

Figure 11: Topography

3.1.2 Geological and Soil Conditions

The geology of the study area is dominated by formations in the Pretoria Group of the Transvaal sequence, however undifferentiated surface deposits are located in low lying areas. Outcrops within this group include: Magaliesberg, Silverton, Daspoort, Hekpoort and Timeball. These are largely comprised of quartzites and shales.

The quartzite ridges are the dominant landforms in the area as they are harder than the more easily eroded shales, and give rise to the Magaliesberg and Witwatersberg. The Silverton and Timeball Shales form the valleys in between these two quartzite ridges. Undifferentiated surface deposits lie on top of the shales. The geological formations run from the northeast to the southwest through the study area. Certain aspects of the geology characterise the topography of the area such as the existence of the quartzite ridges and shales in the valleys. With regards to engineering precautions and characteristics of the geological conditions of the study area:

- Difficulty is experienced in the effective operation of French drains for the disposal of effluent from septic tanks, owing to the impermeability of the Pretoria Shales; and
- Due to the smoothness of the planes in the shales of the Silverton and Timeball groups, they have been known to slide into excavations along the direction of the dip.³

3.1.3 Hartbeespoort Dam

The Hartbeespoort Dam, which is situated within the Crocodile River catchment and drains into the Crocodile River, was completed in 1925. The principal use of the dam water is for irrigation (80%), with lesser use for domestic consumption and compensation flows. Areas directly around the dam such as Schoemansville, Melodie and Ifafi utilise dam water for domestic use.

³ Source: *Hartbeespoort Strategic Environmental Assessment, 2006*

The dam is also a major tourism attraction and is used for recreational purposes. Today, the dam is also a popular residential area with property along the waterfront selling for a premium.⁴ The natural presence of the Magaliesberg and the ridges to the south of the dam create an atmosphere of a natural setting by shielding the dam basin from mining and other developments to the north and urban sprawl.⁵ The Hartbeespoort Dam is of particular concern due to its value as a tourism attraction and its scenic qualities.⁶

The environmental character of the Hartbeespoort Dam no longer reflects the rural atmosphere of a decade ago due to increased development, and this change in character is continuing. Once all the approved developments around the dam are completed, the area surrounding the dam will be completely developed in some form of another.

Although this development trend has a positive economic effect, the natural environment is heavily impacted on. The consequent increasing pressure on natural resources is manifesting in problems such as loss of biodiversity and heritage, decrease in water quality in the region, shortage of potable water and a lack of capacity at the sewage treatment plant to handle increasing sewer loads. These and other problematic issues threaten the sustainability of the environment and can lead to visible and invisible damage (or 'measurable and immeasurable damage') if not addressed timeously in an integrated and strategic manner.

The resource quality of the dam is less than optimal due to poor water quality, degraded in stream and riparian habitat and imbalanced food web and species compositions, jeopardizing the developmental potential of the dam. One of the main concerns is that losing some of the ideally located land to developers will violate and hamper the successful roll-out of the integrated water resource and environmental management program and as such all the secondary spin-offs that could be achieved through the program.⁷

⁴ Source: *Hartbeespoort Strategic Environmental Assessment, 2006*

⁵ Source: *The Hartbeespoort Dam Management Plan, 1st Edition. March 2010*

⁶ Source: *Hartbeespoort Strategic Environmental Assessment, 2006*

⁷ Source: *Proposed Land use and Facility requirements for the Hartbeespoort Dam integrated Biological Remediation Programme, July 2009*

Another key issue that have been identified in relation to the dam and its recreational value is the restricted access that remains for the general public (due to the exclusive nature of the residential estates developed around the dam). The only remaining accesses to the dam across public land include:

- Schoemansville en Melody (the Transvaal Yacht Club, the Bird Sanctuary, Oewer Club and Schoemansville Resort);
- Ifafi Peninsula and the right bank of the Swartspruit inlet ('Voël en Hengelklub' and Birdwood);
- Meerhof (Jacana and Meerhof Resort);
- Portion R of Welgegund (Roos se Oord);
- Portion 5 and 6 of De Rust on the southern shore of the dam (including Lakeland);
- Portion 4 of De Rust (The Coves, Magaliespark Golf Estate and Leguaan Leap);
- Portion 6 of De Rust (Caribbean Beach, Kurperoord, Hartbeespoort Boat Club and Montego Bay); and
- Portions 109 and 110 of De Rust (Kosmos).

As such, the Department of Water Affairs demarcated proposed recreation related use zones on land adjacent to the dam in terms of the document "Proposed Land use and Facility requirements for the Hartbeespoort Dam integrated Biological Remediation Programme, Version 2. July 2009" (refer to Table 10).

The vision that has been developed for the dam by Department of Water Affairs is a residential dam focused on water based recreation, with clarified equitable public and private access, as well as controlled commercial operations, offered in a safe and healthy environment, from both a physical and environmental perspective.⁸

Table 10: Proposed Recreational Land Use Zones Around Hartbeespoort Dam

Public use Zones	Limited Public use Zones	Private use Zones	Commercial use Zones
<ul style="list-style-type: none"> • A section at Schoemansville • Oberon • De Rust • Kommandonek 	<ul style="list-style-type: none"> • Transvaal Yacht Club • Sections of Schoemansville and Melody • Parts of Ifafi and Peninsula • Sections of Meerhof • PTN R of Welgegund (Roos se Oord) • PTN 4 of De Rust (Magaliespark and Leguaan Leap) • PTN 5 & 6 of De Rust (Caribbean Beach, Hartbeespoort Boat Club and Montego Club Nautique Bay) 	<ul style="list-style-type: none"> • Hartbeespoort Dam Zoo • Venice Village • Ile du Lac • Ile d'Afrique • Private properties along the left bank of the Crocodile River inlet • Eagle's landing • Pecanwood • Key West • Club Nautique • Island Estate • Lakeland • West Lake • The Coves • Leloko • K'shane • Kosmos 	<ul style="list-style-type: none"> • Section of Schoemansville and Meerhof • A section of Ifafi Peninsula

⁸ Source: *The Hartbeespoort Dam Management Plan, 1st Edition. March 2010*

3.1.4 Environmental Sensitivity

The environmentally sensitive features in the precinct are set out in Table 11.

Table 11: Environmental Features

Category	Description
Land Capability (AGIS)	<ul style="list-style-type: none"> The majority of the precinct is moderate with a few strips of wilderness running across the site
Protected Areas	<ul style="list-style-type: none"> The Magaliesberg Protected Natural Environment runs through the northern part of the site. The precinct is bordered in the south-west by the Cradle of Humankind World Heritage Site
Hydrology	<ul style="list-style-type: none"> There are a number of small wetlands scattered throughout the site. The Hartbeespoort dam is in the centre of the site. The following rivers and their tributaries can be found in the site: Swartspruit, Moganwe, Magalies, Klipplaat and Krokodil
NW Critical Biodiversity Area (CBA) and Ecological Support Areas (ESA)	<p>The northern part of the site is classified as CBA1 and the remainder of the site as CBA2</p> <ul style="list-style-type: none"> CBA1 is classified as Natural Landscapes with ecosystems and species fully intact and undisturbed. These are areas with high irreplaceability or low flexibility in terms of meeting biodiversity pattern targets. CBA2 is classified as Near-natural Landscapes with ecosystems and species largely intact and undisturbed. These are areas with intermediate irreplaceability or some flexibility in terms of meeting biodiversity targets. Ecological Support Areas are classified as Functional Landscapes that has been moderately disturbed but still able to meet basic functionality. <p style="text-align: right;"><i>Source: North West Province Biodiversity Conservation Assessment Technical Report, 2009</i></p>
Vegetation	<ul style="list-style-type: none"> The majority of the precinct consists of Moot Plains Bushveld. There are strips of Gold Reef Mountain Bushveld in the south and north of the precinct. The south also consists of strips of Andesite Mountain Bushveld and Gauteng Shale Mountain Bushveld. There is a small area of Carletonville Dolomite Grassland in the south-eastern corner of the precinct.
Fauna	The northern part of the precinct is seen as a special habitat for Large Raptors
Flora	There is a section in the north-western part of the precinct noted as a special habitat location, comprising trees over 2500 years old.

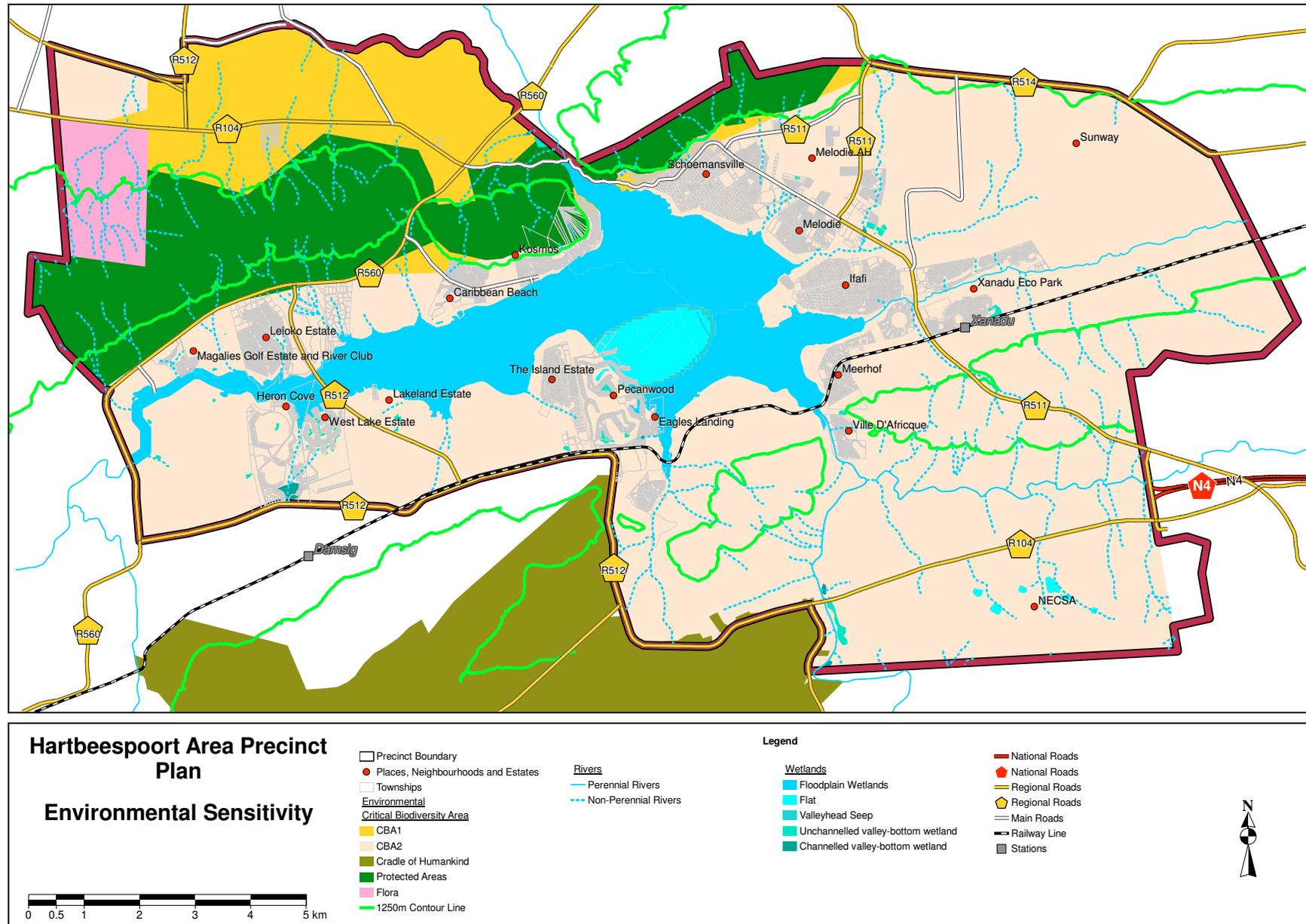


Figure 12: Environmental Sensitivity

3.2 Cadastral Composition of Rural Environment

The rural environment (i.e. outside of the established townships) comprises portions of the following farms:

- Scheerpoort 477 JQ
- De Rust 478 JQ
- Broederstroom 481 JQ
- Weldaba 567 JQ
- Welgegund 491 JQ
- Rietfontein 485 JQ
- Hartbeespoort 482 JQ
- Ifafi 457 JQ
- Arendsnes 565 JQ
- Hartebeesfontein 445 JQ
- Zandfontein 447 JQ
- Bokfontein 448 JQ
- De Uitvalgrond 449 JQ

Melodie Agricultural Holdings are situated to the north of Schoemansville.

3.3 Spatial Form and Land Uses

3.3.1 General Spatial Form

The Hartbeespoort Dam is commonly known as the playground of water sport. A property bloom was experienced in the last few years with the development of a large

number of security and private estates in the vicinity of the dam. This resulted in the development of several new businesses and shopping malls in this area.¹

The study area is characterised by urban (mostly exclusive residential estates) development in the area directly around the dam, with more agricultural and rural residential related land uses further away from the dam. Although the development patterns closely follow the dam, there is also a strong link between the development patterns and the regional roads around the dam (refer to Figure 14).

The main (or main emerging) nodes and gateways in the study area are:

- the R511 node to the east of Ifafi;
- the Jasmyn node to the east of Meerhof;
- the Damdoryn area at the intersection of the R104 and R560;
- the section of the R512 to the south of Pecanwood Estate; and
- sections of Scott Street in Schoemansville and Melodie.

The Rietfontein area in the north-eastern part of the study area experiences particular under development pressure from both legal and illegal developments. The area is mainly characterized by or used for rural residential purposes and illegal businesses and light industries.

3.3.2 Residential Development

The area around the dam developed primarily as a residential area, with older residential neighbourhoods such as Kosmos, Schoemansville, Ifafi, Melodie and Meerhof, and more recently a proliferation of private residential estates. Besides the

¹ Source: Madibeng IDP 2013/2014

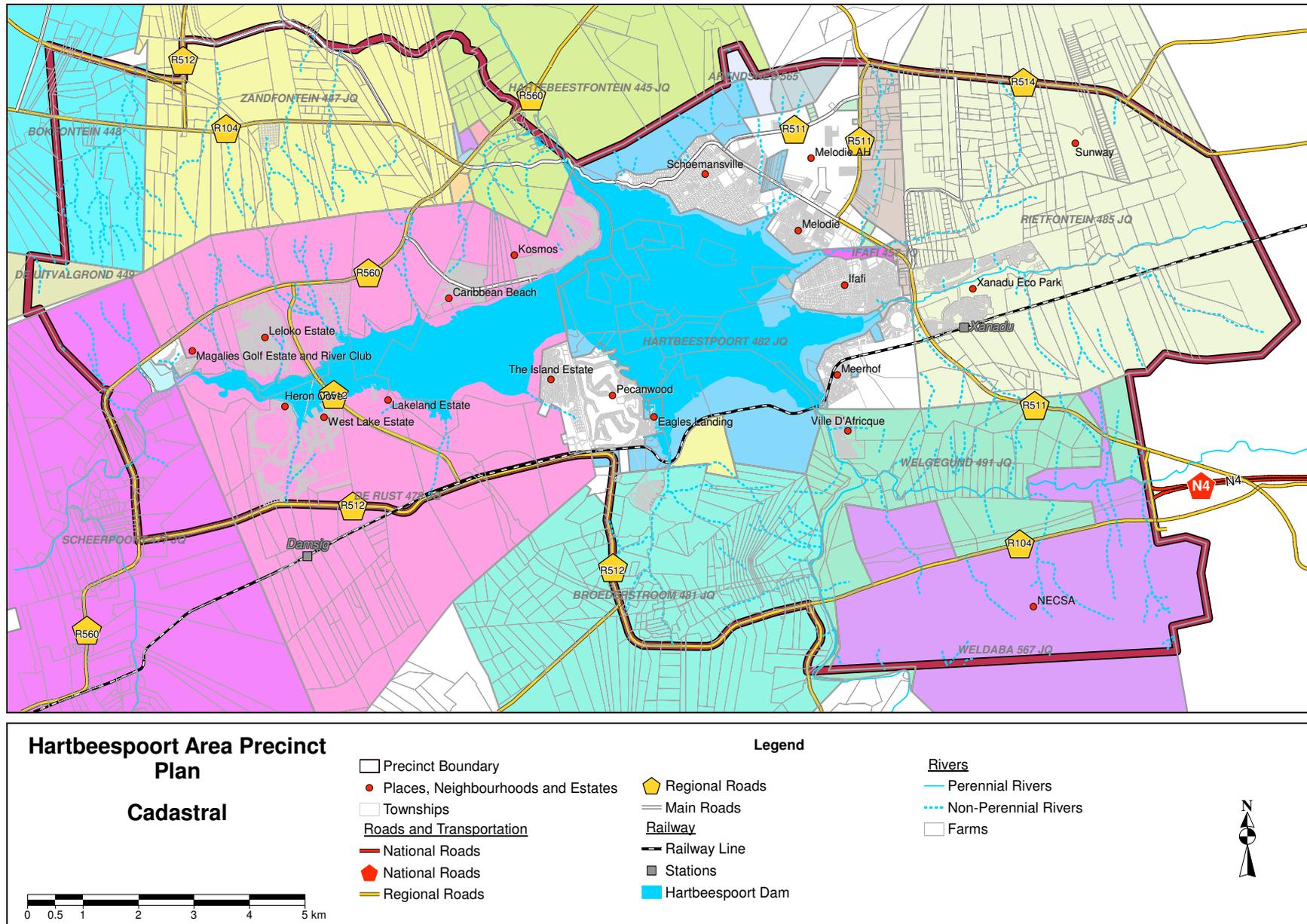


Figure 13: Cadastral Composition of Rural Environment

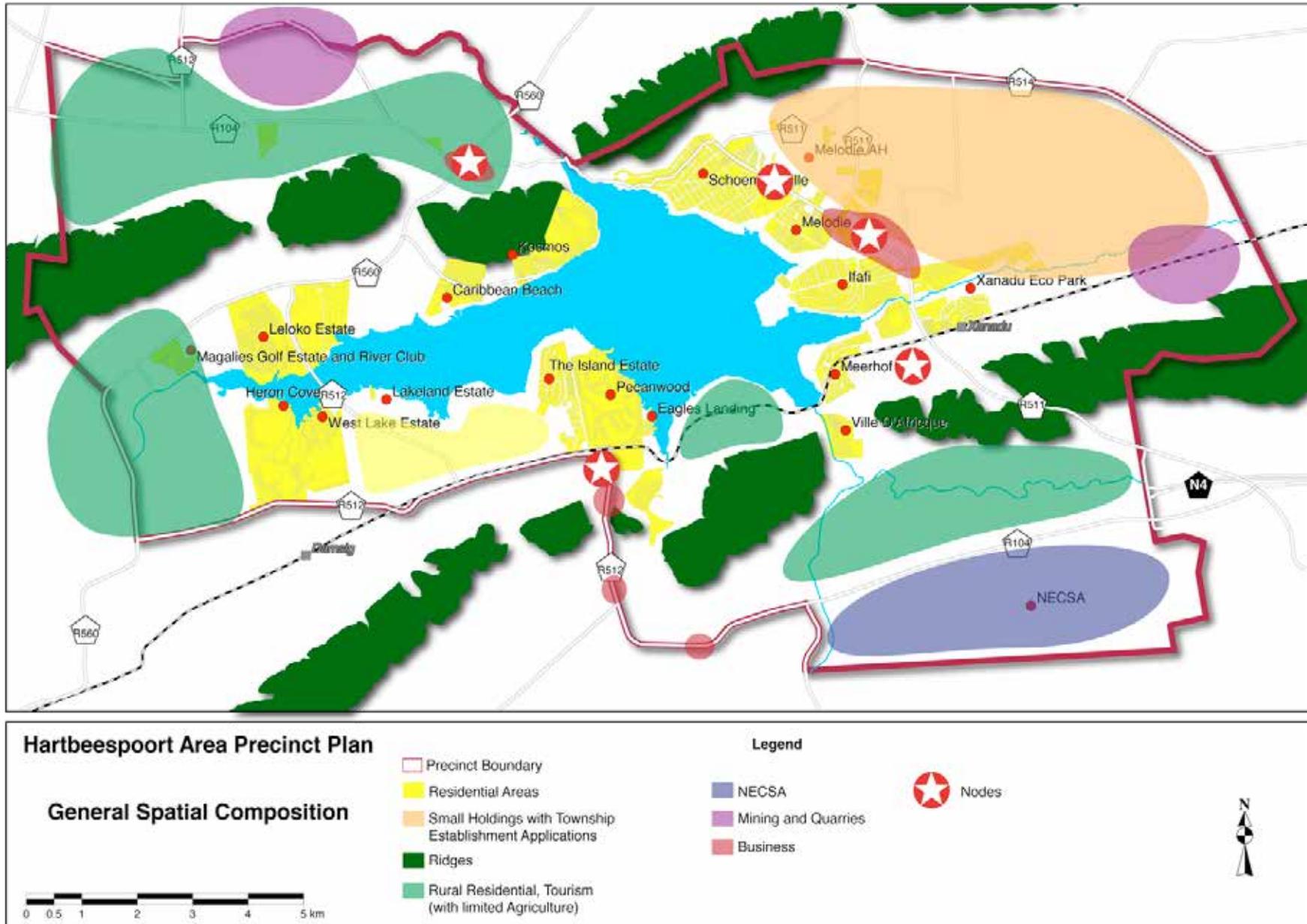


Figure 14: General Spatial Composition

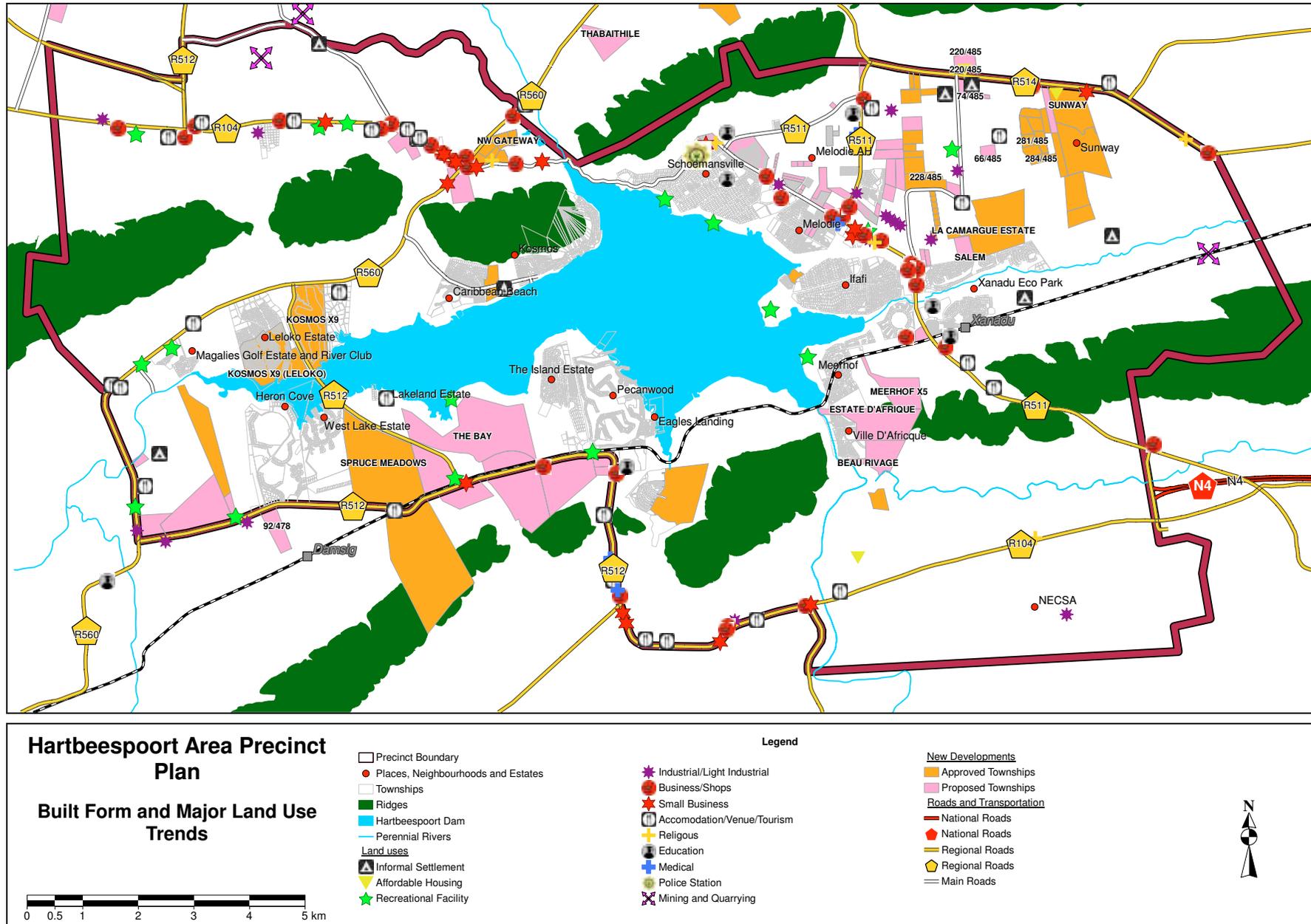


Figure 15: Built Form and Land Use Trends

developed estates, there are a large number of approved estates that have not yet been developed.

The development trends in the area generally manifested in problems such as growth in informal settlements (due to the perception of increased job opportunities), uncoordinated and fragmented housing development leading to sub optimal infrastructure development, the privatisation of the water edge and lack of adequate potable water and capacity at the sewage treatment plant to handle increasing sewer loads.

The area is currently experiencing a situation where many of the approved developments (especially smaller ones) can not go ahead until infrastructure in the area has been upgraded.

The larger informal settlements in the area include the Popo Molefe and Marios settlements in the central-eastern part of the study area, close to the existing Waste Water Treatment Works, the Ten Rooms informal settlement along the R514, the Capitane informal settlement adjacent to the R560 and the Orange Farm settlement adjacent to cosmos. A number of small informal settlements can be found throughout the study area, in most cases comprising farm workers. These settlements are characterised by extensive socio-economic problems such as unemployment, lack of engineering services, crime, lack of education services, lack of transport services etc.

One of the main problems in terms of the formalisation of informal settlements are the large number of illegal foreigners residing in these settlements who do not qualify for housing subsidies.

There are two affordable housing projects in the study area, both adjacent to the R514 in the north-eastern part of the study (in the Rietfontein area), namely the Refentse development (previously the Afsaal development) along the northern side of the R514, and the new Sunway Village along the southern side. The latter development will comprise approximately 3,000 units when completed which will range from subsidised housing to entry-level bonded housing. The Refentse development is the only approved PHP subsidised affordable housing project in the precinct (167 subsidies).²

² Source: Madibeng IDP 2013/2014

There is a great need for an affordable housing development in the western part of the study area to cater in the housing need of farm workers, mine workers and residents of informal settlements in these areas.

3.3.3 Business Development

The largest concentration of business development and non-residential activity can be found along the R511 to the north of the railway line, with the majority of business, office and light industrial land uses concentrated in this area. The second significant concentration of business developments can be found at the intersection of the R104 and R560 to the west of the dam wall (the Damdoryn area).

Smaller concentrations of business development can also be found in the Broederstroom and Pecanwood area along the R512 and along Scott Street in Schoemansville and Melodie.

The following new shopping centres have been approved:

- A shopping centre on the southern side of the dam as part of 'The Bay' development; and
- A shopping centre on the corner of the R511 and Beethoven Street (Melodie Extension 27).

3.3.4 Tourism and Recreation

Tourism-related developments (i.e. lodges, conference venues, restaurants, day spas etc.) can be found along all the major movement routes around the dam, including the R512, R560 and R511. The well-known and recently refurbished Harties Cableway is situated in the Magaliesberg Mountain to the north of Schoemansville.

3.3.5 Social and Community Services

3.3.5.1 Education, Libraries and Community Halls

The study area comprises two government primary and secondary school (i.e. the Generaal Hendrik Schoeman primary school and Hartbeespoort secondary school in Schoemansville and the Ennis Thabong primary school to the south of the Xanadu Eco-Estate).

There are three private schools, namely the Mount Cambridge School in Melodie Agricultural Holdings, Doxa Deo in Xanadu Eco-Estate and Pecanwood College adjacent to the Pecanwood Estate.

Meerhof School for Disabled Children is located in Meerhof.

Scheerpoort Primary School is located just outside of the south-western boundary of the study area, and a number of the children of informal settlements in the western part of the study area attend this school.

There are also a parcel of land in Schoemansville and another in Ifafi that have been earmarked as school sites, although not yet developed.

There is a public library (Maboloka Community Library) in Schoemansville.

In terms of the Madibeng IDP, 2013/2014, the Kosmos Community Hall requires additional parking to be able to function to its full potential. On the eastern side of the dam no formal community hall exists although the existing educational facilities serve the purpose fairly adequately. In future however, a larger and central facility may be required as the population and demand for such a facility increases.

3.3.5.2 Recreation

The majority of the recreational needs of the area are being addressed in accordance with market mechanisms. Sporting facilities not related to water sports should however, be investigated further.³

3.3.5.3 Safety and Security

There is one police station in the study area, located in Schoemansville.

NECSA is contracted by the Madibeng Local Municipality to provide all emergency services (ambulance and fire brigade) to the area south of the Magaliesberg, and is therefore responsible for the study area).

3.3.5.4 Health

The area comprises a number of private medical facilities. A private hospital license has also been granted for the Xanadu Eco-Estate development.

There are two community health clinics (government): (i) located along the R512 to the south of Pecanwood Estate and (ii) in Marais Street in Schoemansville.

Hartbeespoort mobile clinic provides a service to farm areas.⁴

3.3.5.5 Cemeteries

One cemetery is being used and nearing its full capacity. An alternative site should be identified for long-term purposes.⁵

³ Source: Madibeng IDP, 2013/2014

⁴ Source: Madibeng IDP, 2013/2014

⁵ Source: Madibeng IDP 2013/2014

3.3.6 Movement Network

3.3.6.1 Existing Roads

There main regional roads are:

- The R104 which runs in the south-eastern and north-western part of the precinct and connects the study area with Tshwane (Pretoria CBD) and Rustenburg;
- The R560 which runs through the western part of the precinct and connects the study area with Magaliesburg in the south-west;
- The R514 in the north-eastern part of the study area that connects the area with Tshwane to the east;
- The R511 which runs through the eastern part of the study area and connects the area with Sandton to the south-east and Brits and the N4 (Bakwena-Platinum Highway) to the north; and
- The R512 which runs along the southern boundary and through the western part of the study area and which connects the area with Randburg in the south and Brits and the N4 (Bakwena-Platinum Highway) in the north.

The R511 and R512 are also the major access routes to the majority of residential estates and the Schoemansville/Melodie/Ifafi/Meerhof residential neighbourhoods. The section of the R511 from the Gauteng boundary up to the Limpopo boundary, as well as the section of the R512 north of the R104, was taken over by SANRAL in 2012. Generally, the R511 is in a bad condition.

Other important access routes in the precinct are:

- Simon Bekker Ave (Provides access to Kosmos Ridge from the R512 in the northern part of the Precinct); and

- Scott Street and its extension across the dam wall (provides access to Schoemansville and links up with the R104 to the west).

3.3.6.2 Planned Roads

The major planned roads in the precinct are:

- The NWPWV1 which runs parallel to the R104/R512 along the southern boundary of the precinct and will further extend the existing N4 (NECSA) that ends at the Tshwane/Madibeng border;
- The NWPWV3 which is an extension of the R512 which runs across the western part of the dam and will link up with the N4 (Bakwena-Platinum Highway) in the north;
- The proposed K16 which runs in a east-west direction along the north-eastern boundary, connecting the precinct with Tshwane;
- The proposed K20 which runs in an east-west direction through the centre of the eastern part of the precinct; and
- The proposed K27 which runs in a north-south direction through the eastern part of the precinct.

3.3.6.3 Rail

There is a abandoned railway line running along the southern side of the Hartbeespoort dam, linking Pretoria and Magaliesburg. The railway line fell in disuse when Spoornet decided that the line is a burden due to maintenance cost. A private person however uses a small portion of the line from Pecanwood to Meerhof for weekend excursions

with a motor trolley.⁶ Much of this line has been destroyed, but it has potential as both a future commuter and tourism transportation service

There is one station located in the study area, directly south of the Xanadu Eco-Estate.

3.3.6.4 Road Based Public Transport

Thari Transport and, in some areas PUTCO, provides a public transport service in the Hartbeespoort area and mainly service commuters and learners to and from outside areas. The route, which services the Hartbeespoort area, is the Brits, Hartbeespoort route. The pickup points are situated along a carefully planned route through the suburbs and have no bus terminus as such. Commuters wait at bus stops for their busses. Several taxis also service this area with a waiting point in Scott Street. This is however no recognized taxi ranks.⁷

Taxi operators have created an informal taxi rank adjacent to the R511 in Schoemansville. which is currently the main stopping place in the area. There are suggestions on the table that this taxi rank be formalised as part of the Melodie X 27 development. There is also a proposal to develop a new taxi rank opposite the Village Mall.

3.3.6.5 Road Safety

The R560, R512, R511 and R104 have been identified by stakeholders as major routes that are in particularly bad condition. Many local roads in the study area are also in particularly bad condition, with tarred surfaces having disintegrated completely in many instances.

High accident zones include (i) the intersection of the R511 and R514, (ii) along the R512 to the south of Pecanwood Estate and (iii) the intersection of the R560 with the R104 at Damdoryn. The section of the R512 towards Pecanwood past the Mountain

⁶ Source: Madibeng IDP 2013/2014

⁷ Source: Madibeng IDP 2013/2014

Lake shopping centre is in particular dangerous due to speeding trucks on the downhill section of the road.

3.4 Infrastructure

3.4.1 Electricity

The Substations in the area are all owned by Eskom and Tshwane. Madibeng however owns some of the lines feeding out from Ifafi Substation into the urban areas.

In general most of the substations are on maximum capacity. The Tshwane substations which include Ifafi, Broederstroom and Florapark are near full capacity, but the main constraint is the 33kV network feeding these substations which is already over capacity. The Eskom substations have a strong backbone network, but the substations are also near full capacity, however, Eskom has a few projects in the pipeline to upgrade these substations in the next 3 years. Skeerpoort Substation currently has 2 X 5MVA transformers installed which have a safe capacity of 5MVA (in the event that one transformer is lost). The current maximum demand on this substation is approximately 8MVA which means that this substation is already over its safe capacity, however, Eskom is planning to upgrade this substation and replace the existing 2 X 5MVA transformers with 2 X 20MVA transformers.

Summerhill Substation currently has 1 X 5MVA Transformer installed which means that there is no safe capacity available. The maximum demand on this substation is however very low which frees up much of the capacity on this transformer. The substation has sufficient space to add a second transformer, but this will involve additional costs and time.

Hartbeespoort Dam Substation has 2 X 40MVA Transformers installed with a safe capacity of 40MVA of which the maximum demand currently is around 36MVA. There is thus 4MVA safe available capacity in that substation.

Safari Substation is used primarily for NECSA and no supply will be made available from that substation.

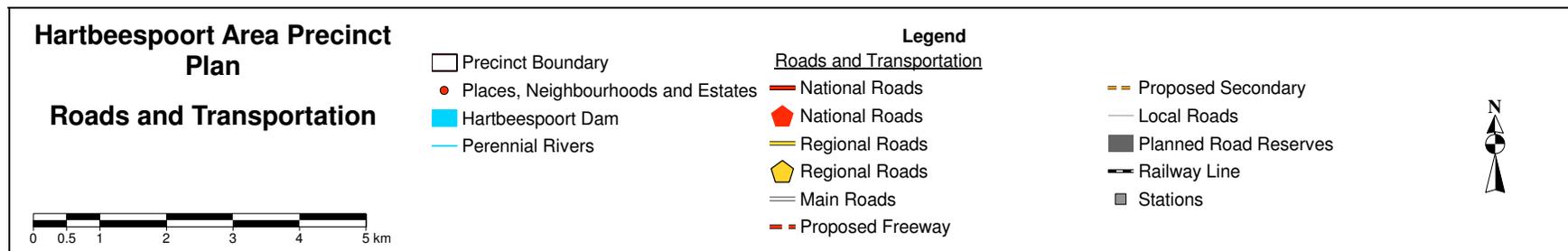
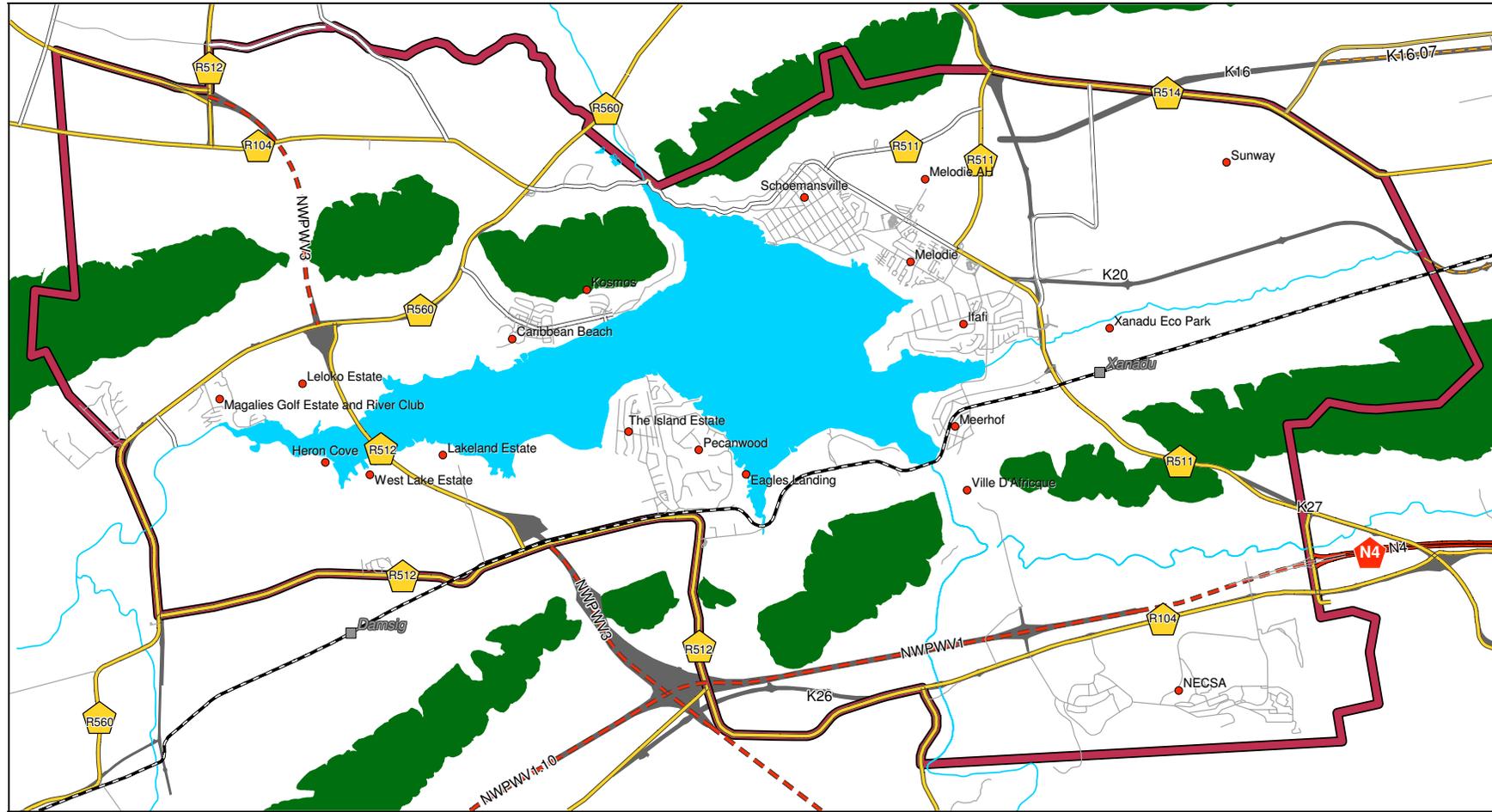


Figure 16: Roads and Transportation

Leloko Substation was primarily built for Leloko Estate and has very little available safe capacity left. Lefko Substation is close to Brits and is primarily for mining and industrial supply. Skeerpoort Substation is listed twice in the table above due to the future planned upgrade.

It is important for planning purposes not to use the available capacity column, but the available safe capacity column. The available capacity is reserved for emergency supply from the utilities, although Eskom is already using emergency spare capacity for normal load.

Table 12 provides a summary of all substations and loadings:

Table 12: Substation Capacity

Substation Name	Supply Authority	Installed Capacity (MVA)	Safe Capacity (MVA)	Maximum Demand (MVA)	Available Capacity (MVA)	Available Safe Capacity (MVA)
Hartbeespoort Dam SS	Eskom	2 X 40	40	36	44	4
Leloko SS	Eskom	2 X 10	10	8	12	2
Summerhill SS	Eskom	1 X 5	0	1	4	0
Lefko SS	Eskom	2 X 10	10	9	11	1
Skeerpoort SS	Eskom	2 X 5	5	8	2	0
Skeerpoort SS	Eskom	2 X 20	20	8	32	12
Florapark	Tshwane	1 X 5	0	3	2	0
Broederstroom	Tshwane	3 X 5	10	9	6	0
Ifafi	Tshwane	2 X 5, 2 X 10	20	22	8	0
Total available capacity					121	19