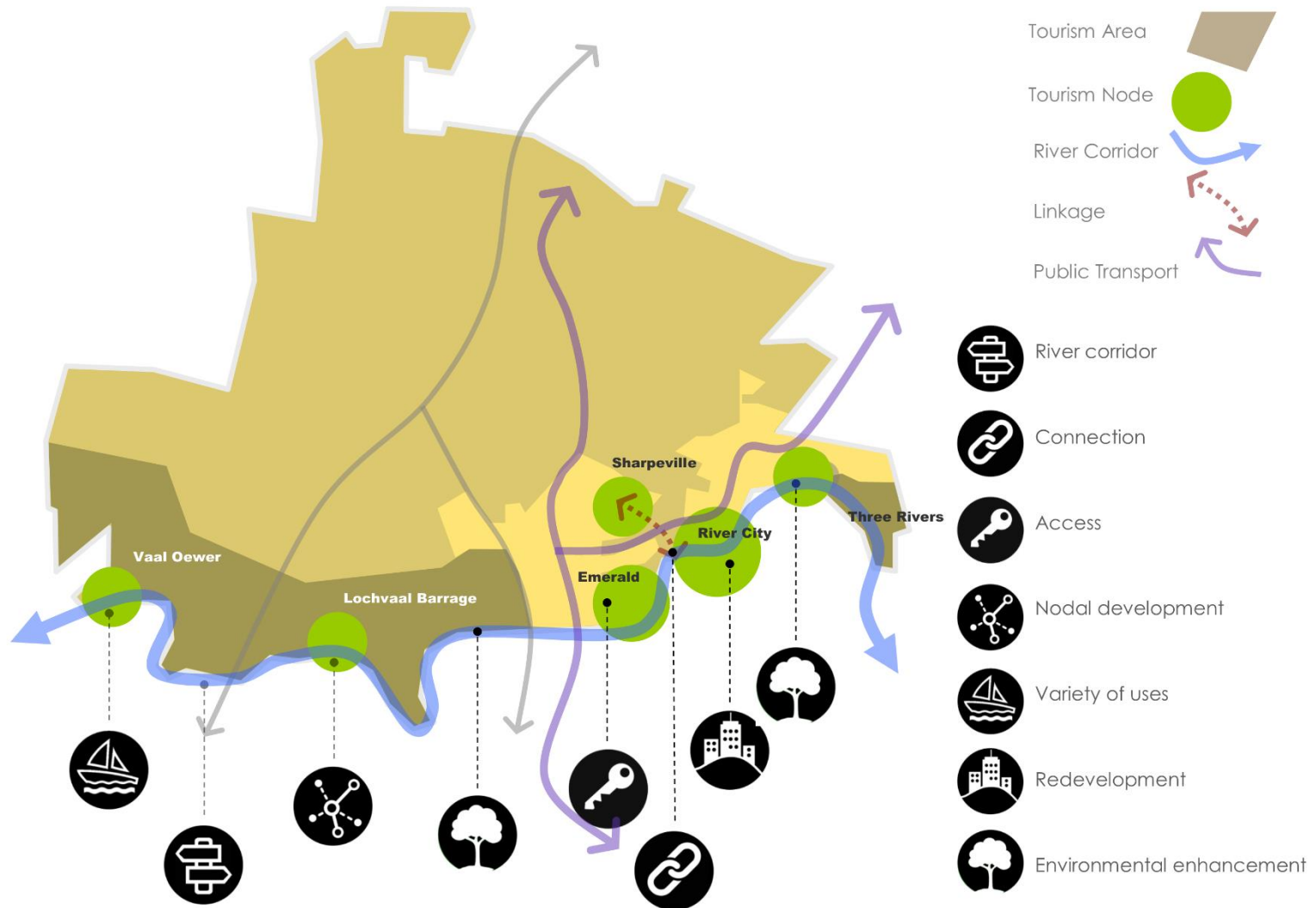


DIAGRAM 31: RIVER CITY CONCEPT

c. Access

The public requires access to the Vaal River waterfront (at least at certain points) to prevent the river from becoming the exclusive property of the landowners that have properties that border the river. There are two ways of providing public access to the riverfront. The first is paid access provided by land owners, such as the Emerald Casino. The second is to access parks that border the river. The latter requires the Municipality to purchase land on the riverfront and proclaim these properties public parks.

d. Nodal development

The development of a clear nodal structure along the Vaal River will increase spatial legibility along the river. In turn, this will help focus Emfuleni on the river, thus enhancing the river city concept. It will also provide distinct destinations along the river for tourists and day-visitors. Creating nodes will require focusing development at key intersections along the river. Various types of nodes can be developed. For example, a node can be a marina on the river, it can be a recreation area situated on the waterfront, or it can be a cluster of restaurants and other tourist attractions situated on the waterfront.

e. Variety of uses

It is important that a variety of uses be encouraged along the Vaal River. This will ensure that the river caters for the needs of local residents and tourists. Uses can range from using the river for water sports (such as boating and fishing) to using the river for more passive uses (such as braaing or bird watching). Establishing the needs of neighbouring communities can go a long way in determining the functions that the river will need to fulfill.

f. Redevelopment

Up to now, Emfuleni has been developed without much regard for the connection between the city and the river. This has led to the development of land uses along the river that are not suited as riverfront uses, such as industrial uses. To fully utilize the potential of the river, these properties need to be redeveloped into uses that are more suited to riverfront uses, such as hotels, restaurants and parks.

g. Environmental enhancement

The Vaal River environment will need to be protected and enhanced where environmental degradation has taken place, if Emfuleni is to be branded a river city. This will require steps such as removing and curbing alien plant species invasion, the rehabilitation of degraded water courses and wetlands, and the planting of indigenous vegetation to enhance recreation areas along the river.

5.5.2. TOURISM DEVELOPMENT

Nationally, there is a strong tendency towards nature-linked tourism and nature-linked tourist destinations within South Africa. As a result, areas with natural beauty are popular tourist attractions. Emfuleni has the scenic Vaal River and this provides Emfuleni with tourism potential, especially with regard to local tourists and day-tourist originating from other parts in Gauteng. This tourism potential is centred on the following tourist areas:

a. Emerald Casino

The Emerald Casino was established with the aim of promoting tourism development within Emfuleni. It has only been able to do so to a certain extent. To enhance the role of this facility, it is proposed that the casino product be re-evaluated to determine how to better utilize this tourist resource. For example, the better utilization of its riverfront can be explored. The Emerald Casino is the only casino in Gauteng with a natural waterfront.

b. Lochvaal Barrage

Lochvaal Barrage is the tourist area that is under development pressure. This development pressure involves the conversion of agricultural holdings along the Vaal River into higher-density residential development. These higher-density residential developments are mostly intended for weekend tourists from other parts in Gauteng. This development pressure requires the strict land use control be exerted in Lochvaal Barrage so that the scenic quality of the area is not diminished. The scenic quality of Lochvaal Barrage is the reason why this area is developed for tourism in the first place. Lochvaal Barrage lends itself water sport-related activities.

c. Sharpeville

The Sharpeville Memorial, with its signing of the Constitution and the Peace Treaty of 1902, has the potential to attract day visitors and tourists from Gauteng and abroad to the Emfuleni region. Emphasis should therefore be placed on the ongoing development of this historical site. Such initiatives would draw day visitors and overseas tourists, which in turn will encourage the growth of the local tourism sector and help diversify the local economy.

TABLE 44: PROPOSED TOURISM AREAS

Tourism area	Attraction	Access	Potential uses	Intervention
Emerald Casino	River and resort	Direct and well developed	Resorts, water sports (boating) and formal tourist accommodation (e.g. lodges)	Re-evaluate casino product to increase visitation of this facility
Lochvaal Barrage	River and lagoon	Indirect and poorly developed	Water sports (boating), informal tourist accommodation (e.g. caravan parks and camping) and guesthouse accommodation	Control land use development to retain scenic quality of the area
Sharpeville	Heritage Site	Direct and well developed	Open air museums and tourist day facilities (e.g. restaurants and curio shops)	Developed historical site on an ongoing basis
Three Rivers	River	Direct and well developed	Tourist day facilities (e.g. restaurants and curio shops) and guesthouse accommodation	Encourage a better linkage between nodal area and river
Vaal Oewer	River and mountainous area	Indirect and poorly developed	Camping, hiking trails and guesthouse accommodation	Control land use development to retain scenic quality of the area

Source: Urban Dynamics Gauteng, 2017

d. Three Rivers

Three Rivers is a residential area located on the Vaal River. It has direct access to the river, which in turn provides it with tourism potential. The characteristics of the area make it suitable for day-tourist facilities (e.g. restaurants and curio shops), as well as weekend-tourist facilities (e.g. guesthouse accommodation). A means of improving the tourist potential of the area would be to establish a better link between the Three Rivers regional node and the Vaal River. This linkage should focus on pedestrian access and the need to provide leisurely access to the river.

e. Vaal Oewer

Vaal Oewer is situated within a scenic natural environment, characterized by mountainous topography. This scenic environment can form the basis for eco-tourism activities. This requires eco-tourism facilities, such as camping sites, hiking trails and guesthouse accommodation. It is imperative that the natural environment is conserved within this part of the Municipal Area to ensure the long-term sustainability of the Vaal Oewer tourism potential.

In addition to the tourism areas mentioned above, gateways are important areas related to the tourism industry. Gateways can be defined as the entry and exit points to a tourism region. They are important because they give visitors and tourists to the region their first and lasting impression of the region. For this reason, it is necessary that gateways are treated in a manner that will attribute to a good impression, which has specific reference to the aesthetic and scenic qualities of gateways.

The entrance into Vanderbijlpark along Barrage Road is an important gateway, because Vanderbijlpark is the core area of the tourist industry within Emfuleni. The Sharpeville Dam is of particular importance in this regard. Protecting this environmental feature is necessary to enhance the tourism potential Sharpeville and the Vaal River. The N1 freeway is also an important access route and gateway to the tourism areas situated along the Vaal River. Visually pollution uses, such as transportation industries on smallholding, should be avoided at all costs along the N1 freeway. This requires strict land use control measures be exercised along the N1 freeway.

5.5.3. ACCOMMODATION

Tourism development can potentially create job and investment opportunities within Emfuleni and stimulate the economic development of the area. However, this will require investment in tourism infrastructure, such as access roads and tourist accommodation. The development of tourist accommodation is central to tourism development within Emfuleni and needs to be done according to a set of criteria that is applicable to Emfuleni. This needs to be done to ensure a quality tourism environment is created and maintained within Emfuleni, which at the same time addresses the needs for local economic development and job creation associated with the tourist sector.

5.5.3.1. Accommodation Typologies

TABLE 45: TOURIST ACCOMMODATION TYPOLOGIES

Typology	Description	Uses Included
Camping and Caravanning	A property used for erection of tents or other temporary structures for temporary accommodation for visitors or holiday-makers, which includes ablution, cooking and other facilities that are related to camping. This includes a caravan park, whether publicly or privately owned.	<ul style="list-style-type: none"> • Tents • Caravans • Communal Ablution Facilities
Bed and Breakfast Establishment	A dwelling house or second dwelling in which the owner of the dwelling supplies lodging and meals to guests who have permanent residence elsewhere; provided that the primary use of the dwelling-house concerned remains for the living accommodation of a single family.	<ul style="list-style-type: none"> • Second Dwelling • Residential Building
Guesthouse	A dwelling house or second dwelling which is used for the purpose of supplying lodging and meals to guests in an establishment which exceeds the single-family house restriction of a bed and breakfast establishment. A guesthouse may also have meeting and function rooms.	<ul style="list-style-type: none"> • Second dwelling • Cottages • Self-catering units • Meeting / Function Rooms • Residential Building
Backpackers Accommodation	A building where lodging is provided, and may incorporate cooking, dining and communal facilities for the use of lodgers. It includes a building in which rooms or beds are rented for residential purposes, such as a boarding house or youth hostel.	<ul style="list-style-type: none"> • Backpackers Lodge • Boarding House • Youth Hostel
Self-catering Units	A building or group of buildings consisting of separate accommodation units, each incorporating a kitchen facility, and which may include other communal facilities for the use of guests, which are rented for residential purposes. It may include holiday flats.	<ul style="list-style-type: none"> • Self-catering units • Communal Facilities • holiday flats
Hotel	A property used as a temporary residence for guests, where lodging and meals are provided. It may include restaurants, conference and entertainment facilities that are ancillary to the primary use as a hotel.	<ul style="list-style-type: none"> • Restaurant or bar • Conference Facilities • Entertainment Facilities • Wellness Centre and Spa
Resort or Lodge	Guest accommodation is subsidiary to the main use, which is of a recreational nature. The main use could be a golf course or similar recreational use.	<ul style="list-style-type: none"> • Clustered dwelling units • Restaurant or bar • Wellness Centre and Spa
Game Farm	Guest accommodation is subsidiary to the main use, which is for the keeping of certain wild animal species. Game farming is further controlled by environmental and tourism legislation.	<ul style="list-style-type: none"> • Clustered dwelling units • Restaurant or bar • Wellness Centre and Spa

Source: Urban Dynamics Gauteng, 2017

Different guest accommodation establishment categories can be identified and are set out in the Table above. Such a classification allows a set of guidelines to be developed, which can be used to evaluate and regulated the tourist accommodation sector within Emfuleni.

5.5.3.2. Implementation Guidelines

Guidelines for the development of tourist facilities within Emfuleni can be an effective mechanism to manage the development of tourism facilities within Emfuleni and provide guidance when considering applications for such activities. These guidelines aim to (a) address the need for access to economic opportunities by supporting the guest accommodation industry, (b) promote a responsible and sustainable approach to guest accommodation development, (c) promote and safeguard the quality of life enjoyed by local residents, and (d) clearly state the land use requirements for establishing guest accommodation. The following guidelines are proposed in dealing with applications relating guest accommodation within Emfuleni:

a. Camping and caravanning

Camping and caravanning sites are usually located in a unique and attractive natural environment. As such, a camping and caravanning site should be developed as a low impact and low intensity use that is in keeping with the context of the area and its surrounding character. A camping and caravanning site can consist of multiple free standing or linked structures of a temporary nature, and may include caravans and tents. Day visitors may be permitted and facilities for their use can be provided. The enterprise may be either in public or private ownership.

b. Bed and breakfast

Part of a dwelling house or second dwelling can be converted to accommodate guests. Breakfast is usually served to residents. Guests may share communal facilities, such as bathroom facilities, or it may be en-suite and private. The architectural appearance and scale of the single residential dwelling unit must be maintained in order to continue to fit the character and context of surrounding residential environment. The Bed and Breakfast Facility may have a minimum of 3 and a maximum of 6 bedrooms.

c. Guesthouses

Guesthouses may be part of a larger single family dwelling house or second dwelling converted to accommodate guests. Part of the dwelling may be provided in a second dwelling. Buildings can be free standing or linked structures. Council may restrict the number of rooms per establishment to mitigate the impact of the establishment on the surrounding residential area. Breakfast is usually served to guests. Guests may share communal facilities or may have en-suite facilities. The guesthouse may have a minimum of 4 and maximum of 12 bedrooms

d. Backpacking and youth hostels

Backpacking and youth hostels provide low cost accommodation to traveling persons whose primary need is for a sleeping facility. Backpacking and youth hostels may contain communal areas, such as kitchen and dining areas and meeting rooms for the exclusive use of lodgers. A kitchen is available for self-help, but no meals are provided for guests. All facilities are communal. Usually there are no restrictions on the number of rooms or beds, but these must be appropriate for the building and surrounding area. However, Council may restrict the number of beds or rooms per establishment in cases and lay down conditions necessary to mitigate the impact of the establishment on the surrounding residential areas.

e. Self-catering apartments

Self-catering apartments is located in a building or a group of buildings consisting of separate accommodation units rented for residential purposes. Each unit incorporates a kitchenette and an ablution facility. The establishment may also provide meals communally to guests. There are usually no restrictions on the number of rooms or beds. However, Council may restrict the number of beds or rooms per establishment in cases where it is necessary to mitigate the impact of the establishment on the surrounding residential environment.

f. Hotels

Hotels are purpose built building, which may consist of multiple free standing structures or a multiple storey single structure. These establishments provide separate rooms with at least one communal dining facility. Breakfast lunch and dinner is served. No provision is made for self-catering. All provided facilities are for the exclusive use of the residing guests. No restrictions are placed on the number of rooms or beds. Council may, however, restrict the number of beds or rooms per establishment to mitigate the impact of the establishment on the surrounding areas. Proximity to major transport routes is an advantage.

g. Lodges and resorts

Lodges and resorts are purpose built and designed guest accommodation units for short term occupancy or use on time sharing basis. Such developments are often located in a unique environment. It can consist of multiple free standing, linked or single structures. Lodges and resorts may include ancillary facilities which are related to the establishment, such as ablution facilities, tourist facilities, recreation facilities, sports facilities, lecture rooms, restaurants, conference facilities, spa and wellness centre, caravan park and camping site. The scale of development is to be determined by contextual information, such as the environmental sensitivity of the area in which it is located, scenic or panoramic views, the carrying capacity for the environment, etc.

h. Game farms

Game farms are purpose built and designed guest accommodation units for short term occupancy or use on time sharing basis for holiday or recreational purposes. It is always located in a unique environment related to wildlife preservation, hunting or fishing recreation. It may include ancillary facilities that are related to the game farm, such as ablution facilities, tourist facilities, recreation facilities, sports facilities, and restaurants. A game farm consists of multiple free standing dwelling units that may or may not be linked to each other. All of the dwelling units must be clustered together and must not deter from the main function of the game farm. The density and design of the game farm must be determined by contextual information, such as environmental sensitivity, scenic views, and the carrying capacity for the natural environment.

The above is an attempt to provide a uniform approach to the management of guest accommodation across all accommodation typologies within Emfuleni. It attempts to provide assessment criteria for each of the accommodation typologies that can be used to approve a consent use or a rezoning application for the establishment of guest accommodation. It is recommended that a Site Development Plan be submitted prior to the approval of any consent use and rezoning right for the establishment of guest accommodation.

5.5.4. TOURISM FACILITIES

Apart from tourist accommodation, tourism facilities can be developed within Emfuleni that specifically aims to provide services and goods to tourists visiting Emfuleni. Tourism facilities can include cultural villages, farmer's markets, information centre, etc.

Importantly, tourism facilities must aim to depict the culture, activities and artifacts of the Emfuleni region. The following guidelines should inform the establishment of tourist facilities:

a. Space and infrastructure

The amount of space needed for the envisaged buildings and visitor facilities of a tourism facility needs to be assessed before the approval of land use rights. Assess to municipal water and electricity capacity and adequate road access also needs to be determined before granting land use rights for the establishment of a tourism facility.

b. Parking

Sufficient parking needs to be provided to cater for tourists that arrive in their own transport. Thus, it is important to estimate beforehand the number of visitors that are envisaged. Importantly, parking for tour buses must be provided if tourist groups are to visit the tourism facility.

c. Amenity value

The location of tourism facilities must be such that the attractiveness of the surrounding area enhances the value of the tourist facility for visitors and tourists. For example, the site for the tourist facility must be free from unpleasant odours often associated with commercial farming practices.

d. Roads and accessibility

The location of tourism facilities must be such that it is easy for tourists using their own transport to find the facility. Thus, the tourism facility should preferably be located within reasonable distance of a main road that is frequented by tourists. Permission must be obtained from the Provincial Department of Transport to construct new access points onto main roads.

e. Signage

Permission must be obtained for the erection of any signs advertising the location of a tourism facility. To erect a road sign in the road reserve (as distinct from on your own property) to advertise a tourism facility will require approval from the Department of Transport in the case of national roads, the Provincial Department of Transport in the case of secondary roads, and the Local Municipality in the case of local roads.

f. Zoning

Where the tourism facility will significantly change the currently land use, application must be made for a change in land use. Any special environmental, mining or other zones that could conflict with the intended tourism facility should be determined before granting land use rights for the development of tourism facilities.

g. Licensing and registration

The tourism facility may need to be registered as a business with the Local Municipality. If the tourism facility intends to serve meals, a trading license will need to be purchased. If liquor is to be sold by the establishment, application will need to be made for a liquor license.

h. Employment and partnerships

It is important to establish partnerships with neighbouring communities in order for them to have a sense of ownership in the tourism facility. As such, it is important for local people to be employed in the operation. The adequate training of tourism facility staff is also vitally important.

5.6. AGRICULTURE

The aim of this section is to ensure that high agricultural land is adequately preserved and made accessible to both commercial and community-based commercial farmers. Even though agriculture is the responsibility of national and provincial government, local government still has a role to play in terms of land use management and the facilitation of investment opportunities to increase agricultural activities and production where possible.

Emfuleni is an important agricultural region within Gauteng, with both extensive and intensive farming constituting the agricultural sector within Emfuleni. There is thus a need to protect the high potential agricultural land found within Emfuleni, provide mechanisms and incentives for the promotion of agricultural development, and determine the most appropriate subdivision criteria for agricultural land to ensure sustainability within the agricultural sector.

5.6.1. AGRICULTURAL DEVELOPMENT

Over the past decade, sustainable agriculture has been gaining increasing support and acceptance within the agricultural sector, because it is seen as a means of addressing the many environmental concerns that have arisen in relation to agricultural practices, including water shortage. Since agriculture is a primary economic activity within Emfuleni, the mismanagement of agricultural resources can have an adverse effect on Emfuleni at large. The need for the sustainable development of agricultural land in Emfuleni is driven by the following overarching factors:

a. Agricultural land is a limited natural resource

There is limited agricultural land in South Africa. South Africa has 122 million hectares of land surface, but only 82 million hectares is used for agriculture, of which most is used for grazing purposes. It is estimated that only 16 million hectares can be used for crop production and that only 3 million hectares of this land can be classified as high-potential agricultural land. Only 1.3 million hectares of this land is irrigated.

b. Food security

Food security exists when a country's people have access to sufficient food products to meet their dietary needs. Therefore, food security is not only dependent on how much food is available, but it is also dependent on the range of food products needed by dietary requirements. A productive and diverse agricultural production sector is therefore fundamental to the food security of the country.

c. Climate change

Climate change, which is causing changes in the environment, is occurring at an ever-increasing rate. Data shows that Southern Africa is experiencing longer dry seasons and rainfall that is becoming less reliable year-on-year. Such climatic factors will influence agricultural production over the long run. Consequently, there will be an increasing need to preserve land for food production and to ensure food security.

Based on the principles of sustainable agricultural development, it is necessary to preserve land with high-potential agricultural soils to ensure food security, even if such land is not currently used for agricultural purposes. In part, this will require creating awareness about the value of agricultural land and the need to preserve it. The municipality will also need to provide a high level

of certainty to landowners, decision makers and other stakeholders with regard to the status and future of agricultural land. This will require effective decision-making on applications relating to the subdivision of agricultural land and the change in use of agricultural land.

5.6.2. LAND USE CHANGE

Land use change refers to applications which will result in farming activities ceasing and alternative uses brought about on land that is currently used for agricultural purposes. Activities that are typically considered agricultural land uses are (a) the cultivation of land for crops or the grazing and breeding of animals, and (b) an enterprise for the processing of agricultural products, such as a canning factory. Other than this, there are non-agricultural uses that can be considered on agricultural land. These are as follows:

a. Mining and waste disposal sites

Mining and waste disposal sites could have severe impacts on agricultural activities if developed within agricultural areas. These could include damage to crops and livestock as a result of increased dust and ground water pollution, increased heavy vehicle traffic that damages roads, the fragmentation of farm land, and the impact on the long-term desirability of farming in the area. Thus, considering applications to allow for mining or waste disposal sites within Emfuleni, must require an impact assessment to determine the impact of these uses on agriculture within Emfuleni. In addition, a set of conditions will be required to mitigate such impacts. No such development should be allowed on high potential agricultural land. Although the approval of mining operations is not a function of municipal government, but a function of national government, Emfuleni should aim to be clear on their position with regard to an application for mining rights. Emfuleni should, as far as possible, aim to influence the National Department of Minerals and Energy in this regard.

b. Nature reserves and resorts

Applications for land use change to allow for nature reserves or resort developments on agricultural land do pose certain concerns. Of greatest concern with such developments is that permission for such land uses often initiates the drive to obtain more land use rights for the nature reserve or resort in future. Often such additional rights involve application for low-density residential development. In general, land use change to nature reserves or resorts should only be considered under the following conditions:

- Resorts must not be permitted on high-potential agricultural land
- Resort accommodation units should be clustered.
- Developers should indicate how potential impacts on adjacent agricultural land will be mitigated
- No water reserved for agricultural purposes may be used to serve the resort development
- The potential to re-establish the natural habitat where a nature reserve is being proposed must be demonstrated.

c. Game farms

A switch from livestock to game farming does not require permission for land use change, except where tourist accommodation is provided. It also does not require consent, except where veterinary permits are needed for the importation and keeping of certain animal species. With regard to accommodation for tourists, the criteria for resort developments should be made applicable. Secondary activities on game farms, such as farm stalls and function venues, can have potential impacts on surrounding agricultural activities, which should be taken into account. These could include noise and other types of pollution, additional non-farm related traffic volumes, and a general impact on the long-term desirability of agriculture in the area.

5.6.3. SUBDIVISION OF FARMLAND

The subdivision of farmland is largely underpinned by the principle of retaining viable economic farm units, because farm units that are too small are not able to provide a sufficient and sustainable income. Aspects that need to be considered when determining the viability of a farm unit in terms of its size, is the capacity of natural resource, particularly water, to support viable farming, and the yield potential of the agricultural soils.

In addition to the above, an Agricultural Hub is in force in the southwestern quadrant of Emfuleni. GDARD has demarcated this region of Emfuleni as a provincial Agricultural Hub. This provincial initiative requires this hub to be protected from urban expansion and densification. Because the Agricultural Hub is a Provincial initiative, it is considered a higher-order and therefore overriding land use initiative.

Based on the above, the following rural subdivision typologies can be identified and densification allowed accordingly, subject to the approval of the Department of Agriculture and subject to the subdivision NOT being located within the Emfuleni Agricultural Hub:

a. Rural residential areas earmarked for rural lifestyle living

In addition, when viewing rural residential areas within the context of the larger municipal area, they fill a characteristic residential gap within the municipal area. These rural residential areas typically provide a rural lifestyle for families who wish to have such a lifestyle or for families who are already functionally part of a rural settlement. An important factor in defining these areas is the availability of bulk water, electricity and sewer.

The primary aim of rural residential areas must be to maintain and enhance the rural character of rural areas. Applying appropriate residential densities is central to maintaining such a rural character. Conventionally, a minimum subdivided stand size of 1 hectare should be supported within rural residential areas. The subdivision of farms to stand sizes of between 1 and 4 hectares must be subject to the following conditions:

- The farm or farm portion is NOT located within the Emfuleni Agricultural Hub;
- Piped water is provided by a relevant authority, such as Rand Water;
- That the subdivision will not pose any pollution problems related to sanitation, and
- That the road infrastructure can handle the resulting increased traffic volumes.

b. Small farms earmarked for intensive farming purposes

Small farms provide farmland for intensive farming purposes and in particular for irrigation farming purposes. Access to a river for irrigation purposes is therefore an advantage. The densities of these farms are much lower than those used for rural residential purposes, partly because they need to be of a sufficient size to enable viable farming, but also due to the limited capacity of transport, utility and social infrastructure. In many cases the need to protect the natural landscape and rural character of an area is also a factor. Typically, such rural areas have stand sizes of between 4 and 20 hectares in size. The subdivision of farms to farming units of between 4 and 20 hectares in size must be subject to the following conditions:

- The farm or farm portion is NOT located within the Emfuleni Agricultural Hub;
- The owner can prove to have adequate water supply from local sources, such as boreholes;
- That the subdivision will not pose any pollution problems related to sanitation, and
- That the road infrastructure can handle the resulting increased traffic volumes.

c. Commercial farms earmarked for extensive farming purposes

Commercial farms consisting of cadastral units that are larger than 20 hectares should be retained as such, whether inside or outside the Emfuleni Agricultural Hub. The status quo of such areas in terms of farm unit size and land use should thus be maintained, except in the following cases:

- Subdivision needed for infrastructure development, such as a road or railway line.
- Subdivision needed for existing or proposed community facilities, such as community halls, churches and schools.
- Subdivisions in order to consolidate to create more functional agricultural units.

The Subdivision of Agricultural Land Act (Act 70) controls the subdivision of agricultural land, which falls under the jurisdiction of this Act. The National Department of Agriculture is responsible for the Act and therefore deals with the subdivision of agricultural land. Land within Emfuleni that does not fall under Act 70, falls within the jurisdiction of Emfuleni. Where land is not under the jurisdiction of Emfuleni, the Municipality can make comments on the applications for subdivisions, based on the guidelines set out above.

5.6.4. AGRI-INDUSTRY

Agri-industry refers to buildings and infrastructure that are required to accommodate the processing of agricultural products. In fact, a large part of agricultural production undergoes some degree of transformation between harvesting the agricultural products and final use. It includes industries that are engaged in the initial processing of agricultural commodities, such as rice and flour milling, leather tanning, cotton ginning, oil pressing, saw milling and fish canning. It also includes industries that undertake further manufacturing operations on products made from agricultural materials, such as bread, biscuit and noodle making, textile spinning and weaving, paper production, clothing and footwear manufacturing.

The development of agri-industries can have many beneficial feedback effects on agriculture itself. The most direct one is the stimulus it provides for increased agricultural production through market expansion. The promotion of agri-industries usually facilitates a substantial increase in employment opportunities. Even if the agri-industrial process is itself capital-intensive, considerable employment may be created.

5.6.4.1. Location of Agric-Industry

The location of agri-industries is largely linked to the availability of agricultural raw materials and low-cost labour. Other factors, such as transport, also determine the location for an agri-industry. Most agricultural products either lose weight and bulk in processing, meaning they can be transported more cheaply after they have been processed, or they are perishable and so can be more easily transported in processed form. The location of agri-industries is also affected by the availability of power and other infrastructure. Based on the above, the following location criteria should apply when evaluating an application for the establishment of an agri-industry:

- The agri-industry should be located near the agricultural product to be processed
- The agri-industry should be located near an unskilled labour market
- The agri-industry must have access to a major road network. This requires careful consideration to avoid overloading and traffic congestion
- The agri-industry must have access to electrical power infrastructure and capacity and in selected cases abundant water sources
- If possible, agri-industries should be grouped to achieve economies of scale
- Agri-industries should preferably not be located on high-potential agricultural soils

5.6.4.2. Limiting Environmental Pollution

Despite the important contribution of agri-industries to overall agricultural development, agri-industries can also give rise to undesirable environmental side-effects. Left unchecked, agri-industries can create environmental pollution through the discharge of organic or hazardous wastes into water supplies or the emission of dust or gases that could affect air quality. The risks of pollution are smaller at the initial stages of processing, but they tend to increase with the level of physical and chemical alteration, particularly in the industries using outdated equipment and technologies. The size of the industry could also be an important factor. Smaller industries often tend to be more polluting than larger agri-industries. This is so because small industries often lack the financial resources to use modern and clean technologies.

Another form of pollution is visual pollution. This type of pollution occurs where an unsightly building is placed in a scenic environment. This type of pollution can have many negative impacts, such as impacting on the tourism potential of an area or reducing the value of neighbouring residential properties. Taking into account that Emfuleni is an important tourist destination,

the visual pollution of agri-industrial buildings should be avoided at all costs. To this end, the following guidelines should be followed when establishing agri-industries:

- Agri-industries must not be located in gateway positions
- Agri-industries must not be located near tourist attractions or facilities, such as guest lodges
- Agri-industries must not be located along scenic routes or tourism routes
- Agri-industries must not be located in highly visual positions which disrupt views of natural landscapes

5.7. SPECIAL PROJECTS

A number of special projects have been proposed for Emfuleni in recent years by the Emfuleni Local Municipality, but also by other government entities. In particular, two projects are worth mentioning: the Vereeniging Urban Renewal Project steered by the Gauteng Department of Human Settlements and the Emfuleni Logistics Hub and Airport championed by the Emfuleni Local Municipality.

5.7.1. VEREENIGING URBAN RENEWAL PROJECT

The edge city phenomenon, which has the past twenty years precipitated the exodus of businesses from traditional CBDs to suburban malls, have left most traditional CBD in decline and in need of renewal. This renewal is needed to enable Traditional CBDs to again attract businesses and residents.

The effect of business decentralization has not escaped the Vereeniging CBD, which is a traditional CBD located in Emfuleni. The decay in the Vereeniging CBD is not only limited to the core of the node, but is also pronounced in the residential areas surrounding the core. This decay has accelerated as more-and-more illegal land uses occur in these areas, resulting in further property depreciation and urban corrosion. It also resulted in escalating municipal maintenance cost and declining revenue level emanating from the CBD. Due to the above, an urban renewal project has been launched for the Vereeniging CBD.

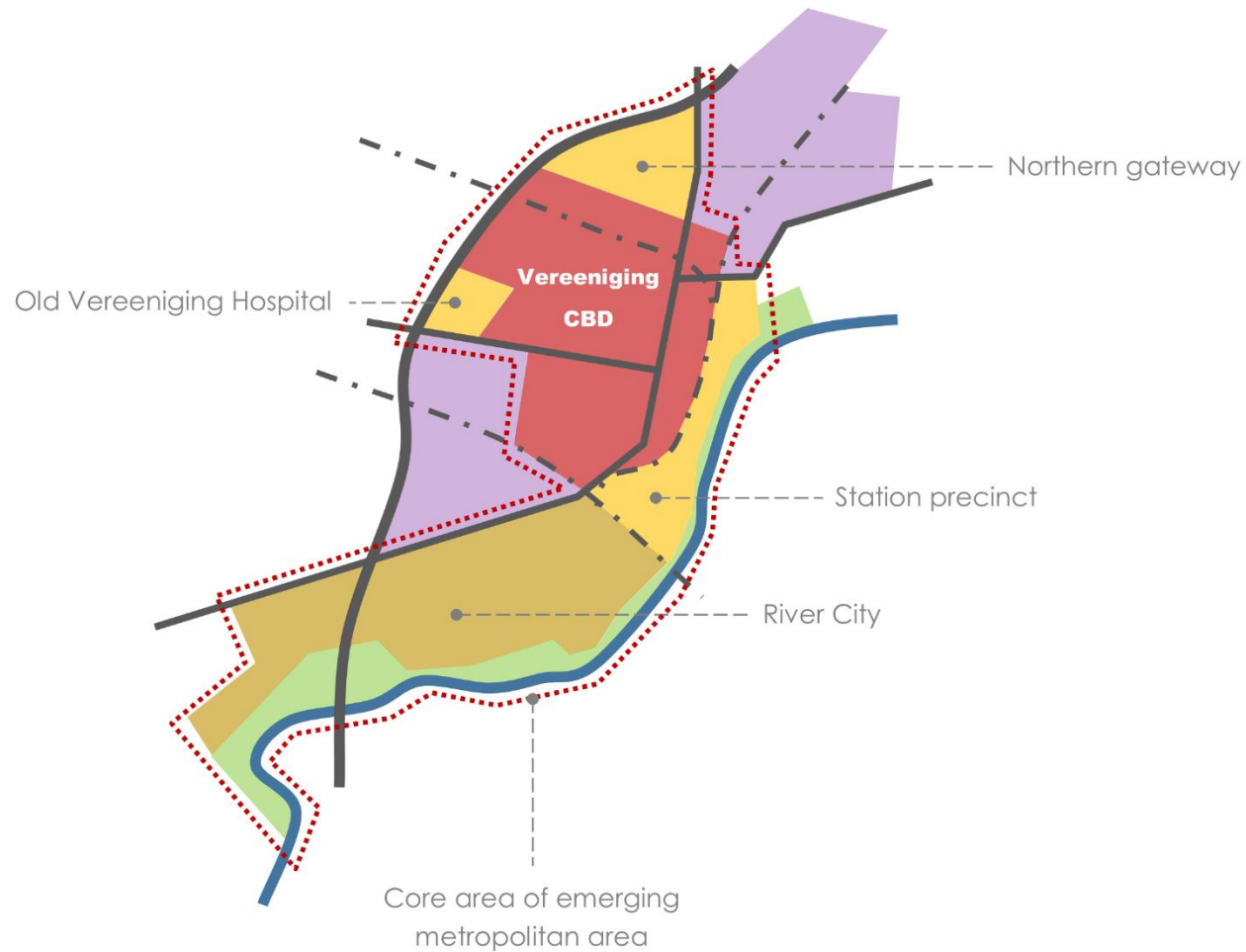


DIAGRAM 32: PROPOSED VEREENIGING CBD INTERVENTION

An endeavor to renew traditional CBD's and attract private sector investments back to traditional CBDs (such as the Vereeniging CBD) was initiated by the National Department of Finance through its Urban Development Zone (UDZ) initiative, which incentivizes private sector investments in traditional CBDs. The Vereeniging CBD was demarcated an Urban Development Zone (the

Vereeniging UDZ). The delineation of the Vereeniging UDZ enables government to facilitate urban renewal in the Vereeniging CBD by providing tax rebates for developers who invested funds in upgrading or redevelopment within the demarcated UDZ area.

In line with the objectives of the Vereeniging UDZ, a number of urban renewal projects have been proposed for the Vereeniging CBD by the Gauteng Department of Housing. These proposals were based on an extensive Urban Renewal Plan prepared by the Department for the Vereeniging CBD. The proposals are aimed at making the Vereeniging CBD a major commercial, government and tourism hub in Emfuleni. These proposals, together with the Emfuleni objective of creating a River City on the Vaal River at the Vereeniging CBD, will achieve the Emfuleni SDF objective of making the Vereeniging CBD the core area of the emerging metropolitan area mentioned in the Development Concept of the SDF.

The Urban Renewal Plan prepared by the Gauteng Department of Housing for the Vereeniging CBD contains a number of objectives and project proposals. The main objective of the plan is to achieve a holistic development vision for the development of the Vereeniging CBD into a sustainable human settlement. To achieve this, would include utilizing the UDZ tax incentives to attract businesses back to the CBD, the improvement and maintenance of infrastructure and buildings within the CBD, the enforcement of municipal by-laws applicable to the CBD, the maintenance of parks, open spaces and areas around public buildings, and the identification of areas that could be redeveloped to create mixed-use areas. A number of areas have been identified that could be redeveloped to create mixed-use areas (see Diagram above). These include the old Vereeniging Hospital site, the northern gateway to the Vereeniging CBD, the station precinct, and the River City site, located south of the CBD.

5.7.2. EMFULENI LOGISTICS HUB AND AIRPORT

The initiative to develop a Logistics Hub and Regional Airport has been established by Emfuleni in recent years to promote economic development within Emfuleni. These initiatives are intended to help generate employment opportunities in Emfuleni and thereby reducing the need for Emfuleni residents to travel large distances to access such employment opportunities in other parts of Gauteng.

The proposed Logistical Hub will be located on parcels of land directly west and adjoining the Arcelor Mittal Industrial establishment. The aim of the Logistical Hub is to be a catalyst for public and private sector investments in Emfuleni to accelerate economic growth and employment creation in the Vaal region. Emfuleni local Municipality has reached an agreement with a number of other role players, such as Transnet, Arcelor Mittal and the Gauteng Department of Economic Development, that a

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logistical hub in Emfuleni be considered as an important flagship projects within the Vaal region. The Gauteng Provincial Government will need to designate the proposed Logistical Hub a Special Economic Zones (SEZ) to increase the potential of this Hub being realised. The potential components of the Logistics Hub include a Transnet container depot, an Industrial Development Zone, an airport, warehouses and storage Facilities, and Intelligence Information Infrastructure



DIAGRAM 33: PROPOSED LOGISTICS HUB AND AIRPORT

The proposed Vaal Logistical Hub is expected to provide O.R. Tambo with a suitable regional logistic facility to the mutual benefit of both Emfuleni and Ekurhuleni Municipalities. In addition, the logistical hub will contribute in improving burdening transport costs and traffic congestions, make Emfuleni more attractive to local and foreign investments, and create employment opportunities which may have otherwise not been realized. Other potential benefits include:

- It will attract new investment, economic development to the Vaal region;
- It will diversify and grow the Vaal economy;
- It will create job opportunities that will address unemployment in the Vaal region;
- It will afford local people to participate in the economy through business partnering, business establishment, training, and skills development;
- It will create a greater demand for Arcelor Mittal's manufacturing output;
- The location of the Logistics Hub at Arcelor Mittal will help minimize the transport cost of materials;
- It will create various opportunities for BBEEE and SMME's within the Vaal region; and
- Kick-start downstream manufacturing in Emfuleni.

Emfuleni proposes the development of a regional Airport within Emfuleni. The aim of this airport is to supplement the Logistics Hub proposed above, and to relieve the OR Tambo International airport and Rand Airport from the growth constraints they are experiencing. Estimates show that the OR Tambo International Airport and Rand Airport are experiencing cargo and passenger growth rates that are unlikely to be satisfied by the future expansion plans of these airports. These expansion plans cannot be amended due to land and infrastructural constraints surrounding these airports. These constraints present an opportunity for the development of a regional airport in Emfuleni to capture some of the growth potential experienced by the mentioned airports.

The location of the proposed regional airport in Emfuleni is critical. The existing airstrips in Emfuleni (such as the existing airstrips near Roshnee and Bophelong) are not suitably located to be converted into a regional airport, because these airports are not located near major transport infrastructure, existing industrial hubs, or the logistical needs of the Vaal region. Consequently, the proposed regional airport was located west of the proposed Logistical Hub, on the opposite site of the N1 freeway. In this locality, the regional airport can serve the proposed Logistical Hub, the Arcelor Mittal industrial hub, and have direct access to the N1 freeway linking the airport to the larger Gauteng region.

The proposed regional airport in Emfuleni is expected to provide infrastructural support and enhance business viability to the proposed Logistical Hub, which will be established immediately west of Arcelor Mittal. In addition, the airport will impact on the

land use pattern of the areas immediately surrounding the airport. These will include the Arcelor Mittal industrial Hub, Bophelong residential area, and the Vanderbijpark CBD. In particular, the strip of land along the P155 will benefit from the regional airport and the proposed logistical Hub. In addition, the development of the regional airport can have positive impact on the socio-economic development the areas immediately surrounding the airport, reduce the transport costs of goods, and enhanced tourism opportunities within the Vaal region.

SECTION 6: URBAN DESIGN FRAMEWORKS

The Development Framework proposed in the previous section of this report, provides the platform for the design of specific sites within Emfuleni, such as the Sebokeng CBD and the Vereeniging River City. Note that these Urban Design Frameworks are conceptual and therefore only aim to provide an understanding of what an appropriate design for these sites should look like. These Urban Design Frameworks are supported by Design Principles, which can be applied to the detailed designs of these sites.

6.1. SEBOKENG CBD

The Sebokeng CBD is located north of the Vanderbijlark CBD and the Arcelor Mittal industrial area. The site is located on Moshoeshoe Road and the Vereeniging-Johannesburg commuter railway line. Sebokeng CBD provides a unique development opportunity for infill development between Vanderbijlpark and Sebokeng. In contrast to the Vanderbijlpark and the Vereeniging CBDs, the Sebokeng CBD is an emerging CBD. The following site design aims to provide a vision for the development of this emerging CBD by applying specific and relevant urban design principles. It is therefore attempted to illustrate how urban design principles can be employed in the design of the Sebokeng CBD, rather than proposing a rigid spatial structure that has to be adhered to when developing the Sebokeng CBD. The aim is thus to influence the manner in which the Sebokeng CBD is ultimately designed and developed.

6.1.1. SITE ATTRIBUTES

The Sebokeng CBD is an existing and emerging nodal area that is located at the existing Houtheuwel commuter railway station. Therefore, the site is highly accessible by means of the commuter railway network. In addition, the bus and minibus-taxi network serving Sebokeng and Evaton uses Moshoeshoe Road, which links the Sebokeng CBD to the Vanderbijlpark CBD to the south and to the Golden Highway to the north. The Moshoeshoe Road bus and minibus-taxi is currently not designed and developed as a formal SPTN route.

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DIAGRAM 1: EXISTING SITUATION

The land use pattern surrounding Sebokeng CBD can broadly be divided into residential, industrial and agricultural uses. The residential component comprises detached housing located north and west of the site, which make up township extensions of Sebokeng. The large Arcelor Mittal industrial area is situated south of the site and separated only by Boy Louw Street (K178) from the site. Non-productive agricultural areas are located west and east of the site.

The Sebokeng CBD itself is partially developed and contains mostly regional community facilities. As such, the site has always functioned as an activity node for the larger Sebokeng area. The site contains a small regional mall, a small industrial area, a hostel complex, a regional hospital and a satellite campus of the Vaal University of Technology (VUT). Despite the fact that the site contains these facilities and fulfills a nodal function, it remains a poorly integrated and poorly designed nodal area, which was at best developed haphazardly. This lack of integration is particularly evident in the lack of pedestrian linkages between the site and the neighbouring Houtheuwel commuter railway station.

The site is not adversely affected by environmental constraints. The only environmental constraint affecting the site is a wetland and drainage system affecting the north-western parts of the site. Conserving this wetland is important and it should therefore be protected in the design of the site. The natural drainage channels and banks of this wetland has to be protected up to the 100-year flood line.

6.1.2. SITE DESIGN

The basic approach of the design of the Sebokeng CBD was to concentrate higher-density, mixed land uses around the existing Houtheuwel commuter railway station and along the proposed Moshoeshoe SPTN route. On the one hand, the purpose of this higher-density, mixed land use structure is to boost the number of commuters using these public transport systems, thus increasing the viability of these public transport facilities. On the other hand, close proximity to public transport is needed to enable the households living within the Sebokeng CBD to access other parts of the greater Emfuleni region.

Taking into account the above, the design of the Sebokeng CBD uses higher-density residential uses as infill development and proposed a pedestrian-oriented structure that supports the use of public transport. The design thus addresses a number of Transit-Oriented Development (TOD) objectives, which includes creating and integrating transit infrastructure, promoting pedestrian movement and walkability, focusing activity on public spaces, and using buildings to create urban form. The spatial implications of these design objectives are illustrated on the Diagrams presented below.

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025



DIAGRAM 2: MOVEMENT NETWORK

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025



DIAGRAM 3 PUBLIC TRANSPORT NETWORK

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025



DIAGRAM 4: URBAN DESIGN FRAMEWORK

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025



DIAGRAM 5: LAND USE STRUCTURE

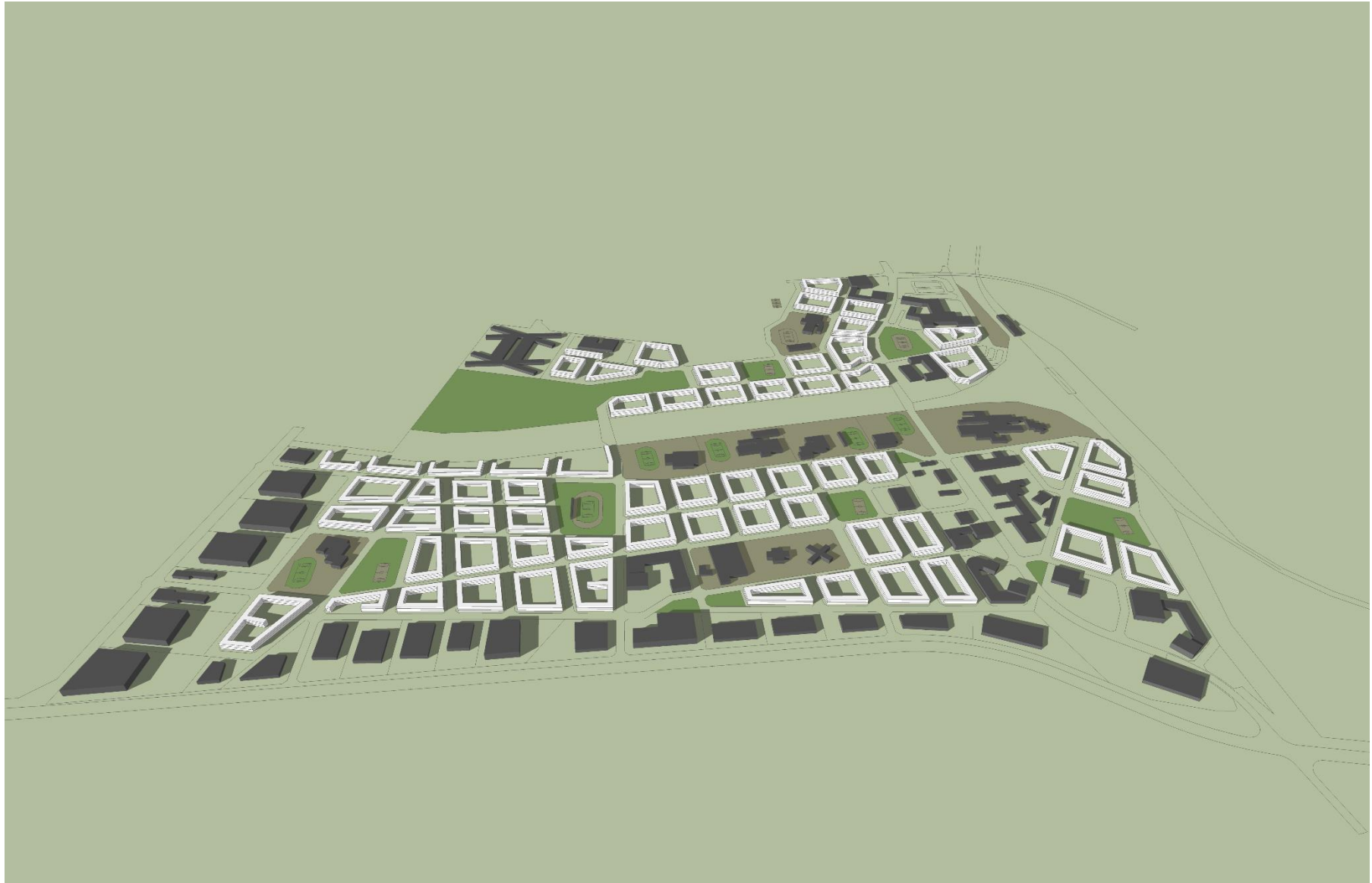


DIAGRAM 6: OVERALL PERSPECTIVE



DIAGRAM 7: LOCAL PERSPECTIVE

6.1.2.1. Movement Network

Movement patterns provide an understanding of how an area functions, because it illustrates the spatial relationships between settlements and nodal areas and the linkages that exist between such spatial entities. The movement pattern to and from the Sebokeng CBD is largely in a north-south direction along Moshoeshoe Road (K53) and to a lesser extent along the Golder Highway (K45). The southward movement is towards the Vanderbijlpark CBD and the northward movement is towards Evaton and Lenasia. Limited east-west movement occurs along the K178, situated on the southern boundary of the site (forming the boundary between the site and the Arcelor Mittal industrial area). Limited east-west movement also occurs along Houtkop Road, situated north of the existing Sebokeng hostel area. These east-west routes give access to Vereeniging and the Vereeniging CBD. The lack of east-west routes within the node itself is very limiting to the node's development.

The South African Road Classification and Access Management Manual sets out a road hierarchy that functions on 5 levels. This road hierarchy can be applied to the design of the Sebokeng CBD site to create a movement network that functions on all levels. The site contains sufficient existing Class 2 roads, which include Moshoeshoe Road (K53), the Golder Highway (K45), and the Boy Louw Street (K178). Class 2 roads are major arterials (or K-routes), which aim to provide access between towns and cities, such as Moshoeshoe Road providing access to Vanderbijlpark and Lenasia. Class 2 roads have a minimum intersection spacing of 800m, but this should be revised for the stretch of road traversing the Sebokeng CBD to enable better pedestrian linkages to public transport systems.

Class 4 roads are proposed for the internal parts of the Sebokeng CBD to enable better linkages within the site and between the site and surrounding high-order roads and public transport facilities. Most of these proposed Class 4 roads aim to improve east-west linkages to the proposed SPTN route on Moshoeshoe Road and the Houtheuwel commuter railway station. Class 4 roads have a minimum intersection spacing of 50m.

A number of Class 5 roads are proposed for the Sebokeng CBD, which basically forms a grid pattern across the site. Such a grid pattern allows efficient pedestrian movement across the site, which in turn promotes the use of public transport serving the site. Class 5 roads are local streets that provide direct access to land uses and link these land uses to the mentioned Class 4 roads. Class 5 roads have a minimum intersection spacing of 10m.

6.1.2.2. Public Transport Network

The Sebokeng CBD is served by a rail line that connects the site to the Vereeniging CBD situated southeast of the site and the Lenasia CBD and the Johannesburg CBD situated north of the site. The Houtheuwel commuter railway station serves the site and is located on the eastern boundary of the site. Currently, this commuter railway station is located within the split of two railway lines, making it difficult to access the station from the Sebokeng CBD site. It is therefore proposed that the Houtheuwel commuter railway station be relocated north of its existing location (see Diagram) to allow the station to be better integrated with the Sebokeng CBD land uses.

In addition to the above, a road-based public transport system (or SPTN route) is proposed along Moshoeshoe Road (K53), which traverses the Sebokeng CBD. This SPTN route will link the Sebokeng CBD to the Vanderbijlpark CBD in the south and the Lenasia CBD in the north. If aligned sensibly, this SPTN route can also function as a feeder system to the existing commuter railway line, thus potentially creating an integrated public transport system.

Land use and public transport need to be integrated to ensure the viability of the public transport system serving Sebokeng CBD. Of particular importance is the manner in which pedestrians move between the public transport facilities (such as the commuter railway station) and the land uses within the Sebokeng CBD. This involves creating a pedestrian-friendly environment within the Sebokeng CBD, using pedestrian walkways and public spaces and using these pedestrian elements to link the commuter railway station to the land uses within the CBD. A grid road and dedicated pedestrian network will best suite pedestrian movement within the Sebokeng CBD.

Other Transit Oriented Development (TOD) principles that needs to be employed in the design of the Sebokeng CBD is obtaining higher land use densities and a land use mix on the site. Higher densities place a larger number of potential commuters within walking distance of the sites existing and proposed public transport facilities. Currently, the existing Sebokeng Mall and the Sebokeng Hospital are the primary land uses defining this CBD. The urban design framework proposes that this existing land use structure be strengthened through infill development and the densification of the Sebokeng CBD. Primarily, it is proposed that this be done through the development of walk-ups on vacant land within the CBD. These walk-ups will provide the CBD with a greater land use mix and density, which would better support the public transport facilities serving the CBD.

6.1.2.3. Urban Design Framework

The aim of the design of Sebokeng CBD was to create a compact urban fabric, which is integrated with public transport, create a suitable pedestrian environment, and enable a diverse land use pattern. A compact urban fabric promotes walking within the Sebokeng CBD as a primary means of movement, because it places a diversity of land uses (shopping, housing, and social facilities) within walking distance of each other. In turn, this creates a vibrant and a pedestrian scale urban environment; which are critical elements that support nodal development.

A basic requirement for an efficient nodal pedestrian network is pedestrian access. It is therefore important to design the Sebokeng CBD in such a way that it would encourage direct pedestrian movement between land uses and public transport facilities serving the CBD. This is called pedestrian permeability and is best achieved using a grid street pattern. Designing a grid street pattern for pedestrian permeability requires establishing an optimal street block size. Inappropriately large street block sizes decrease pedestrian permeability, because it requires longer walking distances to get around the block. Thus, smaller street block sizes tend to increase pedestrian permeability.

Due to the size of the Sebokeng CBD, most of the site is allocated for higher-density residential (walk-ups) purposes to fill the site. These walk-ups can potentially provide enough dwelling units to accommodate the existing Sebokeng hostel residents, as well as a number of additional households. The massing and height of the walk-ups can effectively be used to create urban form and character within the Sebokeng CBD.

Creating a 'sense-of-place' within the Sebokeng CBD is important, because Sebokeng has historically been developed ad-hoc with no particular identity or urbanity. This needs to be changed and can largely be achieved through the proper design of the site. Generally, a 'sense-of-place' is defined by elements such as land use mix, spatial layout, building size and orientation, landscaping, and the manner in which pedestrian and pedestrian movement is accommodated on site.

Another important aspect to address through urban design is edges, because edges encourage activities and a rich public life. Edges refer to the intersections between public and private spaces, such as the interaction between a sidewalk and a walk-up. A number of design interventions create good edges. For example, building facades need to respond to street corners and public spaces, allowing building entrances to face streets or street corners. This helps create active street frontages. In turn, there is a direct linkage between setbacks and edges, because setbacks determine how close a building is located to a street edge. Large setbacks tend to separate buildings from the street edge, which causes poor street-space definition. The design of Sebokeng

CBD thus proposes that walk-ups, retail and office buildings be located near the street edge; creating active edges and enclosed street environments.

6.1.2.4. Land Use Structure

The land use pattern proposed for the Sebokeng CBD can broadly be divided into residential, community, retail, industrial and open space uses. The residential component comprises walk-ups and these are used to fill in the bulk of the site. In addition, the residential density provided by the walk-ups provide the necessary commuter-generating potential to support the public transport facilities serving the Sebokeng CBD.

The residential land use component requires the support of other land uses, such as schools, in order to create complete and sustainable urban environments. Such community facilities must be located in such a way that they are accessible to the residential street blocks they serve. In doing so, these facilities can become the focal points around which residential street blocks can be develop. Other community facilities, such as the existing hospital, all add to the development of a land use mix within the Sebokeng CBD, which supports the existitng and proposed public transport facilities serving the CBD. Developing a range of community facilities within the Sebokeng CBD allows for the development of a one-stop-shop land use arrangement on site. Such an arrangement allows the community facilities to be accessed on the same trip that other errands are made on, such as shopping at the retail centre and visiting the clinic.

The land use composition of the retail or business component of the Sebokeng CBD (primarily to be located along Moshoeshoe Road) needs to be diverse by including uses such as retail, big-box retail, motor trade, and offices in its land use mix. The retail and office space provided within the CBD needs to be allocated according to the needs of its neighbouring consumer base. The retail and business component was designed to utilize the public transport access provided by Moshoeshoe Road (the proposed SPTN route) and the Houtheuwel commuter railway station. It would therefore be sensible to orientate these buildings towards the SPTN route and pedestrian routes connecting these facilities to Houtheuwel Station.

A strip of industrial land is proposed along Boy Louw Street (K178). The location of this industrial strip allows industrial uses (such as warehousing) to take advantage of the visual accessibility provided by Boy Louw Street. In addition, this industrial strip of land creates a buffer between the residential street blocks proposed for the Sebokeng CBD and the Arcelor Mittal heavy industrial area situated on the other side of Boy Louw Street, south of the CBD.

Public spaces are the heart of nodal areas because they are the places of economic, civic, and cultural life, and human interaction. A public space can function as a market place, a civic stage, a playground for children, or a sport facility. The design of the Sebokeng CBD needs to incorporate a variety of public spaces, which range from parks to urban squares located at public transport facilities. The parks proposed for the Sebokeng CBD have all been located in accessible location throughout the site, primarily along possible pedestrian routes flowing across the site.

6.2. VEREENIGING RIVER CITY

The Vereeniging River City is located south of the Vereeniging CBD and borders the Vaal River. This allows the site to be developed as a waterfront development facing the Vaal River. In addition, the site has direct access to the Vereeniging CBD and the Vereeniging commuter railway station, making it suited for the development of a higher-density urban environment. The following site design aims to provide a vision for the development of this riverfront development by applying specific and relevant urban design principles. It is therefore attempted to illustrate how urban design principles can be employed in the design of the Vereeniging River City, rather than proposing a rigid spatial structure that has to be adhered to when developing the Vereeniging River City. The aim is thus to influence the manner in which the Vereeniging River City is ultimately designed and developed.

6.1.1. SITE ATTRIBUTES

The Vereeniging River City is an abandoned heavy industrial area located on the Vaal River, with access to the Vereeniging CBD. The site is highly accessible by means of the region's strategic road network and the Johannesburg-Vereeniging commuter railway line. In addition, the proposed public transportation route that the Vanderbijlpark CBD to the Vereeniging CBD runs along the northern boundary of the site on Barrage Road. Barrage Road is currently not designed and developed as a formal SPTN route.

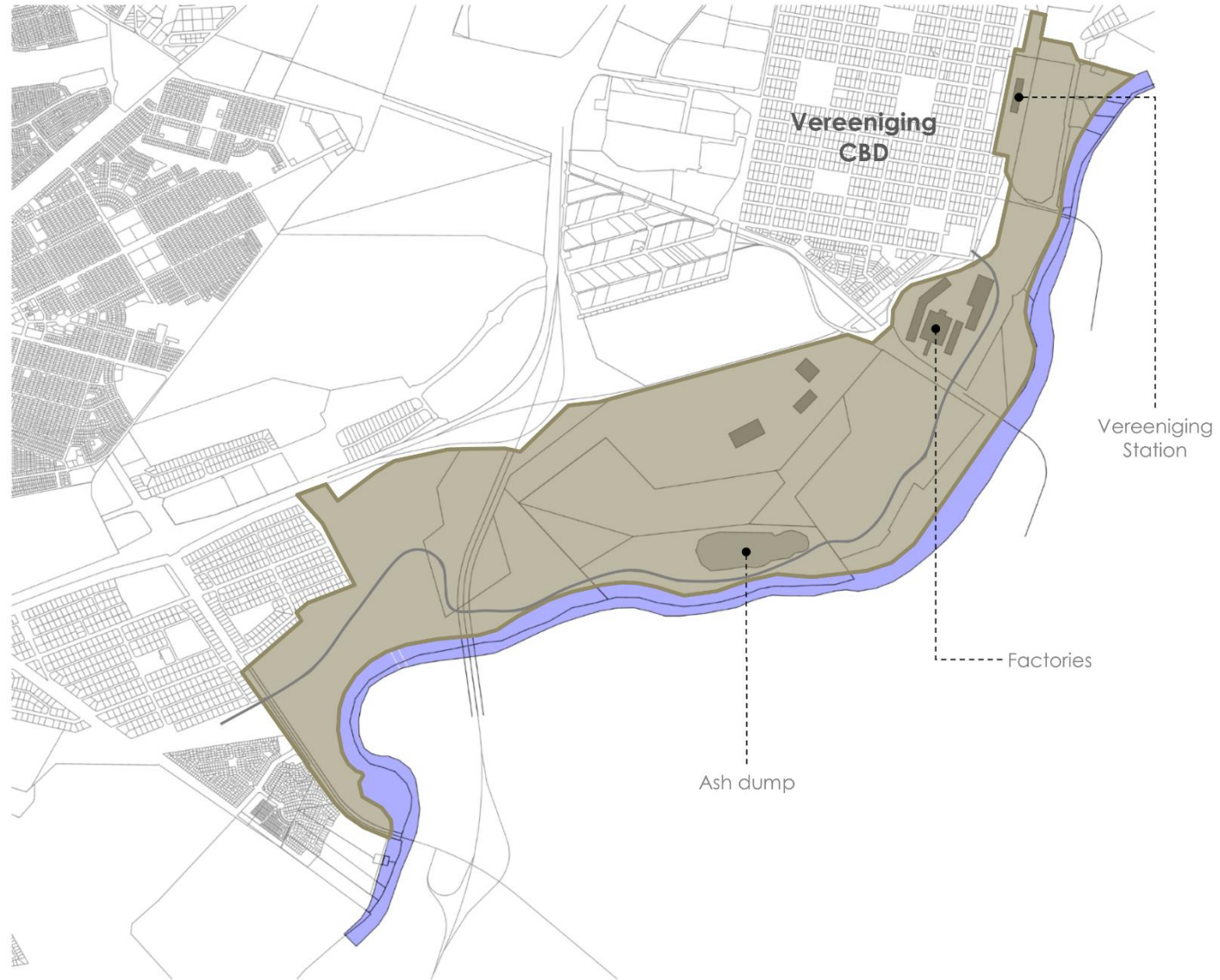


DIAGRAM 1: EXISTING SITUATION

The land use pattern surrounding Vereeniging River City can broadly be divided into residential, industrial and open space uses. The residential component comprises detached housing located north-east of the site in the Vereeniging CBD, north-west of the site in Sharpeville, and west of the site in Bedworth Park. The Leeuwkuil industrial area is situated north of the site and separated only by Barrage Road from the site. Open spaces include the Vaal River, located on the southern boundary of the site, the the Sharpeville Dam, located north-west of the site.

The site itself is partially developed and contains mostly industrial facilities and mine dumps. It includes the Vaal Works, a large steel factory, located on the eastern parts of the site, next to the Vereeniging CBD. The Verref Refractory is situated in the central parts of the site, against Barrage Road and is accessed via Barrage Road. The site also comprises an ash dump, situated in the central parts of the site against the Vaal River. This ash dump is owned by the Emfuleni Local Municipality and is slowly being sold off. Most of the factories located on the site will need to be demolished to allow the redevelopment of the site. There are some factory buildings that can be retained due to the historic architectural value and reused for other purposes, such as cultural centres or tourist facilities. The mine dumps will also have to be removed to fully use the site.

The site is not adversely affected by environmental constrains, except for the 100-year floodline the affects about a quarter of the site's surface. To optimally utilize the site a allow buildings to be build up to the edge of the Vaal River, this floodline area can be earth-filled to above the 100-year flood level. The earth-fill of this area is the ussumption made in this urban design framework for the River City site. In addition to the above, the site is highly contaminated by histroric industrial and mining activity. The rehabilitation of these contaminated areas will need to tbe conducted befor urban development can proceed on the site.

6.1.2. SITE DESIGN

The basic approach of the design of the Vereeniging River City was to concentrate higher-density, mixed land uses on the Vaal riverfront and along Barrage Road. Placing a large number of households on the Vaal River will place these households within close proximity of the river and enable these households to access the recreational opportunities associated with the river. In addition, the higher-density, mixed land use structure is to boost the number of commuters within walking distance the the proposed Barrage Road public transport route, thus increasing the viability of this public transport facility once developed.

Taking into account the above, the design of the Vereeniging River City uses higher-density residential uses as infill development and proposed a pedestrian-oriented structure that supports the use of public transport. The design thus addresses a number of Transit-Oriented Development (TOD) objectives, which includes creating and integrating transit infrastructure, promoting

pedestrian movement and walkability, focusing activity on public spaces, and using buildings to create urban form. The spatial implications of these design objectives are illustrated on the Diagrams presented below.



DIAGRAM 2: MOVEMENT NETWORK

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025



DIAGRAM 3 PUBLIC TRANSPORT NETWORK



DIAGRAM 4: URBAN DESIGN FRAMEWORK

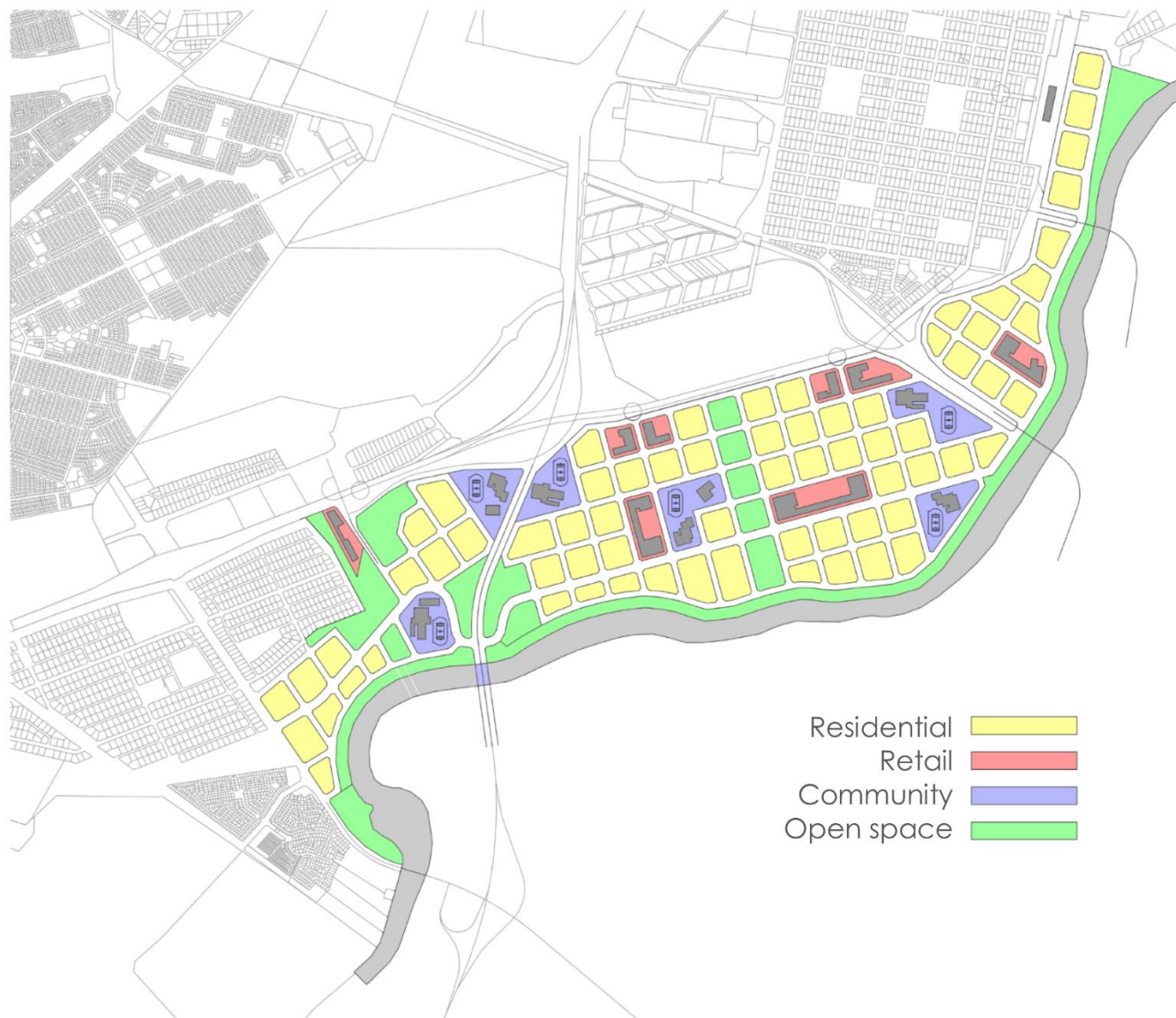


DIAGRAM 5: LAND USE STRUCTURE



DIAGRAM 6: OVERALL PERSPECTIVE

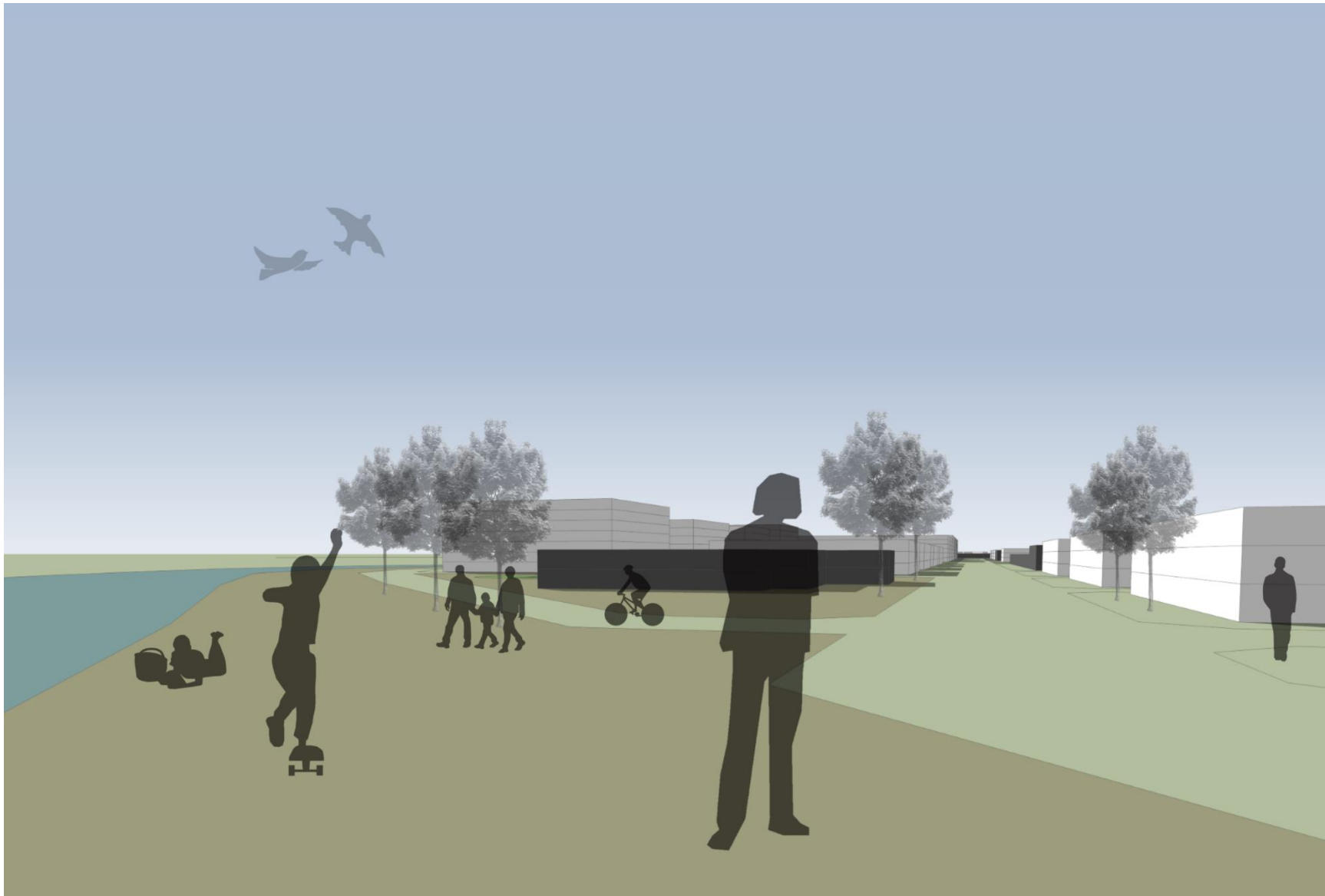


DIAGRAM 7: LOCAL PERSPECTIVE

6.1.2.1. Movement Network

Movement patterns provide an understanding of how an area functions, because it illustrates the spatial relationships between settlements and nodal areas and the linkages that exist between such spatial entities. The movement pattern to and from the Vereeniging River City is largely in an east-west direction along Barrage Road (K174). Barrage Road links the Vanderbijlpark CBD to the Vereeniging CBD. This east-west movement can be reinforced by upgrading the existing Vaal riverfront road (Mario Milani Road) to become the central collector road serving the proposed development. Due to the strategic road network surrounding the site and the limited intersection spacing enforced by the design limitations of the strategic road network, the site only has two primary access points. The first access point is via Ascot on Vaal Road, situated on the western boundary of the site, and the second access point is via Victoria Avenue, linking the site to the Vereeniging CBD.

The South African Road Classification and Access Management Manual sets out a road hierarchy that functions on 5 levels. This road hierarchy can be applied to the design of the Vereeniging River City site to create a movement network that functions on all levels. The site has access to Barrage Road (K174), which is an existing Class 2 road aligned along the northern boundary of the site. Class 2 roads are major arterials (or K-routes), which aim to provide access between towns and cities, such as Barrage Road providing access to Vanderbijlpark CBD and the Vereeniging CBD. Class 2 roads have a minimum intersection spacing of 800m, but this should be revised for the stretch of road located between the PWV11 and the Vereeniging CBD to enable better pedestrian linkages to proposed public transport system operating on Barrage Road.

A Class 4 road is proposed for the internal parts of the Vereeniging River City site to enable better linkages within the site and between the site and surrounding urban neighbourhoods. In particular, this Class 4 road will improve east-west linkages to the Vereeniging CBD and the Vereeniging commuter railway station, thus integrating the site with the Vereeniging CBD and higher-order public transport. Class 4 roads have a minimum intersection spacing of 50m.

A number of Class 5 roads are proposed for the Vereeniging River City, which basically forms a grid pattern across the site. Such a grid pattern allows efficient pedestrian movement across the site, which in turn promotes access to and the use of public transport serving the site. Class 5 roads are local streets that provide direct access to land uses and link these land uses to the mentioned Class 4 roads. Class 5 roads have a minimum intersection spacing of 10m.

6.1.2.2. Public Transport Network

The Vereeniging River City has access to the commuter rail line that terminates at the Vereeniging CBD, situated northeast of the site. This commuter railway line connects the Vereeniging CBD to the Lenasia CBD and the Johannesburg CBD. In addition to the commuter railway line, a road-based public transport system (or SPTN route) is proposed along Barrage Road (K174), which is located on the northern boundary of the site. This SPTN route will link the site to the Vanderbijlpark CBD in the west and the Vereeniging CBD to the northeast. This SPTN route can also function as a feeder system to the Vereeniging commuter railway line, thus connecting the site to an integrated public transport system.

Land use and public transport need to be integrated to ensure the viability of the public transport system serving Vereeniging River City. Of particular importance is the manner in which pedestrians move between the public transport facilities (such as the bus stations) and the land uses within the Vereeniging River City. This involves creating a pedestrian-friendly environment within the Vereeniging River City, using pedestrian walkways and public spaces and using these pedestrian elements to link the commuter railway station to the land uses within the CBD. A grid road and dedicated pedestrian network will best suite pedestrian movement within the Vereeniging River City.

Other Transit Oriented Development (TOD) principles that needs to be employed in the design of the Vereeniging River City is obtaining higher land use densities and a land use mix on the site. Higher densities place a larger number of potential commuters within walking distance of the sites existing and proposed public transport facilities. Placing a large number of potential commuters on the site can be done through the development of walk-ups. The mix can be achieved by creating residential-supporting uses on the site, such as schools and shopping centres. A land use mix better supports public transport by giving a commuter a number of reasons to use the public transport facilities. In other words, a land use mix creates a one-stop-shop environment that favours the use of public transport

6.1.2.3. Urban Design Framework

The aim of the design of Vereeniging River City was to create a compact urban fabric, which is integrated with public transport, creates a suitable pedestrian environment, and enable a diverse land use pattern. A compact urban fabric promotes walking within the Vereeniging River City as a primary means of movement, because it places a diversity of land uses (shopping, housing, and social facilities) within walking distance of each other. In turn, this creates a vibrant and a pedestrian scale urban environment; which are critical elements of a transit-oriented development.

A basic requirement for an efficient pedestrian network is pedestrian access. It is therefore important to design the Vereeniging River City in such a way that it would encourage direct pedestrian movement between land uses and public transport facilities serving the CBD. This is called pedestrian permeability and is best achieved using a grid street pattern. Designing a grid street pattern for pedestrian permeability requires establishing an optimal street block size. Inappropriately large street block sizes decrease pedestrian permeability, because it requires longer walking distances to get around the block. Thus, smaller street block sizes tend to increase pedestrian permeability.

Due to the size of the Vereeniging River City, most of the site is allocated for higher-density residential (walk-ups) purposes to fill the site. The massing and height of the walk-ups can effectively be used to create urban form and character within the Vereeniging River City. Creating a 'sense-of-place' within the Vereeniging River City is also important. Generally, a 'sense-of-place' is defined by elements such as land use mix, spatial layout, building size and orientation, landscaping, and the manner in which pedestrian and pedestrian movement is accommodated on site. The Vereeniging River City is located on the Vaal River, which can effectively effectively be used to create a unique 'sense-of-place' within Gauteng.

Another important aspect to address through urban design is edges, because edges encourage activities and a rich public life. Edges refer to the intersections between public and private spaces, such as the interaction between a sidewalk and a walk-up. A number of design interventions create good edges. For example, building facades need to respond to street corners and public spaces, allowing building entrances to face streets or street corners. This helps create active street frontages. In turn, there is a direct linkage between setbacks and edges, because setbacks determine how close a building is located to a street edge. Large setbacks tend to separate buildings from the street edge, which causes poor street-space definition. The design of Vereeniging River City thus proposes that walk-ups, retail and office buildings be located near the street edge; creating active edges and enclosed street environments.

6.1.2.4. Land Use Structure

The land use pattern proposed for the Vereeniging River City can broadly be divided into residential, community, retail and open space uses. The residential component comprises walk-ups and these are used to fill in the bulk of the site. In addition, the residential density provided by the walk-ups provide the necessary commuter-generating potential to support the public transport networks serving the Vereeniging River City. A strip of higher-density apartment buildings is proposed along the Vaal River waterfront. The location of this residential strip will allow these apartments to take advantage of the views of the Vaal River and

can therefore be sold as premium bonded units. The residential units located closer to the proposed Barrage Road SPTN route can be utilized for more affordable walk-up units.

The residential land use component requires the support of other land uses, such as schools, in order to create complete and sustainable urban environments. Such community facilities must be located in such a way that they are accessible to the residential street blocks they serve. In doing so, these facilities can become the focal points around which residential street blocks can be developed. The community facilities, in conjunction with the other land uses proposed for the site, all add to the development of a land use mix within the Vereeniging River City, which supports the existing and proposed public transport facilities serving the site. Developing a range of land uses within the Vereeniging River City allows for the development of a one-stop-shop land use arrangement on site. Such an arrangement allows the community facilities to be accessed on the same trip that other errands are made on, such as shopping at the retail centre and visiting the clinic.

The land use composition of the retail or business component of the Vereeniging River City (primarily to be located along the Mario Milani Road) needs to be diverse by including uses such as retail, big-box retail and offices in its land use mix. The retail and office space provided on the site needs to be allocated according to the needs of its surrounding consumer base. The retail and business component was designed to utilize the public transport access provided by Barrage Road (the proposed SPTN route) and the Vereeniging commuter railway station. These buildings need to be orientated towards the SPTN route and pedestrian routes connecting this facility to the site.

Public spaces are the heart of higher-density urban areas because they are the places of economic, civic, and cultural life. A public space can function as a market place, a civic stage, a playground for children, or a sport facility. The design of the Vereeniging River City needs to incorporate a variety of public spaces, which range from parks to urban squares located at public transport facilities. The urban design framework for the Vereeniging River City proposes a promenade be developed along the Vaal River edge to allow the public to have direct access and utilize this natural asset. This promenade needs to be a local, metropolitan and provincial facilities, providing waterfront access to locals, people of Gauteng, and to international tourists. A central park is proposed for the Vereeniging River City, which will link the inner and northern parts of the site to the Vaar riverfront and promenade.

6.3. DESIGN PRINCIPLES

Developing or redeveloping an urban area, such as the Sebokeng CBD, requires applying a number of urban design principles. These design principles need to address a wide range of spatial issues. For example, it is important to know how the specific design of walkways, public spaces and parks can encourage a rich public life within urban areas. It is also important to know how buildings can reinforce key locations within urban areas. Another key element of urban development is obtaining a public transport-oriented spatial structure by focusing on pedestrian movement, rather than on private vehicles. Based on the above, the following urban design principles need to be taken into account when developing or redeveloping an urban area:

PRINCIPLE 1: COMPLETE THE STREET NETWORK

The street network of the site must reinforce direct pedestrian access and movement across the site to existing and proposed retail facilities, community facilities, and public transport facilities. To this end, the site's street network needs to be extended across the site and 'stitched' to the surrounding strategic road network. As many linkages to the surrounding strategic road network must be provided as is permitted by road design standards to increase accessibility.

PRINCIPLE 2: CREATE A HIERARCHY OF STREETS

A hierarchy of streets must be employed to provide structure of movement for both pedestrians and vehicles. The primary connectors (20m streets) should connect the site to public transport routes and major roads, and should assist with internal circulation. The secondary connectors (13m street) should cater for pedestrians, slow moving traffic, and should provide direct building access.

PRINCIPLE 3: CREATE COMPLETE STREETS

Complete streets are streets that cater for everyone and all types of mobility, including pedestrians, bicyclists, motorists and public transport. Such streets are designed for safe use by all users of all ages and abilities. Streets must therefore be designed to make it easy for pedestrians to cross the street, walk to the shop, access public transport, and cycle to work. A complete street can include sidewalks, bike lanes, comfortable and accessible public transport, frequent and safe crossing opportunities, median islands, curb extensions, narrower travel lanes, and roundabouts.

PRINCIPLE 4: MAKE ACCESS TO PUBLIC TRANSPORT CONVENIENT

Implement pedestrian-friendly design measures that make public transport facilities, such as bus/ taxi drop-off points, easily accessible. This can include creating direct pedestrian routes that allow pedestrian to access public transport facilities over the shortest distance, using the street network and public spaces to achieve this.

PRINCIPLE 5: CONSIDER STREET BLOCK SIZE AND PERMEABILITY

Creating a pedestrian environment requires good pedestrian access, which in turn is encouraged by direct pedestrian movement. This is called pedestrian permeability and is best achieved using a grid street pattern and establishing smaller street block sizes. A smaller street block tends to enhance permeability, because it shortens the distances pedestrians need to walk to get around the street block to access uses or facilities located on the other side of the street block.

PRINCIPLE 6: USE BUILDING HEIGHT TO CREATE URBAN FORM

The buildings should utilize the maximum height allowed to increase building density along public transport routes and signal the location of public transport facilities. Building heights can be lowered where it is necessary to enable a better density interface with neighbouring residential areas. Buildings height should be used to 'frame' public spaces and streets, creating pleasant pedestrian environments.

PRINCIPLE 7: USE A RANGE OF BUILDING DESIGNS

A range of buildings designs and styles should be used. These should vary in building layout and façade designs and can best be achieved by using 2 or more architect firms with different architectural styles; each firm responsible for different buildings. Differentiation in building style, scale and finishes creates diversity and visual vibrancy. External finishes of building should be of high quality.

PRINCIPLE 8: DEFINE AND ENCOURAGE ACTIVE EDGES

Street blocks should be designed based on the edge-block principle, where buildings are placed close to the stand boundary (typically 2-4m from the boundary). Entrench in this design application is the principle of overlooking and surveillance. Buildings that are located close to the street edge allows the street to be viewed through windows and from balconies, which in turn make streets safer for pedestrian.

PRINCIPLE 9: FENCES AND BUILDINGS SECURITY

Fencing is undesirable from an urban design perspective, because it tends to limit pedestrian access and movement. However, providing fencing is often a necessity within urban areas and it is therefore better to address the issue than ignoring it. Should a fence be erected, it should be visually permeable to visually connect buildings with streets. Sensible gate placement can improve pedestrian accessibility and should therefore be carefully positioned.

PRINCIPLE 10: DEFINE PUBLIC AND PRIVATE SPACE

A clear distinction should be made between what is public space and what is private space. No ambiguous spaces should be allowed. Walk-up buildings should be enclosed to form inner courtyards that are controlled private spaces. While private space should be protected, maximum permeability of public spaces must be enabled.

PRINCIPLE 11: CREATE PUBLIC SPACES LINKED TO AN OPEN SPACE LATTICE

Develop public spaces for recreation and community interaction. Public spaces should be developed at key pedestrian intersections to increase access to and use of these spaces. A range of public space typologies can be developed, including urban squares, markets, sports fields, and parks. These public spaces must be linked together to create an open space lattice. The lattice connectors can include the streams or tree-lined streets.

PRINCIPLE 12: PROMOTE STREETS AS PUBLIC SPACES

Although part of the complete streets principle, it needs to be emphasized that streets need to be designed as public spaces so that they can be used as public spaces. This requires enhancing pedestrian routes with landscaping, providing street furniture, allowing residential buildings to overlook these streets, and connecting these streets with other public spaces.

PRINCIPLE 13: ENABLE ACCESS TO RETAIL AND PUBLIC FACILITIES

Residential communities need easy access to retail facilities and public amenities, such as schools. In turn, providing access to such facilities will enhance the viability of these facilities. This can be achieved by designing the street network and pedestrian routes to intersect with retail facilities and public amenities, or at least provide the shortest possible routes to these facilities.

PRINCIPLE 14: PARKING MUST NOT IMPEDE PEDESTRIAN MOVEMENT

High-density land uses, such as walk-ups and retail, require extensive parking areas or structures to support these uses. These parking areas or structures can become barriers to pedestrian movement. Parking areas and structures should not be located on street frontages. This separates the street frontages from the buildings, requiring pedestrians to cross the parking area to access the building. Where possible, parking areas should be provided within the courtyards of buildings (and walk-ups in particular) to allow the buildings to remain connected to the street front.

PRINCIPLE 15: CONSIDER THE DESIGN OF PARKING AREAS

It is necessary that the detailed design of parking areas and structures are visually compatible with the character of neighbouring buildings. The impact of parking areas and structures can be reduced with trees, landscape features and surface treatments. One of the key challenges is to minimize the size of parking areas or parking structures, especially at retail centres. Ways to achieve this through design is to break up large parking areas with trees, buildings, or different surface treatments, or to provide parking areas on elevated levels, underground or in semi-basements where practical.

SECTION 7: LAND USE MANAGEMENT

The Development Framework proposed in the previous section of this report, provides the platform for a Land Use Management System (LUMS). The Land Use Management System is therefore informed by the Development Framework and should aim to manage the implementation of the framework proposals.

7.1. DEVELOPMENT DENSITY

A critical element in developing more sustainable cities is applying higher urban densities than in the past. This has been necessitated by the inefficiency and high costs of existing spatial patterns, especially with regard to providing municipal services and public transport. For example, low urban densities result in long walking distances and therefore cannot support public transport effectively. Of particular importance is the integration of higher-density housing development and public transport. Public transport is and must be central to higher-density housing development, simply because households that typically live at higher residential densities are generally more reliant upon public transport to access employment opportunities.

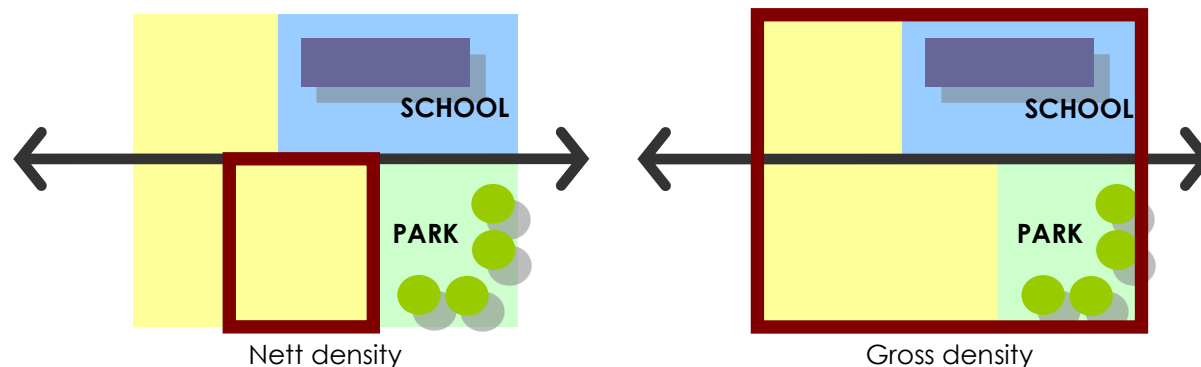


DIAGRAM 30: DENSITY MEASURES

Based on the above as a point of departure, specific development density ranges are proposed for nodes (as set out in the Land Use Management zones dealt with in this section of the report) and the peripheral areas surrounding nodes within Emfuleni. These densities aim to increase densities within the proposed activity nodes, which are centred on the existing and proposed public transport routes and stations. The proposed densities are expressed in terms of units per hectare (u/ha).

Density refers to the intensity of development within a zoning district. In residential areas, density is generally measured by the maximum number of dwelling units permitted per hectare of land (e.g. 20 units/ha). Residential density can be expressed as nett or gross density. Nett residential density (see Diagram above) refers to the density on a specific site, excluding public roads, social facilities and public open space, thus including only the area allocated for residential use. Gross residential density refers to the density of a specific site including the land occupied by infrastructure, social and economic facilities, such as schools, shops, open space and roads.

Nett density is used when referring to residential density in this Land Use Management section of the Emfuleni SDF. A dual land use management system is proposed to govern residential density; the one is based on land use management zones and the other is based on distance from an activity node. Both can be applied to determine residential density and whichever method provides the high residential density can be utilized.

7.2. LAND USE MANAGEMENT ZONES

The Land Use Management System aims to implement the Development Framework proposals through applications for land use change, such as township establishment applications. The Land Use Management System comprises the following mutual supporting elements:

- Demarcated zones: Emfuleni was divided into a number of Land Use Management zones. These zones aim to promote the development of a specific land use character (as defined in the Development Framework) through the use of land use mix and density.
- Land use matrix: The Land Use Management zones are linked to a matrix. The matrix defines the land use mix and density to be allowed within each demarcated zone.

The Land Use Management (LUMS) zones aims to achieve specific objectives, as is set out in the Table below. **The Land Use Management (LUMS) zones are demarcated on Figure 31, and in greater detail on Figures 33-42. The land use mix and density that are linked to these zones are set out in Table 37.**

Zone 1: High-density residential zone

Zone 1 aims to encourage residential densities associated with a Municipal Node or CBD that supports a major public transport station, thus placing as many people as possible within comfortable walking distance of economic opportunities and public transport. A maximum residential density of 80 units per hectare is allowed in Zone 1. The aim should be not to develop residential densities lower than 60 units per hectare in this zone to ensure that the necessary residential densities are developed to support the operation of public transport. Land uses to be supported and accommodated within Zone 1 include medium and high density residential typologies, as well as alternative forms of accommodation, such as boarding houses. Educational and other social facilities are also supported within Zone 1.

TABLE 37: OBJECTIVES OF LAND USE ZONES

Land Use Management Zone	Aim and Objective
Zone 1: High-density residential zone	Encourage residential densities associated with a Central Business District (CBD) that supports a major public transport station
Zone 2: Medium-density residential zone	Encourage residential densities that allows affordable housing development and supports road-based public transport
Zone 3: Low-density residential zone	Maintain typical suburban residential areas
Zone 4: Retail and office zone	Concentrate retail, office and residential uses to serve regional sectors within the municipal area
Zone 5: Heavy Industry and Commercial	Provide for polluting industrial and commercial activities
Zone 6: Light Industry and Commercial	Encourage and concentrate non-polluting commercial and light industrial activities
Zone 7: Open space zone	Enable the protection of environmental sensitive areas and geotechnically hazardous areas
Zone 8: Agricultural zone	Protect high-potential agricultural soils and allow of low-intensity residential uses where applicable
Zone 9: Specialized zone	A specialized node accommodated specific land use types that are not necessarily found in or considered desirable as part of a typical activity node.

Source: Urban Dynamics Gauteng, 2017

Zone 2: Medium-density residential zone

Zone 2 aims to encourage residential densities that allows affordable housing development and supports road-based public transport. A maximum residential density of 60 units per hectare are allowed within Zone 2. Such densities typically allow for the development of a range of affordable housing typologies within this zone. Residential-supporting land uses to be accommodated within Zone 2 include educational facilities and medical facilities. Zone 2 also allows for the establishment of micro enterprises with the aim to support and promote SMMEs within this zone. Concent for the establishment of micro enterprises are strictly managed by the micro enterprises management system, set out in Paragraph 6.3 below.

Zone 3: Low-density residential zone

The aim of Zone 3 is to develop and maintain the residential character of typical suburban residential neighbourhoods. This involves the management of land use development within these residential areas and curbing the proliferation of noxious and disturbing land uses within these areas. Zone 3 does also allow for the establishment of micro enterprises with the aim to support and promote SMMEs within this zone. However, concent for the establishment of micro enterprises are strictly managed by the micro enterprises management system, set out in Paragraph 6.3 below, in order to curb the proliferation of noxious and disturbing land uses within this zone. A maximum residential density of 30 units per hectare should be supported in Zone 3. Residential supporting facilities to be accommodated within this zone include schools, social facilities and recreational facilities.

Zone 4: Retail and Office Zone

The primary aim of Zone 4 is to concentrate retail, office and higher-density residential uses to serve regional sectors within the municipal area. Entertainment uses can also form an integral part of the land use mix of Zone 4. Businesses associated with the motor trade, i.e. filling stations, showrooms, outlets and services centres, are also to be accommodated within Zone 4. The density and land use mix allowed within Zone 4 enable Transit Oriented Development (TOD) development, which is turn encourages the use of public transport. Business uses are TOD supporting land uses and can typically include ground-level retail and second and third-storey office or residential uses. A maximum FAR of 1.8 is allowed within Zone 4.

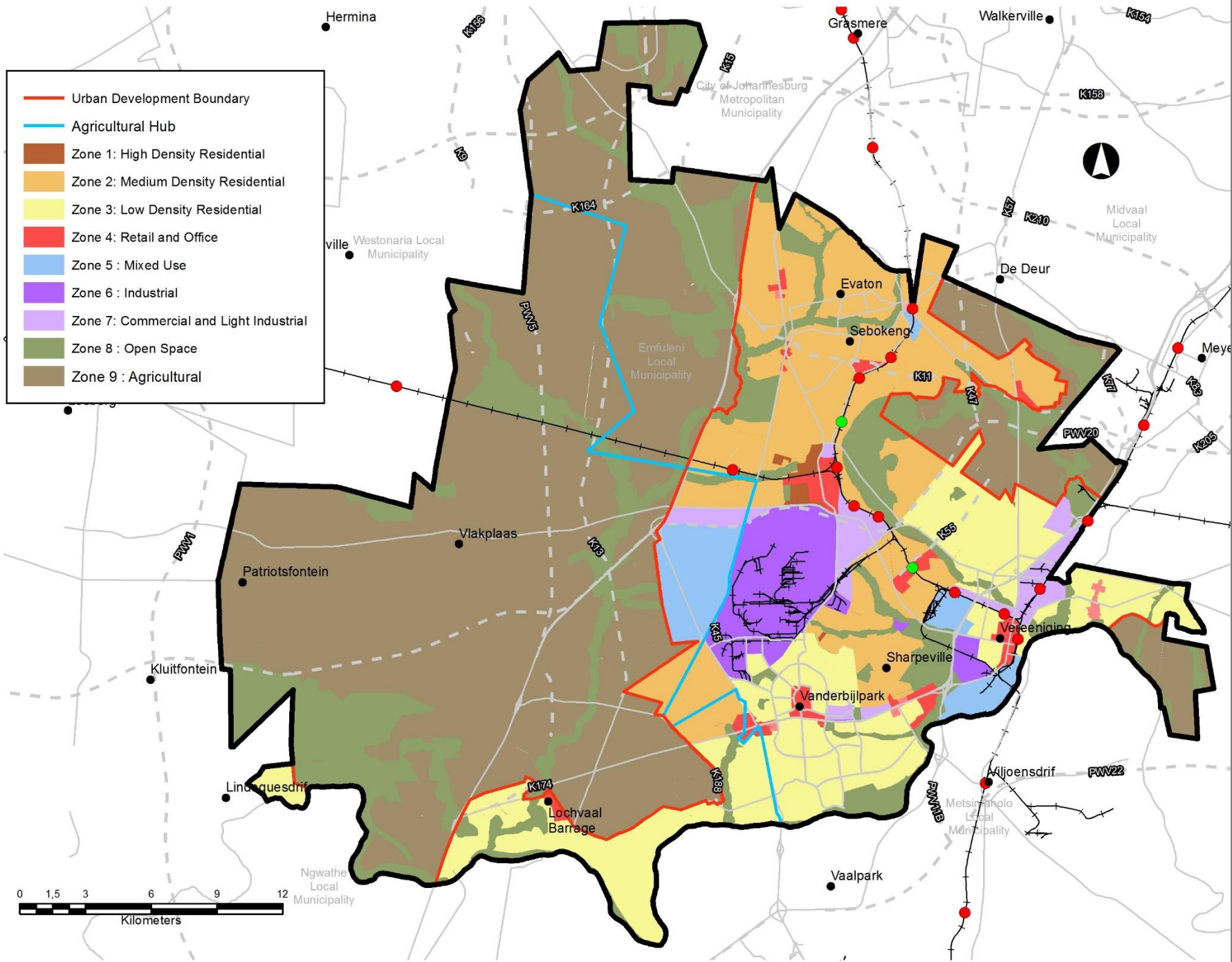


FIGURE 28 | LAND USE MANAGEMENT

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

TABLE 38: EMFULENI SDF LAND USE MANAGEMENT SCHEDULE

Broad Land Use Category	Land Use Category	Zone 1 High-density residential zone	Zone 2 Medium-density residential zone	Zone 3 Low-density residential zone	Zone 4 Retail and Office Zone	Zone 5 Mixed-use zone	Zone 6 Industrial zone	Zone 7 Commercial and light industrial zone	Zone 8 Open space zone	Zone 9 Agricultural zone
Residential	Very low-density			•		•				•
	Low-density		•	•		•				
	Medium-density	•	•	•	•	•				
	High-density	•			•	•				
Institutional	Accommodation	•			•	•				
	Educational	•	•	•	•	•				•
	Medical				•	•				•
	Religious	•	•	•	•	•				•
	Social	•	•	•	•	•				•
	Cemetery								•	•
	Landfill								•	•
Business	Retail				•	•				
	Big box Retail					•				
	Office				•	•	•	•		
	Entertainment				•	•				
	Motor trade				•	•		•		
	Micro enterprise		•	•	•	•				•
Authority	Municipal				•	•	•	•	•	•
	Government				•	•	•	•		
Industrial	Light					•		•		
	Heavy						•			
	Commercial					•	•	•		
	Mining									•
Open space	Active	•	•	•	•	•			•	•
	Passive	•	•	•	•	•	•	•	•	•
Agriculture	Agriculture									•
Maximum FAR		n/a	n/a	n/a	1.8	0.8	0.8	0.8	n/a	n/a
Maximum Nett Residential Density		80 u/ha	60 u/ha	30 u/ha	150 u/ha	n/a	n/a	n/a	n/a	n/a

Source: Emfuleni Local Municipality, 2017

- Mining in Zone 8 to be approval by National Department of Minerals and Energy
- Approval of cemetery in Zones 2, 3, 4, 7 and 8 is subject to geotechnical investigation and Environmental Impact Assessment
- Approval of land fill in Zones 7 and 8 is subject to geotechnical investigation and Environmental Impact Assessment
- Mixed Use in this SDF document refers to Dwelling units, Business, Light Industry, Commercial (excluding noxious commercial or industry).

Zone 5: Mixed-use zone

Mixed-Use Zone (Zone 5) is a type of urban development that blends residential, commercial, cultural, institutional, industrial and commercial uses, where those functions are physically and functionally integrated. This zone differs from a Retail and Office Zone (Zone 4) in that it also allows industrial and commercial development to form part of the land use mix. In other words, it allows a greater range of land uses. Because industrial and commercial uses form part of the mix of Zone 5, it is essential that these land uses be highly regulated to ensure an acceptable interface between the land uses within this zone. A Mixed-Use Zone typically has a number of advantages, which include reduced distances between housing, workplaces, retail businesses, and other destinations, a more compact development, and a stronger neighborhood character. A maximum FAR of 0.8 is allowed within Zone 5.

Zone 6: Heavy Industry and Commercial

The primary aim of Zone 6 is to provide space for heavy and noxious industrial activities. Due to the noxious nature of Zone 6, only a limited range of associated land uses are to be developed within this zone. These include commercial uses, light industries and institutional uses associated with government and municipal entities. A maximum FAR of 0.8 is allowed within Zone 6.

Zone 7: Light Industry and Commercial

The primary aim of Zone 7 is to provide space for commercial and light industrial activities. In particular, commercial developments, such as distribution centres, storage, wholesale and warehousing can be encouraged within this zone. Stringent development controls must be implemented within this zone to ensure an acceptable interface between this zone and neighbouring residential areas. For the same reason, heavy noxious industries are excluded from this zone. Other land uses to be encouraged within Zone 7 include offices uses associated with the commercial and light industrial uses, motor trade uses, and institutional uses, such as Government and Municipal depots. A maximum FAR of 0.8 is allowed within Zone 7.

Zone 8: Open space zone

The aim of Zone 8 is to protect environmental sensitive areas and geotechnically hazardous areas from urban development. These areas are shown as a single zone, but different levels of protection and conservation can be applied to different parts of this zone, depending on the nature of the environment and its capacity to accommodate certain

open space uses. It is important to note that the portions of Zone 8 bordering rivers and tributaries, presented on the LUMS map (Figure 31), is approximate. The final (township) boundaries of Zone 8, where it borders rivers and tributaries, will be determined by the size of the 1:100-year flood area affecting these portions of Zone 8, as determined by a certified engineer during township establishment.

Zone 9: Agricultural zone

The primary aim of Zone 9 is to protect high-potential agricultural land associated with the Emfuleni Agricultural Hub. To this end, NO farm or farm portion located within the Emfuleni Agricultural Hub may be subdivided. Farms or farm portions located outside the Emfuleni Agricultural Hub may be subdivided for rural residential purposes to enable rural lifestyle living, or it may be subdivided for intensive farming purposes. Farms or farm portions located outside the Emfuleni Agricultural Hub may be subdivided for rural residential purposes to stand sizes of between 1 and 4 hectares, provided it has piped water is provided by a relevant authority, such as Rand Water. Farms or farm portions located outside the Emfuleni Agricultural Hub may be subdivided for intensive farming purposes to stand sizes of between 4 and 20 hectares, provided the owner can prove to have adequate water supply from local sources, such as boreholes. All subdivisions of farms or farm portions must not pose any pollution problems related to sanitation, and the existing road infrastructure must be able to handle the resulting increased traffic volumes. Urban agriculture, subsistence farming and commercial farming are allowed within this Zone 9, as well as industries related to animals and plants, such as nurseries. Micro enterprises associated with rural living, such as farm stalls, are also to be supported within Zone 9. Conditions for the approval of micro enterprises in set out in Paragraph 6.3 below.

The LUMS zones proposed aim to provide municipal planners with a tool to help assess development applications, such township establishment, rezoning or consent use applications. As far as possible, these LUMS zones have given consideration to existing land use patterns. These LUMS zones do not affect existing land use rights on properties, even if the existing rights have not been exercised or do not correspond with the land uses proposed in the relevant LUMS zone. **If there is a discrepancy between the Table above and the written text within this section of the report, the Table must receive precedence.**

It is important to note that the LUMS zones presented above do not overwrite the relevant Town Planning Scheme, but only intends to supplement it. As such, it does not attempt to address all the issues that are contained within a Town Planning Scheme, but rather addresses only those issues that are operational to the implementation of the Spatial Development Framework proposals. The LUMS zones proposed within this report can be used as a guide to review the Town Planning Scheme in future. The Table presented above only provides the broad land use types are allowed within each LUMS zone. More detailed land use types that fall within each of these LUMS zones are presented in Annexure A.

The Emfuleni SDF is a broadly strategic development indicator of desired patterns of development and capital investments and assists the municipality to re-channel economic capacities and mobilises catalytic projects intended to attract corporate investment in order to support economic growth initiatives. More comprehensive local spatial development frameworks (LSDFs) represent more detailed erf level planning of the Emfuleni SDF; hence **in the event that there is any real or perceived contradiction between the Emfuleni SDF and any approved LSDF, the LSDF shall take precedence over the Emfuleni SDF in respect to the portion of land under consideration.**

7.3. NODAL DISTANCE DENSITY

The Table below guides the allocation of housing density within and around activity nodes. This is done to ensure that a centrifugal densification pattern is achieved around nodes, with the highest housing densities located within the nodes and lower housing densities located around the nodes. Such a density pattern ensures suitable density thresholds are achieved to support public transport that serve nodal areas within Emfuleni.

TABLE 42: RECOMMENDED RESIDENTIAL DENSITY WITHIN AND OUTSIDE ACTIVITY NODES

Density	Municipal node	Regional node	Community node	Neighbourhood node	Specialised node
High Density	60 to 150 u/ha within a node	50 to 80 u/ha within a node	40 to 60 u/ha within a node	40 to 60 u/ha within a node	40 to 60 u/ha within a node
Medium Density	20 to 60 u/ha within 400m from the centre of a node	20 to 50 u/ha within 300m from the centre of a node	20 to 40 u/ha within 200m from the centre of a node	20 to 40 u/ha within 100m from the centre of a node	20 to 40 u/ha within 200m from the centre of a node
Low Density	0 to 20 u/ha beyond 400m from the centre of a node	0 to 20 u/ha beyond a 300m from the centre of a node	0 to 20 u/ha beyond a 200m from the centre of a node	0 to 20 u/ha beyond a 100m from the centre of a node	0 to 20 u/ha beyond a 200m from the centre of a node

Source: Spatial Planning Section, Emfuleni Local Municipality, 2017

Although the Emfuleni SDF makes all attempts to achieve a densification pattern that is centred on Emfuleni's existing and proposed nodal structure, it may be that in some instances there is no alignment between the nodal densification pattern proposed above and the proposals made on the Land Use Management Zone Map (Figure 23). **If this is the case and the density of the Table above is higher than the density proposed by the Land Use Management Zones Map, the density recommendations of the Table above shall take precedence over any density recommendation reflected in Figure 23 (Land Use Management Zones Map).**

7.4. MICRO ENTERPRISES

The approval and development of micro enterprises within Emfuleni is guided by the following LUMS guidelines, as set out in the Table below. The Table provides the percentage of floor area of a residential dwelling that can be used for micro enterprises. These LUMS guidelines are only applicable to Zones 1, 2 and Zone 3; subject to the property being located next to and having access to a Class 4 road, or being located next to and having access to Helena Lochner Street, between Rossini Street and Conradie Street, or being located next to and having access to Assegai Street, between General Herzog Road and Umtata Street. In all these cases, the residential character of the subject property shall remain in tact.

TABLE 39: MICRO ENTERPRISE FLOOR AREA ALLOCATION

Land Use Management Zone	Zone 2: Medium-Density Residential Zone and Zone 3: Low-Density Residential Zone		Zone 1: High density
Number of building storeys	1 storey	2 storeys	3 storeys
Maximum % of building floor area to be allocated to micro enterprises	40%	35%	25%
Ceiling building floor area to be allocated to micro enterprises	Up to a maximum floor area of 300m ² per property		

Source: Urban Dynamics Gauteng, 2017

Notes: Property located within Zone 2 or Zone 3 must be located next to and have access to a Class 4 road, with the exception of Helena Lochner Street Assegai Street
No retail study is required for the establishment of a micro enterprise.

In Three Rivers, Offices (excluding Medical Consulting Rooms), Places of Refreshment (excluding retail of fresh produce), Hotels, Bed and Breakfast and Beauty Parlours can be supported along Golf Road between its eastern intersection with Athlone Road and at the corner of Orwell and Severn Streets.

Residential properties bordering Frikkie Meyer Boulevard on the western side, between Verdi Street and Beethoven Street, the following uses may be supported; Places of Refreshment, Offices, Coffee Shops, Antique shops, Salons, Health Spas and High Density Residential development provided direct access shall be gained off a newly developed service lane/road. Existing non-residential uses in the triangle formed by General Hertzog Road, Golf Road and Pou Street in PeaceHaven be retained and no expansion shall be supported.

Micro enterprises that can be considered resorting under this LUMS guideline are offices, medical rooms, places of instruction, places of worship (excluding entertainment, retail, commercial and industrial related uses); provided it can be proven that these micro enterprises do not severely impact on the surrounding residential neighbourhood in terms of air pollution, noise pollution or visual pollution. For example, high-mast towers can be considered excessive visual pollution and loud music often associated with entertainment uses can be considered excessive noise pollution.

In assessing applications for the development of a micro enterprise on a property, several circumstances in relation to each individual case and its merits need to be taken into account. These must include:

- Whether the proposal would be consistent with the general planning and specific policies for the area concerned
- Whether the proposed development could be accommodated within the existing municipal services capacity of the neighbourhood
- Whether the traffic likely to be generated by the proposed development could be accommodated adequately on the road network
- Whether adequate provision is made for parking

Based on the above, the following specific conditions are set for the approval of a micro enterprise, especially if it involves extensions to the existing dwelling unit:

a. Setbacks and interface

If the micro enterprise requires the extension of the existing dwelling unit, setbacks of the extension will be required and determined on the basis of the setbacks for the existing detached house. Greater setbacks may be required in some cases

in order to ensure that neighbouring dwellings are private and retain sufficient daylight. Applicants for dwelling unit extension to house micro enterprises must be required to show what impact building or demolition proposals will have on adjacent properties. In particular, vehicle access and parking areas will need to be related to adjacent developments.

b. Architectural character

The character of a residential neighbourhood is made up of the architectural design of the houses and the landscape setting. The design of a micro enterprise building, be it an extension of the existing building or the conversion of a part of the existing building, will need to be assessed in relation to the neighbourhood character and in particular the existing house on the stand. Development of a micro enterprise must be harmonious in scale, materials, form and character with the existing house on the site and with other dwellings in the neighbourhood. If a contrasting architectural style is proposed, which contrasts the style of the original buildings (e.g. old versus new), this needs to be done by a competent architect who understands the use of contrast to enhance the overall building design and appearance.

c. Building height

The impact of an extension of the existing house to accommodate a micro enterprise may be most apparent in the addition of an extra storey. It is therefore considered important to limit the building height of an extension to the conditions that neighbours could have expected under the existing design and positioning conditions of the stand in question. The maximum height, where a micro enterprise requires the extension to an existing house, shall be two storeys.

TABLE 40: PARKING REQUIREMENTS OF MICRO ENTERPRISES

Floor area of the micro enterprise	On-site parking spaces
100m ² or less	2 in addition to existing parking spaces
101m ² to 300m ²	3 in addition to existing parking spaces
301m ² to 500m ²	4 in addition to existing parking spaces

Source: Urban Dynamics Gauteng, 2017

d. Parking

Vehicle parking spaces for micro enterprises are required to be provided at the rates depicted by the Table below. The construction of a carport or garage must comply with the design and positioning conditions of the title deed of the stand

in question. Car parking spaces are to be located behind the minimum building line and at least two spaces are to have unimpeded access.

Unless parking is controlled it will have an adverse impact on the existing residential character of a residential area. Where possible, parking should be provided at the back of the existing house, to allow the front of the properties to retain its garden and its residential character. Where there is no option but to place the parking area in front of the house, it must be a condition of approval that the area in front of the house is landscaped and not simply converted into a 'car park'.

e. Landscaping

The quality of a residential environment is largely determined by the street landscape (e.g. tree-lined streets), which is reinforced by the front gardens of residential properties. It is essential that when developing a micro enterprise, that the area between the existing house and the front property boundary does not deteriorate. Deterioration could occur through the introduction of an additional vehicular access, parking in front of the building or through a lack of significant planting.

Applicants for a micro enterprise should be encouraged to take access from the same driveway that the existing house does, in the interests of preserving the existing streetscape. Existing street trees are to be retained where possible, especially existing mature trees on the stand. In order to achieve this, the Council can require the submission of a landscape design. Screening by using landscaping may be required to prevent overlooking of neighbouring property.

f. Operating hours

Residential environments need to be quiet during evening and night time hours. It is therefore a requirement that all micro enterprises allowed to establish under this LUMS guideline undertake to only operate between 8h00 and 17h00 on weekdays and between 8h00 and 14h00 on Saturdays. Micro enterprises may not be allowed to operate on Sundays or public holidays.

g. Municipal services

The requirements of Emfuleni to maintain municipal services capacity must apply. The cost of any augmentation of municipal services infrastructure and the cost of service connections will be borne by the applicant for a micro enterprise.

h. Signs and advertising

Signs or advertisements on the premises of micro enterprises aim to draw attention to goods or services available at the premises where the advertisement is being displayed. The signs or advertisements of micro enterprises are not intended to permit all forms of outdoor advertising on the premises; it only permits advertisements for the goods or services available at the particular premises. Signs and Outdoor advertisements:

- may only be displayed on the external wall of the part of the residential dwelling that is used for the micro enterprise
- may not be fixed at right angles to the building wall
- may not be fixed to a fence or gate of the property
- may not be fixed to poles planted in any location on the property or within the street reserve

A sign or advertisement must not exceed 1.5 square metres in area. Only a single (one) sign or advertisement is allowed per property. Signs or advertisements or sign may contain internally illuminated letters or characters on an un-illuminated background or lit by 'halo' illumination. Such an advertisement must not have any intermittent light source, moving feature, animation or exposed cold cathode tubing.

i. Community involvement

Prior to consideration of an application for micro enterprises, neighbours will need to have been informed of the proposal. Neighbours in this case are considered having a mutual boundary with the property on which the micro enterprise is considered. Where comments are received from neighbours, these comments must be used to determine whether or not the conditions for the development of a micro enterprise are satisfied and to establish conditions for approval so that the intentions of the LUMS guidelines regarding micro enterprises can be met. The invitation to comment must apply to the impact of the micro enterprise on neighbouring properties and not to the applicant's opportunity to develop a micro enterprise.

j. Rights granted

Micro enterprises should be granted a consent use to operate their business. Such business must not be granted a rezoning of the residential property. The municipality must grant these consent uses for a limited number of years (e.g. 2 years), with the right to revoke these rights after this period, should the Municipality find that the property owners has not complied with the conditions of granting the consent use in the first place. Reasons for not renewing the consent use could be a

failure of the property owner to implement the landscaping condition, or the micro enterprise not operating within the prescribed operating hours, or the micro enterprise causing excessive air, noise or visual pollution.

SECTION 8: CAPITAL INVESTMENT PROGRAMME

8.1 CAPITAL INVESTMENT PROGRAMME

A Capital Investment Programme (CIP) was prepared for the implementation of the Emfuleni SDF proposals. This Capital Investment Programme consists of the following components:

a. Cost estimate

Projects to be implemented by the Emfuleni Local Municipality and other governmental organizations, which are needed to unlock the development potential of Emfuleni (as set out in the Emfuleni SDF), were identified. These projects were listed and a cost estimate was prepared for each of these projects. It is important to note that the cost estimated reflect currently prices and that inflationary effects will most likely increase these cost over time. This implies that the costs involved to implement the longer-term projects will be higher than presented in this report. Also, it is important to state that the cost presented in this report are only rudimentary costs and that more detailed calculations of these cost during implementation may result in significant changes in to the costs presented in this report.

b. Development programme

A list of catalyst project was identified from the project list above and were phased over an 8-year period. To a large extent, this catalyst project development programme aims to guide the township establishment process, which would be a significant spin-off emanating from these catalyst projects. In other words, this programme will enable the planning of bulk municipal services infrastructure and public transport facilities, which needs to coincide with township development within Emfuleni. It is important to state that this development programme is only indicative and that various unforeseen factors may ultimately cause the implementation of the various projects to deviate from the development programme proposed.

8.1.1. PROJECT COST ESTIMATE

Investment by Emfuleni Local Municipality is essential in order to create a sustainable and equitable urban environment and to provide the appropriate environment for non-municipal (public and private) investment in Emfuleni. Investment by the Emfuleni Local Municipality should, amongst others, include investment in bulk municipal services infrastructure development and the provision of public transport infrastructure. This can largely be done through the implementation of key projects to be implemented by Emfuleni Local Municipality and other governmental organizations. The key projects identified in the Emfuleni SDF are the following:

a. Bulk water network

Development of the Sonlandpark area is critical in order to density and support the Vereeniging-Johannesburg commuter railway line and development the triangle located between the Sebokeng CBD, the Vanderbijlpark CBD and the Vereeniging CBD, as envisaged in the Emfuleni SDF. To enable this, it would most likely be necessary to extend the existing bulk water pipeline network into Sonlandpark area and construct a water reservoir to cater for urban expansion within the Sonlandpark area.

b. Bulk sewer network

Development of the Sonlandpark area would most likely also require the expansion of the existing bulk sewer pipeline network into the Sonlandpark area. The upgrading of bulk sewer network in Evaton needs to be a priority to avert possible health risks associated with an inadequate sanitation system.

c. Regional waste water works

Development of the planned regional waste water treatment works, located near the Vaal River, is needed to create the capacity to cater for urban development within Emfuleni as a whole. The development of this works is the single largest capital expenditure project for Emfuleni. However, almost all the other project proposed for Emfuleni, and the general development of Emfuleni into a metropolitan area, is dependent upon the construction of this works. Therefore, the construction of this works needs to be Emfuleni's number one priority.

d. Bulk electrical network

Development of the Sonlandpark area would also require the expansion of the existing bulk electrical network into the Sonlandpark area. It will most likely also require the construction of two or more electrical substations to serve Sonlandpark area.

e. Transit infrastructure

Central to the development of the Sonlandpark area would be to construct a commuter railway station at Sonlandpark on the Vereeniging-Johannesburg commuter railway line. This station should become the central focus of the proposed Sonlandpark development, as envisaged in the Emfuleni SDF. In addition to the above, Emfuleni needs to start the planning of a more extensive and integrated public transport system to serve the emerging metropolitan area. It is proposed that a Strategic Public Transport Network (SPTN) be developed, which could in future be converted to a Bus Rapid Transit (BRT) system. One such a SPTN route is proposed along Barrage Road, which would connect Bophelong, the Vanderbijlpark CBD, the Bedworthpark regional node and the Vereeniging CBD to each other.

f. Pedestrian infrastructure

The construction of pedestrian infrastructure is related to the construction of transit infrastructure, because transit infrastructure is accessed via pedestrian infrastructure. The construction of pedestrian infrastructure includes the construction of pedestrian walkways on First Avenue and a portion of Selbourne Road in Evaton. It also includes the development of pedestrian walkways between the Sebokeng CBD and the Houtheuwel commuter railway station. This will enable a direct link between the major land uses within the CBD and the Houtheuwel commuter railway station, thus facilitation land use and transportation integration.

g. Road infrastructure

A number of new roads need to be constructed. These include the construction of Sebe Road in Evaton, the extension of William Nicol Road up to Barrage Road, and the construction of service lanes on both sides of Moshoeshoe Road.

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TABLE 46: PROJECT COST ESTIMATE

Project	Project Detail	Implementing Agent	Cost Estimate (current prices)	
			Municipal Expenditure	Non-Municipal Expenditure
Bulk water infrastructure	Extend bulk water pipeline network into Sonlandpark area	ELM/ MIG	R4 440 000	
	Construct water reservoir at Sonlandpark	ELM/ MIG	R20 000 000	
Bulk sewer infrastructure	Extend bulk sewer pipeline network into Sonlandpark area	ELM/ MIG	R2 100 000	
	Upgrade bulk sewer network in Evaton	ELM/MIG	R11 045 000	
Regional sewer works	Develop regional waste water treatment plant to the Vaal River	SDM/ MIG		R450 000 000
Bulk electricity infrastructure	Extend bulk electrical network into Sonlandpark area	ELM/ MIG	R5 760 000	
	Construct substations to serve Sonlandpark area	ELM/ MIG	R1 000 000	
Transit infrastructure	Construct commuter railway station at Sonlandpark	PRASA		R35 000 000
	Develop public transport route along Barrage Road	ELM/ MIG	R273 700 000	
Pedestrian infrastructure	Construct pedestrian walkways on First Avenue and a portion of Selbourne Road in Evaton	ELM/MIG	R3 016 000	
	Develop pedestrian walkways linking the Sebokeng CBD to its station	ELM	R17 000	
Road infrastructure	Construct Sebe Road in Evaton	ELM/MIG	R23 621 480	
	Extend William Nicol Road up to Barrage Road	ELM/MIG	R4 000 000	
	Construct Service Lanes on both sides of Moshoeshoe Road (north of Erf 20225 and south of Erf 65579 SBK Zones 10 and 14)	ELM/MIG	R8 000 000	
Road infrastructure upgrading	Construct, surface, curbing sidewalks, and construct storm-water infrastructure on Chamberlain Road in Evaton	ELM/MIG	R14 500 000	
	Construct, surface, curbing sidewalks, and construct storm-water infrastructure on Bodea Road in Evaton	ELM/MIG	R13 578 000	
	Construct, surface, curbing sidewalks, and construct storm-water infrastructure on Milner Road in Evaton	ELM/MIG	R14 822 000	
	Construct, surface, curbing sidewalks, and construct storm-water infrastructure on West Road in Evaton	ELM/MIG	R30 449 000	
	Upgrade storm-water on Easton Road and surface adjacent roads	ELM/MIG	R6 333 000	
Social infrastructure	Construct community park in Mafatsane Government Precinct	ELM/MIG	R3 277 000	

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Project	Project Detail	Implementing Agent	Cost Estimate (current prices)	
			Municipal Expenditure	Non-Municipal Expenditure
Local economic development	Upgrade Thusong Centre	ELM	R4 164 000	
	Redevelop Sebokeng CBD industrial area into industrial hive	ELM	R144 200 000	
	Develop crop farming using hydroponic and organic methods on four sites in Evaton	ELM	R858 000	
	Construct a Brick-Making Plant in Evaton	ELM	R2 000 000	
Institutional development	Formalise informal trading stalls on Adams Road and the Old Golden Highway in Evaton	ELM	R1 500 000	
	Draft Urban Design Framework for the Sebokeng CBD		R800 000	
	Draft Urban Design Framework for the River City CBD extension		R800 000	
	Draft Urban Design Framework for the Logistics Hub		R800 000	
	Draft an incremental implementation plan for the Barrage Road public transport route		R1 400 000	
	Draft Urban Design Framework for the Eastern Government Precinct		R800 000	
	Redevelop the pedestrian mall in the Eastern Government Precinct.	ELM	R25 000 000	
TOTAL COST			R621 980 480	R485 000 000

Source: Spatial Planning Section, Emfuleni Local Municipality 2017

Abbreviations: ELM: Emfuleni Local Municipality, SDM: Sedibeng District Municipality, MIG: Municipal Infrastructure Grant, DoH: Gauteng Department of Housing

h. Road infrastructure upgrades

The road network of Emfuleni is on the verge of collapse due to a lack of road maintenance and repair. This includes the resurfacing, construction of curbing sidewalks, and the construction of storm-water infrastructure on Chamberlain Road, Bodea Road, Milner Road, and West Road in Evaton. The upgrading of storm-water on Easton Road and surfacing of adjacent roads is also required.

i. Social infrastructure

A number of social infrastructure projects are proposed for Emfuleni. These include the construction of a community park in the proposed Mafatsane Government Precinct, and the upgrading of the Thusong Centre.

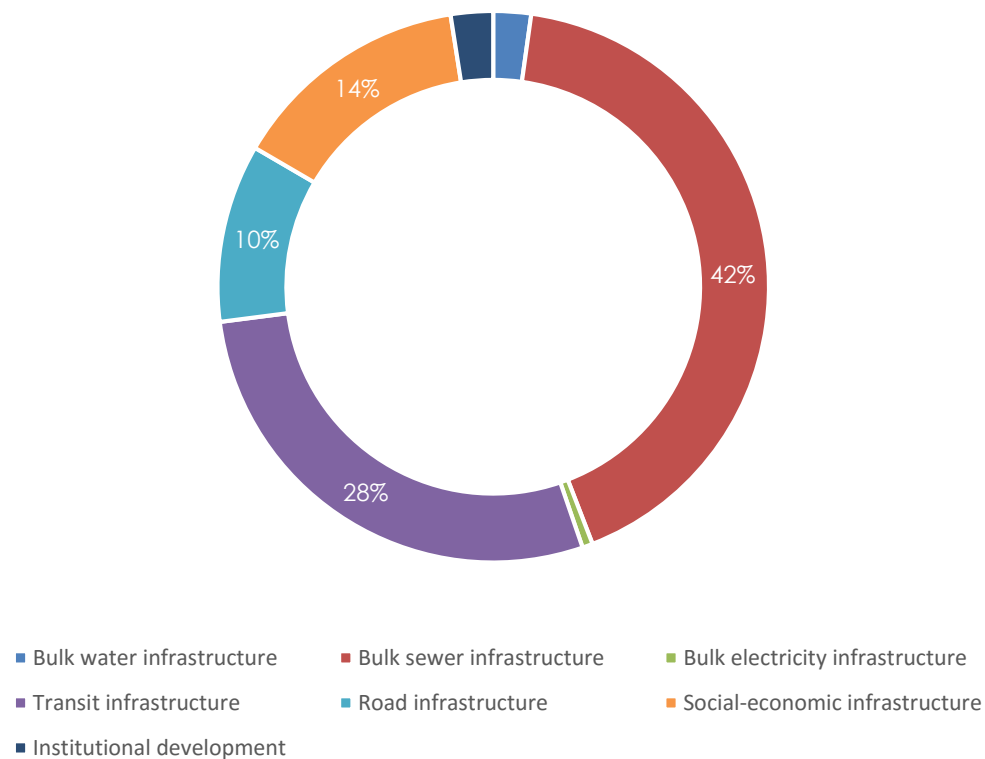


DIAGRAM 34: DISTRIBUTION OF COST PER CATEGORY

j. Local Economic Development

The Sebokeng CBD comprises a small industrial area, situated on Moshoeshoe Road. This industrial area is still largely vacant, comprising only a small number of SMME-type industries. It is proposed that the vacant industrial stands within this industrial area be developed as hive-industries, which can be rented out to the local population of Sebokeng and Evaton. This will further support SMME development within this part of Emfuleni. Other Local Economic Development projects are also

proposed for Emfuleni, these include crop farming using hydroponic and organic methods on four sites in Evaton, the construction of a brick-making plant in Evaton, and the formalisation of informal trading stalls on Adams Road and the Old Golden Highway in Evaton.

k. Institutional development

Development of the Eastern Government Precinct includes the development of a pedestrian mall, the formalization of informal businesses along this mall, and the formalization of the taxis and bus rank. The development of the Eastern Government Precinct also includes the preparation of an Urban Design Framework and other town planning related tasks.

The Table above gives a rudimentary indication of the cost to implement the projects proposed in the Emfuleni SDF. The actual costs of these projects are subject to other variables that can only be determined once each project is at the point of implementation. Variables such as inflation and unforeseen project detail can impact on the final cost of a project. Consequently, the Emfuleni SDF cannot be held accountable for the final cost incurred to implement the Emfuleni SDF projects. As depicted by the Table above, the total budget needed to implement the projects of the Emfuleni SDF, for which the Emfuleni Local Municipality is responsible for, amounts to approximately R621 million.

As depicted by the Diagram above, the highest cost item is the upgrading of the bulk sewer system. The upgrading of the bulk sewer system will require 42% of the budget. Emfuleni will not be able to fund this cost item alone, and will require other funding mechanisms (such as MIG) to fund this item. The upgrading of the bulk sewer system includes the construction of the planned regional waste water treatment plant. Currently, the lack of bulk sewer treatment is the primary factor impeding growth within Emfuleni. It is therefore appropriate that the bulk of the municipal budget goes to resolving this issue. If this issue is not resolved, most of the other development proposals made in the Emfuleni SDF will not come to fruition.

The second highest cost item is the construction of a public transport route along Barrage Road. The development of public transport route will require 28% of the budget. The development of this public transport route is necessary to move Emfuleni towards becoming a metropolitan area in Gauteng. In turn, becoming a metropolitan area will benefit Emfuleni in terms of Provincial expenditure allocation. As mentioned in the Emfuleni SDF, the implementation of the public transport route (which will ultimately become a BRT route) can be done in incremental stages. This implies that the budget allocated to this project can be spread over a number of years. The design of the proposed public transport route needs to allow for an incremental implementation approach.

The provision of bulk water and electricity municipal infrastructure, which is a key component to unlocking development potential within the Sonlandpark area, uses a relatively small part of the budget. Developing the bulk infrastructure required for the Sonlandpark area is considered a necessity, because the Sonlandpark area is a priority development area within Emfuleni.

Additional projects to be funded include the construction and upgrading of roads, of which the extension of William Nicol Road up to Barrage Road needs mention. Additional projects also include developing pedestrian walkways to link the Sebokeng CBD to its station, various social and economic project, and the upgrading of the Eastern Government Precinct pedestrian mall.

8.1.2. CATALYTIC PROJECT PROGRAMME

A number of projects have been identified and listed in the Cost Estimate above. Some of these projects are catalytic, because the development of these projects could potentially lead to a number of spin-off projects being implemented, such as housing and retail projects. The selected catalytic projects are listed in the Table below. The implementation of the catalyst projects identified within the Emfuleni SDF needs to be structured in such a way that certain targets can be met within certain timeframes. Short term catalyst projects should focus on immediate needs, whereas longer term projects should aim to increase standard of living within Emfuleni as a whole.

The catalytic projects proposed for the development of Emfuleni was divided over an 8-year period (2017-2025), as set out in the Table below. This will ensure the logical implementation of the catalyst projects, spread implementation funds over a period to relieve funding pressures at any given time, ensure that catalyst projects are developed prior to non-catalyst project, and ensure the viable implementation and operation of each project. These projects can be divided into groups based on the following rationale:

Group 1: Development of the regional waste water treatment works

- Development of the planned regional waste water treatment works, located near the Vaal River, is needed to create the capacity to cater for urban development within Emfuleni as a whole. The development of this works is the single largest capital expenditure project for Emfuleni.
- Almost all the other project proposed for Emfuleni, and the general development of Emfuleni into a metropolitan area, is dependent upon the construction of this works. Therefore, the construction of this works needs to be Emfuleni's number one priority.

Group 2: Residential expansion into the Sonlandpark area

- The densification of the Vereeniging-Johannesburg commuter railway line is a primary objective of the Emfuleni SDF. To enable this, requires residential expansion into the Sonlandpark area.
- Expansion into the Sonlandpark area will require investment in bulk infrastructure, such as extending the bulk electrical network into the Sonlandpark area.
- It will also require the development of the proposed commuter railway station at Sonlandpark

Group 3: Development of the Sebokeng Municipal Node (CBD)

- The development of the Sebokeng Municipal Node (CBD), as proposed in the Emfuleni SDF, in order for this node to better serve the Sebokeng-Evaton region.
- Key to the development of the nodal area includes the development of higher-density housing units, such as walk-up units. This will help establish a CBD environment and provide the necessary residential densities to support the Houtheuwel commuter railway station. To attract provincial spending in housing development in the CBD will require the drafting of a detailed Urban Design Framework for the CBD.
- The construction of pedestrian accesses and pedestrian bridges, which links the housing and retail land uses within the Sebokeng Municipal Node (CBD) to the Houtheuwel commuter railway station, is critical to the development of this node.
- The redevelopment of the industrial area located within the Sebokeng Municipal Node (CBD) will help develop the northern gateway to this node and it will provide floor area for the establishment of SMME's within Sebokeng. The latter can be done by developing industrial hives, which can be rented out to local SMMEs.

Group 4: Development of the Barrage Road public transport route

- The development of public transport within the Emfuleni is necessary to support residential expansion within Emfuleni. The development of public transport becomes of particular importance if Emfuleni intends to become a metropolitan area, because providing integrated public transport is a key function of metropolitan areas.
- A number of SPTN routes were proposed within the Emfuleni SDF. The development of a public transport route along Barrage Road is considered the highest priority. Such a route will link Bophelong, the Vanderbijlpark Municipal Node (CBD), the Bedworthpark Regional Node, Sharpeville and the Vereeniging Municipal Node (CBD) to each other.

TABLE 47: CATALYST PROJECT PROGRAMME

Project Group	Catalyst project	Year									
		2017	2018	2019	2020	2021	2022	2023	2025	2025	
Development of regional waste water treatment plant	Develop regional waste water treatment plant at the Vaal River		•								
	Residential expansion into the Sonlandpark area										
	Extend bulk water pipeline network into Sonlandpark area				•						
	Construct water reservoir at Sonlandpark					•					
	Extend bulk sewer pipeline network into Sonlandpark area						•				
	Extend bulk electrical network into Sonlandpark area					•					
	Construct substations to serve Sonlandpark area						•				
Development of the Sebokeng Municipal Node (CBD)	Construct commuter railway station at Sonlandpark								•		
	Draft Urban Design Framework for the Sebokeng CBD		•								
	Develop pedestrian walkways linking the Sebokeng CBD to its station				•						
Development of the Barrage Road public transport route	Redevelop Sebokeng CBD industrial area into industrial hive					•					
	Draft an incremental implementation plan for the Barrage Road public transport route					•					
	Develop the public transport route along Barrage Road in stages						•		•		•
Development of the River City/ Vereeniging CBD	Draft Urban Design Framework for the River City CBD extension		•								

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Project Group	Catalyst project	Year										
		2017	2018	2019	2020	2021	2022	2023	2024	2025	2025	
Development of the of the P155 corridor	Draft Urban Design Framework for the Logistics Hub Extend William Nicol Road up to Barrage Road				•							

Source: Urban Dynamics Gauteng, 2017

Group 5: Development of the River City/ Vereeniging CBD

- The Emfuleni SDF proposes the expansion of the Vereeniging CBD to become the core area of the emerging Emfuleni metropolitan area. This must be done through the Urban Renewal of the existing Vereeniging CBD and the expansion of the Vereeniging CBD into the planned River City site.
- The development of Barrage Road will also be critical to the development of this metropolitan core area, because the entire future metropolitan area needs to be linked to the core area
- Resolving the sewer capacity problem is key to the development of this emerging metropolitan core area.

Group 6: Development of the of the P155

- The Emfuleni SDF proposes the development of the P155 by implementing a number of projects. The development will ultimately culminate in the development of the proposed Logistical Hub located west of Arcelor Mittal.
- An Urban Design Framework needs to be developed for the proposed Logistics Hub to use to 'sell' the idea to prospective public and private interest groups
- A key project to development the P155 will be the extension of William Nicol Road up to Barrage Road

It has to be noted that the implementation of the catalytic projects mentioned above, as well as the other projects noted in the Emfuleni SDF, will be a dynamic process that may change as the implementation process dictates at the time of implementation. The programme for the implementation of Emfuleni proposals should therefore only be considered a guide and should not be considered a fixed or rigid programme to adhere to.

8.2. INSTITUTIONAL ARRANGEMENTS

A key issue regarding the implementation of the Emfuleni SDF will be how to ensure that the implementation of the Emfuleni SDF proposals is aligned at the different spheres of municipal government. This will require an implementation process that will enable alignment, but it will also require the different spheres of municipal government to manage their interrelationships effectively. An effective process requires that resource allocation is aligned with strategic development priorities, as is set out in the Emfuleni SDF. This can largely be done by absorbing the Emfuleni SDF proposals into the Integrated Development Plan (IDP). Based on the above, the following guidelines need to be adhered to in order to manage the relationships between the different spheres of municipal government with regard to the implementation of the Emfuleni SDF proposals:

- All spheres of municipal government must support coordinated and integrated planning
- All spheres of municipal government and other stakeholders must reach a shared understanding and agreement on the tasks required to implement the Emfuleni SDF
- Each sphere of municipal government needs to take responsibility for its own planning-related task of the Emfuleni SDF
- Alignment between spheres of municipal government will require cooperation, whereby the plans of one sphere supports the plans of another
- All spheres of municipal government and other stakeholders must commit to the prioritization and an implementation schedule for the implementation of the Emfuleni SDF proposals
- The catalyst projects proposed within the Emfuleni SDF must be absorbed into the IDP and into each update of the IDP document
- A mutual assessment framework must be used to monitor the extent to which the Emfuleni SDF proposal are implemented by each sphere of municipal government

8.2.1. SECTOR INTEGRATION

The Emfuleni SDF bridges the gap between the developmental issues facing Emfuleni and the allocation of a budget within the IDP to address these developmental issues. The Emfuleni SDF also facilitates integration and coordination between the different spheres of municipal government to address these development issues. The Table below illustrates how the Emfuleni SDF aligns the responsibilities of the different spheres of municipal government to addresses the developmental issues facing Emfuleni.

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TABLE 48: SECTOR ALIGNMENT AND INTEGRATION

Spatial Guidelines	Affordable Housing Development	Municipal Services Development	Integrated Transport Development	Environmental Management	Local Economic Development	Health and Education Development	Issues
Settlement and housing	•	•	•	•		•	<ul style="list-style-type: none"> ○ Decent affordable housing must be provided to households that cannot afford formal housing ○ Alternative housing options ought to be investigated ○ Municipal service of a sufficient quality must be provided to settlements ○ Settlement must have access to well-planned and managed public transport to ensure sufficient accessibility ○ Development should be sustainable by addressing needs relating to health, education and recreation ○ Settlement development must not degrade environmental sensitive areas
Social services	•		•			•	<ul style="list-style-type: none"> ○ All households must have reasonable access to health and educational facilities ○ Public transport must provide communities access the health and educational facilities ○ Avoid the duplication of community facilities or the oversupply of community facilities through proper planning
Municipal and transportation infrastructure	•	•	•		•		<ul style="list-style-type: none"> ○ Municipal service infrastructure investment must be provided to enable the expansion of settlements, but must not enable urban sprawl or urban leapfrogging ○ Municipal service infrastructure investment must support and be aligned with the timing of the Urban Development Boundary ○ Public transport should service existing and planned settlements ○ Mobility and accessibility are important principles that need to influence the planning and design of settlements, such as the use of Transit Orientated Design (TOD) principles
Economic development		•	•		•		<ul style="list-style-type: none"> ○ The development nodal areas must comply with a set of development and design guidelines.

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Spatial Guidelines	Affordable Housing Development	Municipal Services Development	Integrated Transport Development	Environmental Management	Local Economic Development	Health and Education Development	Issues
Agriculture and open space conservation	•	•	•	•	•		<ul style="list-style-type: none"> ○ Service provision should be geared towards the development of the nodal areas ○ Nodal areas must be served by a well-planned and maintained road network and public transport system that connects the nodes to surrounding communities ○ Encourage the development of retail facilities in accordance with the economic carrying capacity of the Emfuleni population ○ Enable the development of a range of industrial and commercial areas that provide for the varied and specific needs of different businesses ○ High-potential agricultural soils need to be protected at all costs. ○ Respect and support the Gauteng Agricultural Hub initiative. ○ Protect the environmental sensitive areas and water bodies against degradation and pollution. ○ Settlements must have access the full municipal services infrastructure to avoid pollution of water sources ○ Settlement expansion and development must adhere to clear environmental management guidelines

Source: Urban Dynamics Gauteng, 2017

Recognition must be given to the fact that the different spheres of municipal government will each play a vital role in achieving the overall strategic objectives of the Emfuleni SDF. This will include putting in place processes to implement the Emfuleni SDF proposals, allocating the appropriate human resources and skills to implement the proposals, alignment all actions with other spheres of municipal government, and diligently monitoring performance in order to ensure projects are realized.

In addition to the above, the implementation of the Emfuleni SDF will most likely require participation and partnership building amongst the different spheres of municipal government, the Emfuleni community and private business. Such partnerships are

needed to address the variety of spatial, environmental, social and economic issues that are faced within Emfuleni. This collaboration between these parties must be a deliberate action by all parties involved.

8.2.2. EVALUATION AND MONITORING

The performance of the implementation process, whereby the Emfuleni SDF proposals are implemented, needs to be measured against a clear and comprehensive set of indicators. The Table below provides possible indicators that can be used to measure the Emfuleni SDF implementation process.

TABLE 49: EVALUATION AND MONITORING

Theme	Outcome	Indicators
Economic	To encourage sustainable economic development	<ul style="list-style-type: none"> • Establishment of nodal areas and retail development • Establishment of industrial and commercial activities
Housing	To develop sufficient and suitable housing	<ul style="list-style-type: none"> • Protection of high-potential agricultural soils • Number of informal housing units • Number of affordable housing units • Range of housing typologies applied
Social	To ensure all households have access to basic health and education opportunities	<ul style="list-style-type: none"> • School to population ratio • Clinic to population ratio • Physical access to health facilities
Recreation	To ensure that adequate space is provided for recreational purposes	<ul style="list-style-type: none"> • Provision of suitable recreational facilities • Physical access to recreational facilities or parks • Use of landscaping in nodal areas
Environment	To promote a sustainable natural environment	<ul style="list-style-type: none"> • Conservation of watercourses and environmentally sensitive areas
Access	To ensure accessibility and choice of travel modes	<ul style="list-style-type: none"> • Levels of water, air and visual pollution • Availability and frequency of public transport • Levels of modal interchange • Use of private vehicles as opposed to public transport • Public transport availability to access nodal areas, community facilities and employment opportunities

Source: Urban Dynamics Gauteng, 2017

A key performance indicator is the level of access to quality social and economic facilities. This information can be obtained by simply counting the number of facilities constructed in comparison to the number of housing units that are developed within a particular part of Emfuleni. Counting the number of affordable housing units developed and counting the reduction in the number of informal shacks for satellite photography, is a means of determining progress in housing development. Other information, such as the availability and frequency of public transport, can be obtained from the Integrated Transport Plan (ITP). Information not available from ready sources can be collected using community surveys or having consultative meeting with key community stakeholders. Ensuring that the collection of information is accurate and well maintained will be essential. This is not only relevant for land use data, but also for information pertaining to transportation, infrastructure and municipal services provision.

ANNEXURE A
LAND USE DEFINITIONS

EMFULENI SPATIAL DEVELOPMENT FRAMEWORK 2025

Broad Land Use Category	Land Use Category	Land Use Definition	Typical Land Uses
Residential	Very low-density	Land use allowing rural living on agricultural holdings using single dwelling units	Single dwelling unit
	Low-density	Land use allowing traditional suburban living using single dwelling units	Single dwelling unit
	Medium-density	Land use allowing the horizontal and vertical grouping of dwelling units up to 3 storeys in height	Group housing Second dwelling unit Backyard rental unit Semi-detached housing Commune Retirement village Children's home
	High-density	Land use allowing the horizontal and vertical grouping of dwelling units up to 4 storeys in height	Row housing Walk-up apartments Flats
	Accommodation	Land use for the purpose of letting individual rooms for residential accommodation	Boarding house Hotel Guest house Resort Hostel
Community	Educational	Land use where child-care service are provided and where children, adolescence and adults receive formal education	Crèche Pre-primary school Primary school Secondary school Technical school Technical college Skills training centre Satellite campus Adult education centre
	Medical	Land use where patients are given medical treatment or advice	Clinic Community hospital Day hospital Medical consulting rooms
	Religious	Place of worship and religious education	Church Mosque Temple

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Broad Land Use Category	Land Use Category	Land Use Definition	Typical Land Uses
	Social	Land use that provides municipal or social services to local communities	Community hall Library Post office Pension pay-point Customer care centre Police station Fire brigade Emergency services
	Cemetery	Land use that allows burial of human remains	Cemetery
	Landfill	Land use that allow for the disposal of non-hazardous solid waste	Landfill site
Business	Retail	Land use that allows the trading of retail goods	Hypermarket Supermarket Specialist retailers (e.g. clothing and furniture) Banking branches
	Big box retail	Land use that allows the trading of wholesale goods	Wholesale warehouses
	Office	Land use for the performance of administrative or professional functions	Professional offices Conference facility
	Entertainment	Place of entertainment that is usually associated with the retail industry	Entertainment centre Restaurant Fast food outlet Tavern
	Motor trade	Land use that allows the retail, repair and maintenance of motor vehicles	Filling station Vehicle service centre Vehicle showrooms
	Micro enterprise	Business or enterprise attached to and supplementing a residential component. The residential component remains the primary land use associated with the property.	Home office Home-based medical consulting room Non-disturbing home enterprise (e.g. hair dresser or day care centre) Farm stall
Institutional	Municipal	Land use associated with the daily operation and functioning of the municipality	Administrative offices Parking garage Minibus taxi holding and or parking area Municipal training facilities Bus depot Electrical purpose Equipment stores

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Broad Land Use Category	Land Use Category	Land Use Definition	Typical Land Uses
	Government	Land use associated with the daily operation and functioning of the national or provincial government	Administrative office Railway reserves and stations Telecommunication
Industrial	Light	Land use for <u>non</u> -pollution industries used for manufacturing purposes	Non-noxious factories Maintenance and repair workshops Engineering works Builders yard
	Heavy	Land use for pollution industries used for manufacturing purposes	Noxious and polluting factories Scrap yard
	Commercial	Land use for the handling and storage of cargo and the wholesale of goods	Distribution centre Wholesale trade Warehousing Cartage and transport services
	Mining	Land use associated with mining and mining operations	Mine shafts Slimes dams Mine dumps Mineral processing plants Mine hostels
Open space	Active	Open space that has a recreational function linked to it	Public park Play ground Sports field Sports club Cultural heritage site Amusement park Recreation area
	Passive	Open space that has a hazard avoidance or natural resource conservation function	Private open space Conservancy Protected area River flood areas Geological unsuitable land Topographically unsuitable land Hazardous zones (e.g. pollutions areas)
Agriculture	Agriculture	Land use that is intended of subsistence of commercial farming purposes and uses generally associated with plants and animals.	Subsistence farming Commercial farming Communal agriculture Agriculture skills training facilities Nursery Vetenary clinic Animal kennel

