5. BIOPHYSICAL DESCRIPTION OF THE PROPOSED SITE

5.1 Location of the site

The development of a residential area is proposed on Portion 52 of the farm Rondebosch 403 JS, Middelburg. The property is 48.4292 ha in extent and located south of the R104 provincial road between Middelburg and Belfast (Figure 5.1). The site is located a few hundred metres east of Middelburg X22 and north of Nasaret.

The centre co-ordinates of the site are:
29º30'40.22''E and 25º46'25.44''S.

The Surveyor-General 21 digit site reference number for the proposed project is:

T	O	J	S	0	0	0	0	0	0	0	0	0	4	0	3	0	0	0	5	2

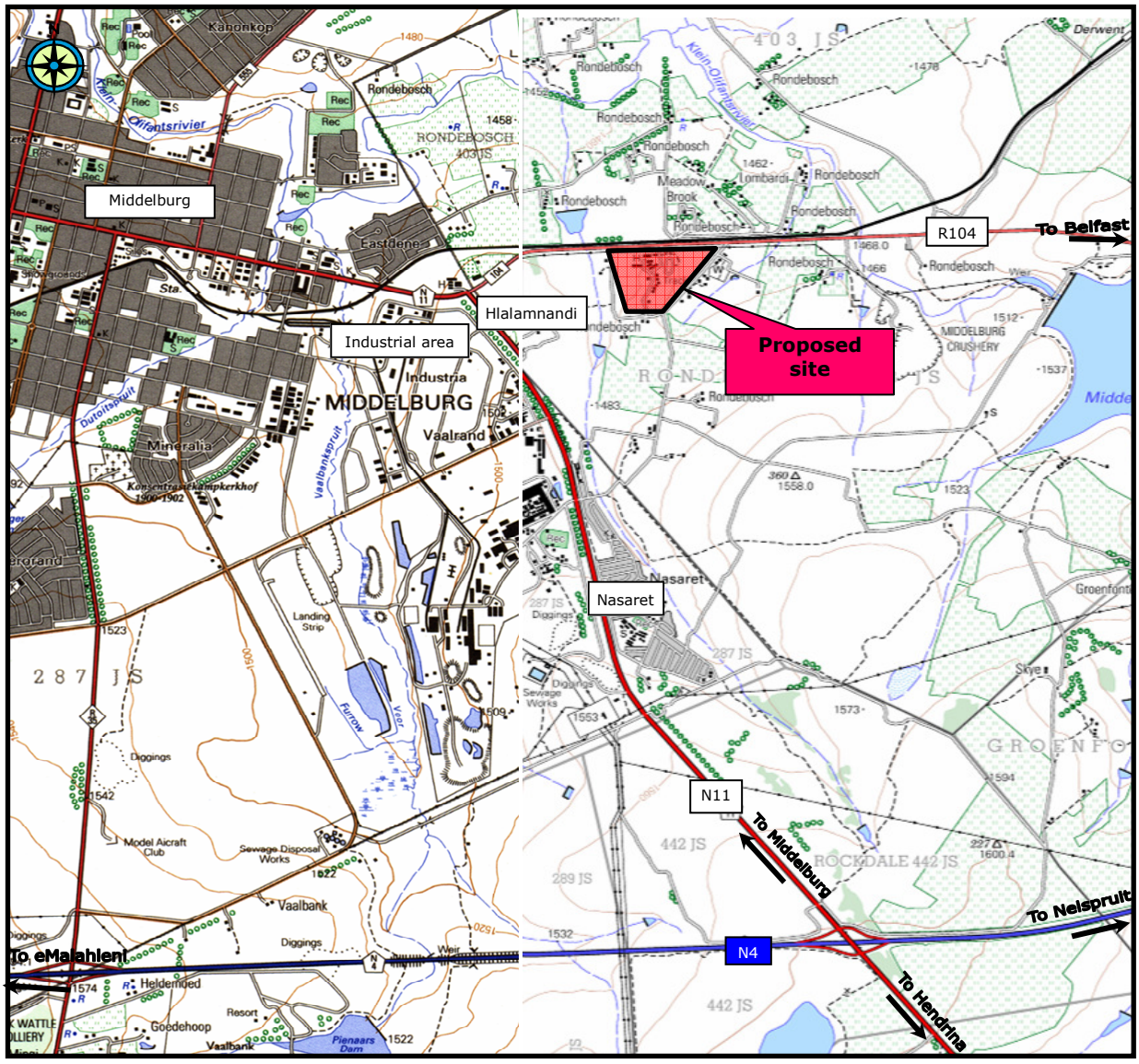


Figure 5.1: Location of site *(taken from 1: 50 000 2529CD and 2529DC)*

5.2 Climate

5.2.1 Temperature

The climate is typically "Highveld", with summer temperatures ranging from 9°C to 32°C and winter temperatures from -6°C to 22°C. The mean monthly maximum and minimum temperatures recorded are given in Table 5.1.

Table 5.1: Mean, maximum and minimum temperature

Mean Monthly Maximum and Minimum Temperatures (°C)				
Month	**Daily Maximum**	**Daily Minimum**	**Highest Temp.**	**Lowest Temp**
January	27,2	13,7	32,0	9,1
February	26,8	13,4	30,8	9,0
March	26,8	11,4	30,2	6,4
April	23,9	7,4	27,9	1,4
May	21,3	2,2	26,1	-2,9
June	18,5	-1,8	22,4	-6,0
July	18,4	-1,7	23,0	-5,8
August	21,4	0,8	26,0	-4.1
September	24,0	5,3	29,2	-1,3
October	26,0	10,1	31,2	4,4
November	26,2	11,8	31,8	5,9
December	27,1	13,2	31,2	7,8
Yearly Average	**23.9**	**7.2**	**28.4**	**2.0**

5.2.2 Rainfall

The site occurs in Mpumalanga and falls in the summer rainfall region, which is characterized by thunderstorm activity and relatively low average rainfall. The mean annual rainfall is 735mm compared to the mean annual potential evaporation of 1500mm. Pertinent climate data was obtained from the Middelburg (No. 0515/826) and Belfast (No. 0517/0109) weather stations.

The average number of days per month having rainfall depths in excess of 0,1mm, together with the maximum and minimum number of rainfall days are given in Table 5.2 while the 24 hour rainfall depths for different recurrence intervals are given in Table 5.3.

Table 5.2: Monthly rainfall data

Average Monthly Rainfall Depths (mm) and Days Having a Rainfall of >0,1mm		
Month	**Ave Depths**	**Ave Days**
January	132	13,8
February	103	11,2
March	88	9,5
April	42	6,5
May	19	2,9
June	7	1,5
July	9	1,7
August	8	0,9
September	22	3,7
October	63	8,3
November	124	13,0
December	118	13,1
Total	**735**	**86.1**

Table 5.3: Rainfall intensities

24 Hour Rainfall Depths (mm)			
Maximum Depth	**50 Year Storm Event**	**100 Year Storm Event**	**200 Year Storm Event**
117	104	118	134

5.2.3 Prevailing wind direction

The prevailing wind direction data for the Middelburg station is provided in Table 5.4a.

Table 5.4a: Mean monthly wind speed and direction

Month	N		NE		E		SE		S		SW		W		NW	
	N	v	N	v	n	v	n	V	n	v	n	v	n	v	N	v
January	161	3.0	287	3.2	44	3.1	92	3.3	122	3.6	96	3.3	109	3.7	48	4.5
February	142	2.9	295	3.2	44	3.1	74	3.4	112	3.4	101	2.9	141	3.9	60	4.2
March	152	2.8	304	3.3	36	3.1	54	3.1	100	3.4	104	2.9	139	3.4	63	3.5
April	170	2.7	211	3.3	47	3.2	95	3.4	149	3.6	146	2.8	87	3.4	39	3.0
May	172	2.6	166	2.9	59	3.4	89	3.7	162	3.9	167	2.9	67	3.0	51	3.3
June	146	2.5	149	3.0	54	3.6	117	3.0	157	3.8	166	2.7	86	3.2	43	3.2
July	162	2.5	184	2.9	51	3.9	99	3.9	142	3.6	143	2.8	79	3.4	53	4.2
August	174	5.4	180	3.4	40	3.5	86	4.1	141	4.1	182	3.0	83	3.2	40	4.4
September	197	3.2	223	3.8	27	3.5	70	3.9	131	4.3	171	3.3	84	4.0	41	3.9
October	190	3.4	243	3.7	33	3.6	71	3.6	142	4.0	160	3.8	83	4.3	42	3.6
November	174	3.2	225	3.6	28	3.1	68	3.1	185	3.8	154	3.5	92	4.1	40	3.9
December	180	3.1	254	3.4	34	3.0	69	3.3	154	3.5	135	3.3	95	4.0	40	4.0
Average	**188**	**2.0**	**227**	**3.3**	**41**	**3.3**	**82**	**3.8**	**141**	**3.8**	**146**	**3.1**	**95**	**3.7**	**47**	**3.8**

n = average direction frequency per 1000 readings; v = velocity (m/s)

5.2.4 Evaporation

The mean monthly evaporation data recorded at the relevant weather station are given in Table 5.4b. The data in the table was obtained using an 'A' Pan.

Table 5.4b: Mean monthly evaporation

Month	**Evaporation (mm)**	**Rainfall (mm)**	**Monthly deficit (mm)**
January	160	132	28
February	140	103	37
March	110	88	22
April	110	42	68
May	85	19	66
June	70	7	63
July	75	9	66
August	110	8	102
September	140	22	118
October	160	63	97
November	160	124	36
December	180	118	62
Total Average	**1500**	**735**	**765**

5.2.4 The incidence of extreme weather conditions

Being located on the Highveld, the area is prone to extreme weather on a regular basis. These weather conditions include droughts, floods and strong gusty winds prior to and during thunderstorms. Frost also occurs on an average of 120 to 150 days between April and September.

5.3 Geology

According to the 1: 250 000 Geological Series (number 2528 Pretoria), the site is underlain by tillite of the Dwyka Formation and by shale of the Loskop Formation and possibly intrusive diabase.

A geotechnical study was undertaken by Mr. P. Hansmeyer of Engeolab cc (referred to as Hansmeyer, 2009). A copy of the report is provided in Appendix 11. For a description of the methodology used, please refer to Appendix 11.

Hansmeyer (2009) indicated that the site is underlain by transported soils and decomposed rocks derived from the in situ weathering of tillite, intrusive diabase and older Loskop shale (Figure 5.2). Well cemented hardpan ferricrete was recorded along the central southern section of the western boundary (Figure 5.2).

The following do not occur on site:

- Dolomite, sinkhole or doline areas;
- Unstable geological features.

It should be noted that the said site has not been undermined.

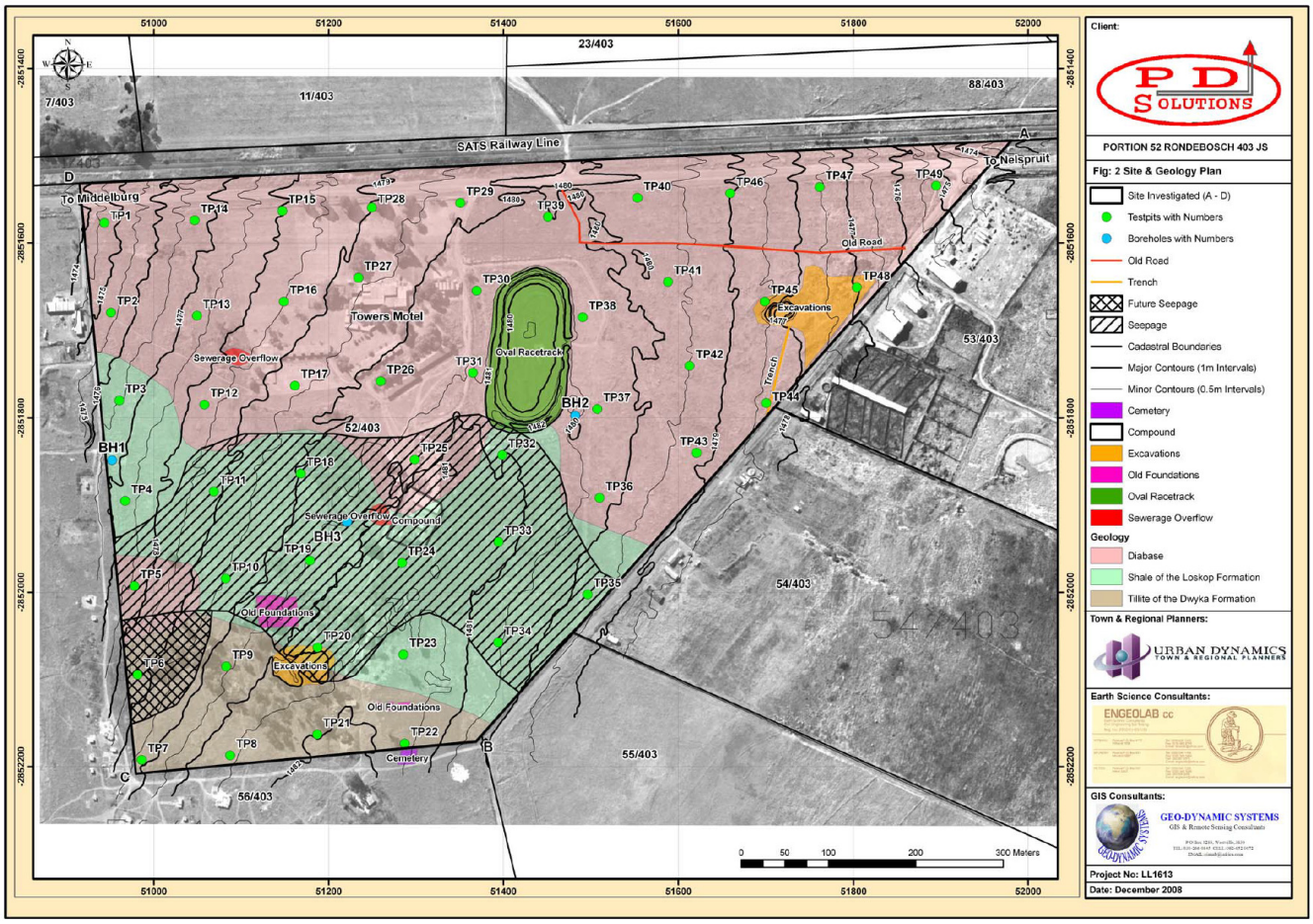


Figure 5.2: Geology of the proposed site (taken from Hansmeyer, 2009)

5.4 Topography

The proposed site lies between 1482 meters above mean sea level (mamsl) and 1474 mamsl (Figure 5.1).

The landscape of the project area can be described as Dry Undulating/Flat Highlands according to the Mpumalanga Biobase (Emery *et. al.*, 2002). In terms of landscape importance, this landscape type was afforded a score of Medium.

According to the AGIS Comprehensive Map drafted by the Department of Agriculture, Forestry and Fisheries, the slope of the majority of the site is less than 2% (i.e. level to very gentle slope; Figure 5.3).

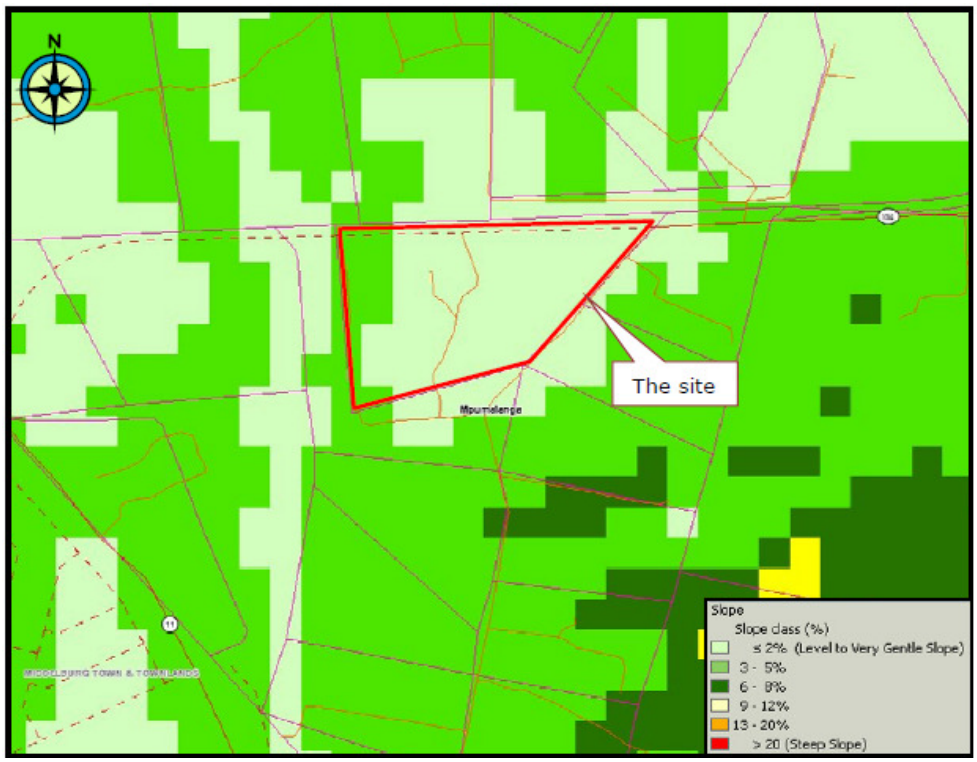


Figure 5.3: Slope of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

The terrain type of the proposed site is indicated as plains with open low hills or ridges as indicated in Figure 5.4.

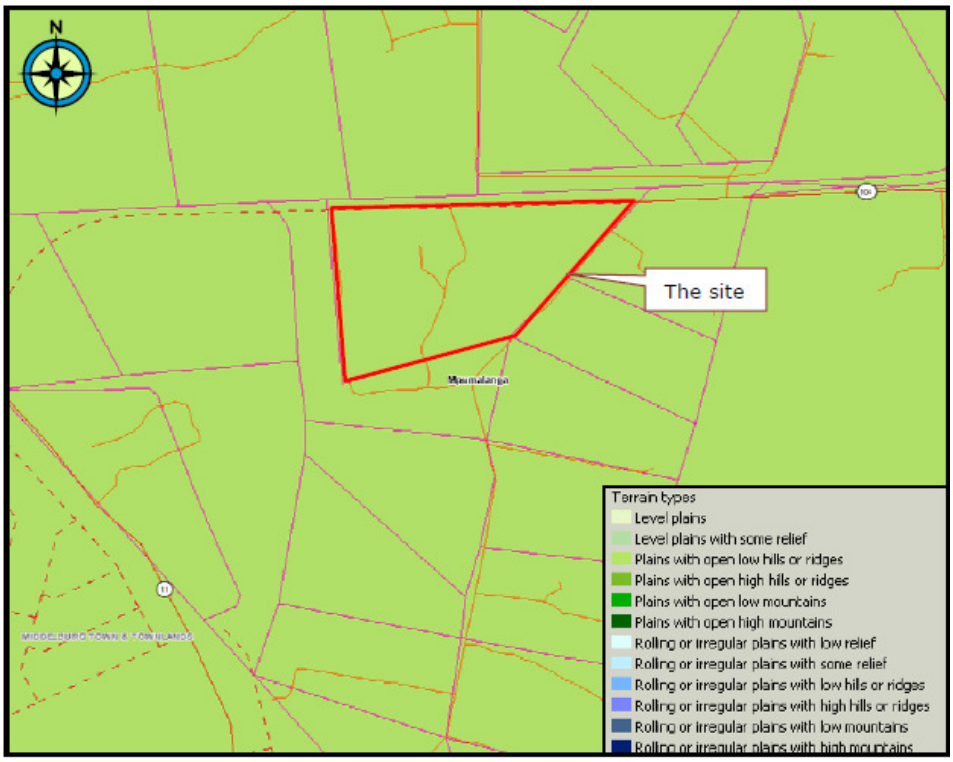


Figure 5.4: Terrain type of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

The site is relatively flat and slopes in a westerly and easterly direction. A local watershed (north-north-east trending) in approximately the centre of the site diverts surface water runoff towards the western and eastern boundaries. The lowest points of the site are the north western and north eastern corners (Figure 5.1).

No unstable rocky slopes or steep slopes with loose soil are present on site. The gradient of the said site is therefore suitable for development.

The topography of the said site has mainly been impacted upon by the construction of buildings and infrastructure on site, namely:

- Copper Towers buildings;
- Hostels, accommodation facilities and houses;
- Race track;
- Eskom and Telkom lines;
- Fences.

A number of excavations and gravel roads as well as past agricultural activities have also impacted on the topography. More detailed information with regards to the infrastructure located on site is provided in Section 5.6.4 of this report.

5.5 Soils/land capability/agricultural potential

5.5.1 Soils

According to the AGIS Comprehensive Atlas of the Department of Agriculture, Forestry and Fisheries, the majority of the site falls within the Ba37 land type (Figure 5.5), which is characterised by red, yellow and/or greyish plinthic soils with low to medium base status (PT1; Figure 5.6).

The soils of the south western portion of the site falls into the Bb land type (Figure 5.5). Red soils are not widespread and upland duplex and black clay soils are rare.

Through site observations, it was noted that the site is covered by transported soils of variable colour and texture. The soil varied from reddish silty sand to loose dark brown sand. There is also a variation in the depth of the soil due to the different underlying geological formations i.e. tillite, shale and diabase.

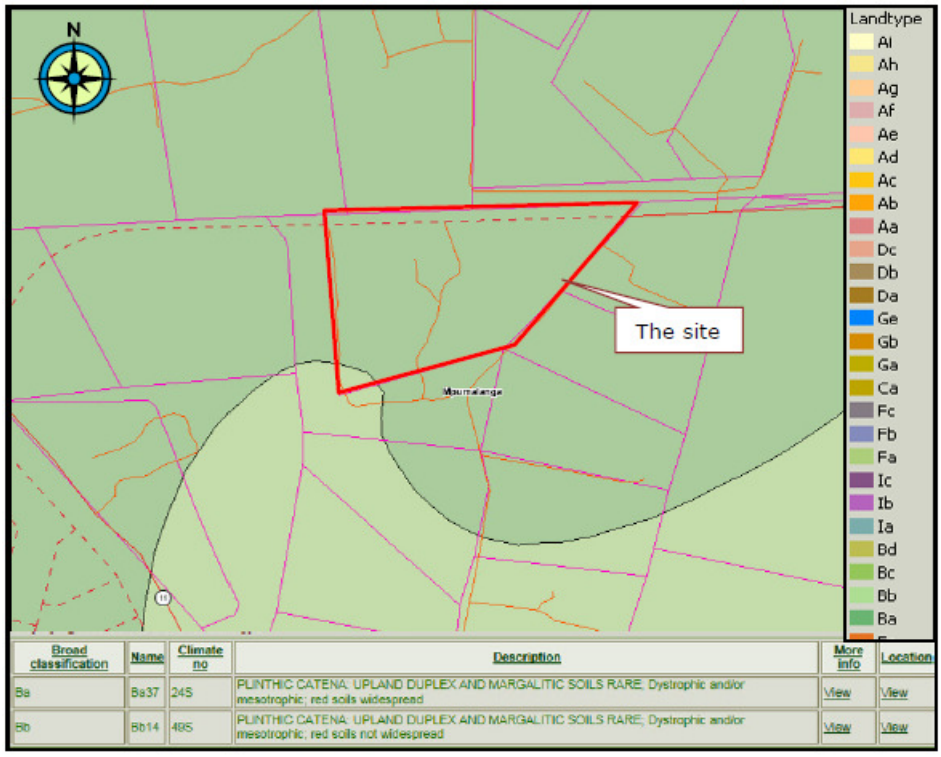


Figure 5.5: Land type of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

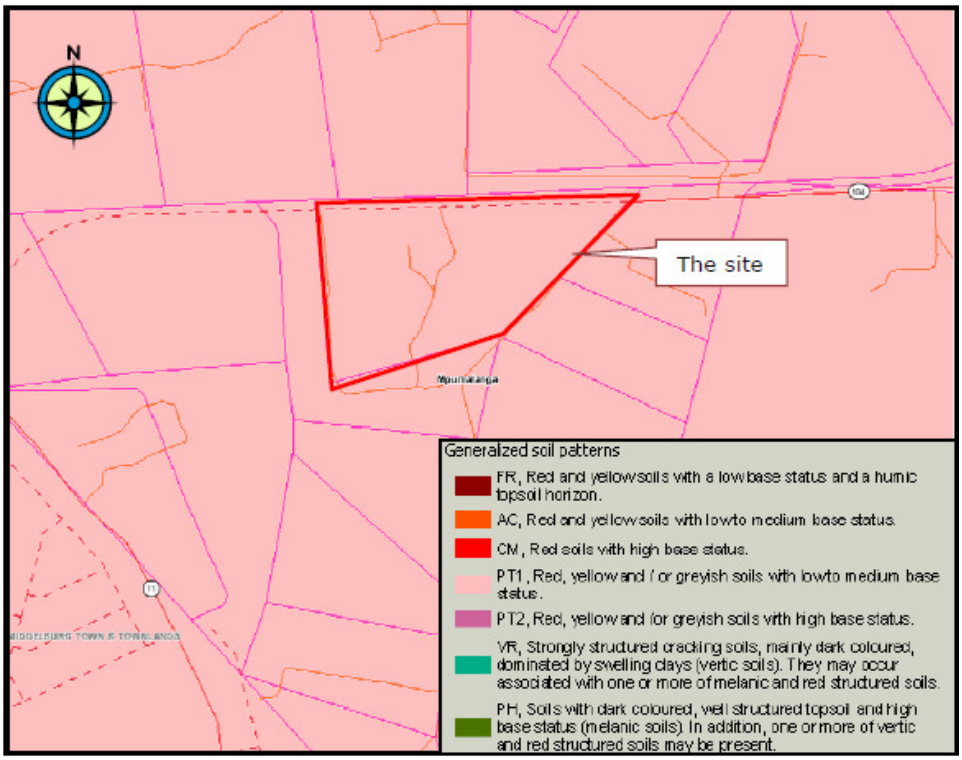


Figure 5.6: Generalized soil patterns of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

5.5.2 Agricultural potential/land capability

In terms of land capability, the proposed site is indicated according to the Department of Agriculture, Forestry and Fisheries as moderate potential arable land (Figure 5.7).

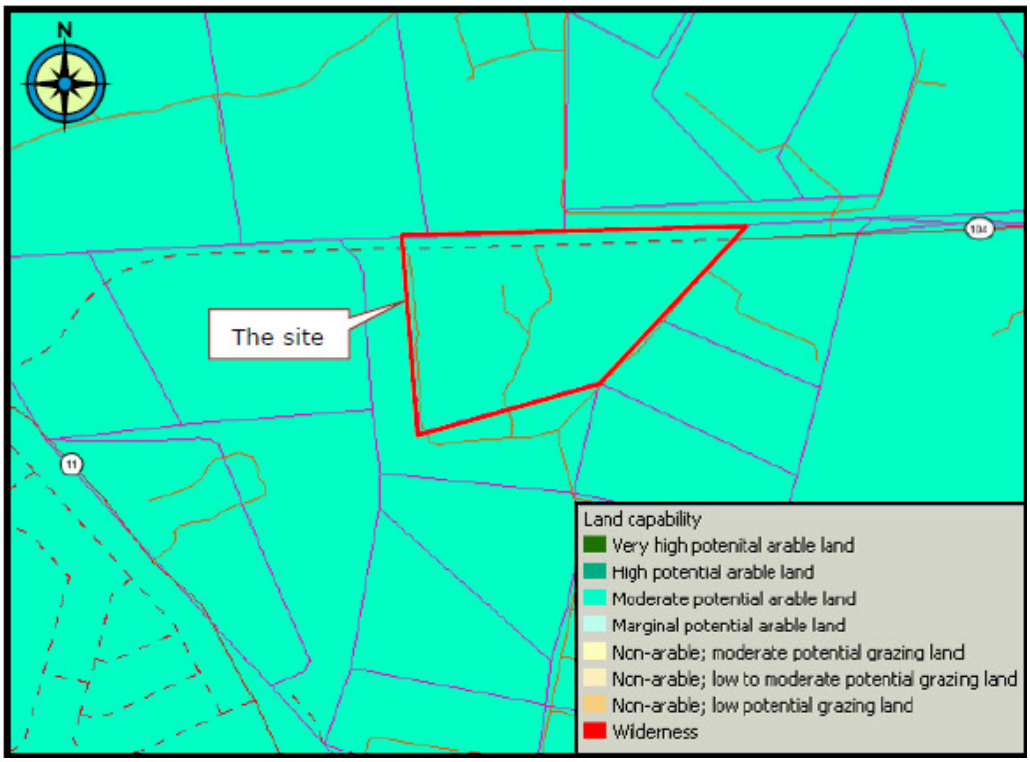


Figure 5.7: Land capability of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

The grazing potential of the area is approximately 3 hectares per large stock unit according to the Department of Agriculture, Forestry and Fisheries. If cultivated, the area could produce 4-5 tons of maize per hectare. The said site is however, indicated as Transformed Rangeland (Figure 5.8) and has a low to moderate agricultural potential due to the degree of disturbance/human impacts on site (e.g. buildings, roads, race-track, waste, etc.).

The soil of the site has been impacted upon by the following:

- Construction of various buildings (e.g. Copper Towers buildings, accommodation facilities, hostels, houses) (Figure 5.10);
- Construction and utilization of the roads (cement and gravel) (Figure 5.10);
- Installation of infrastructure (e.g. powerlines and sewer pipes);
- Construction and utilization of the race track (Figure 5.10);
- Agriculture (past cultivation);
- Soil erosion along the gravel roads;
- Waste disposal;
- Sewage disposal (using septic tanks) and the resultant overflows (Photo 14 and 15; Figure 5.11);
- Excavations.

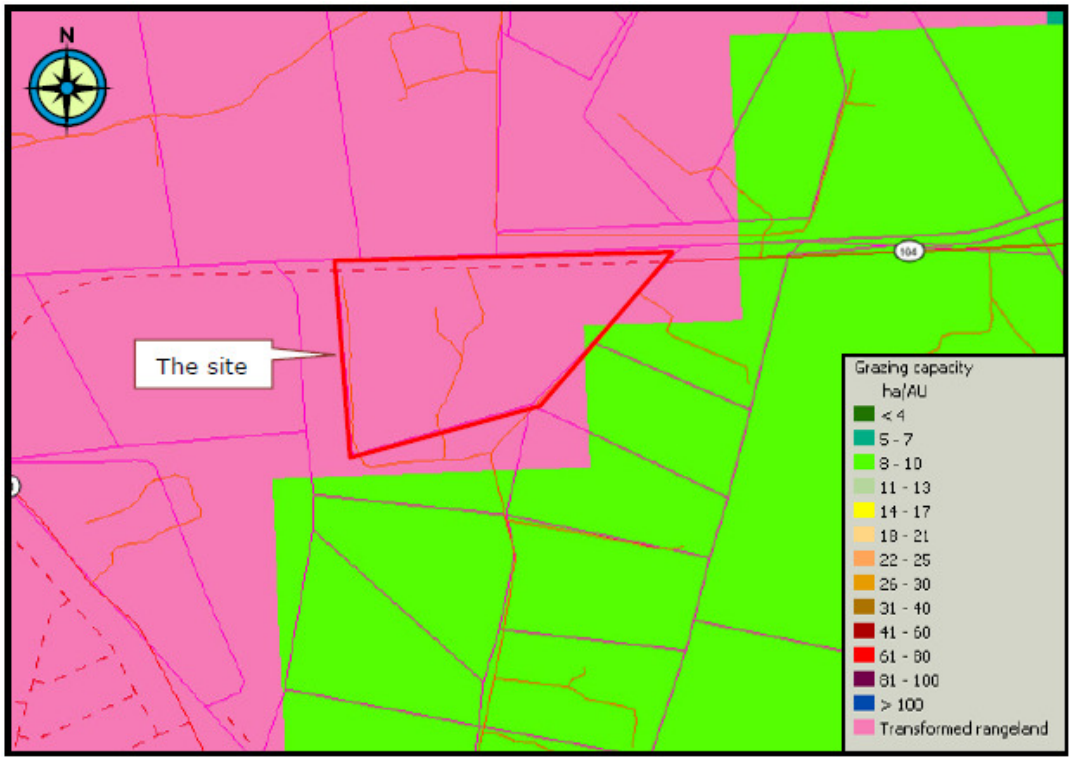


Figure 5.8: Grazing capacity of the proposed site (taken from Department of Agriculture, Forestry and Fisheries)

5.5.3 Geotechnical aspects

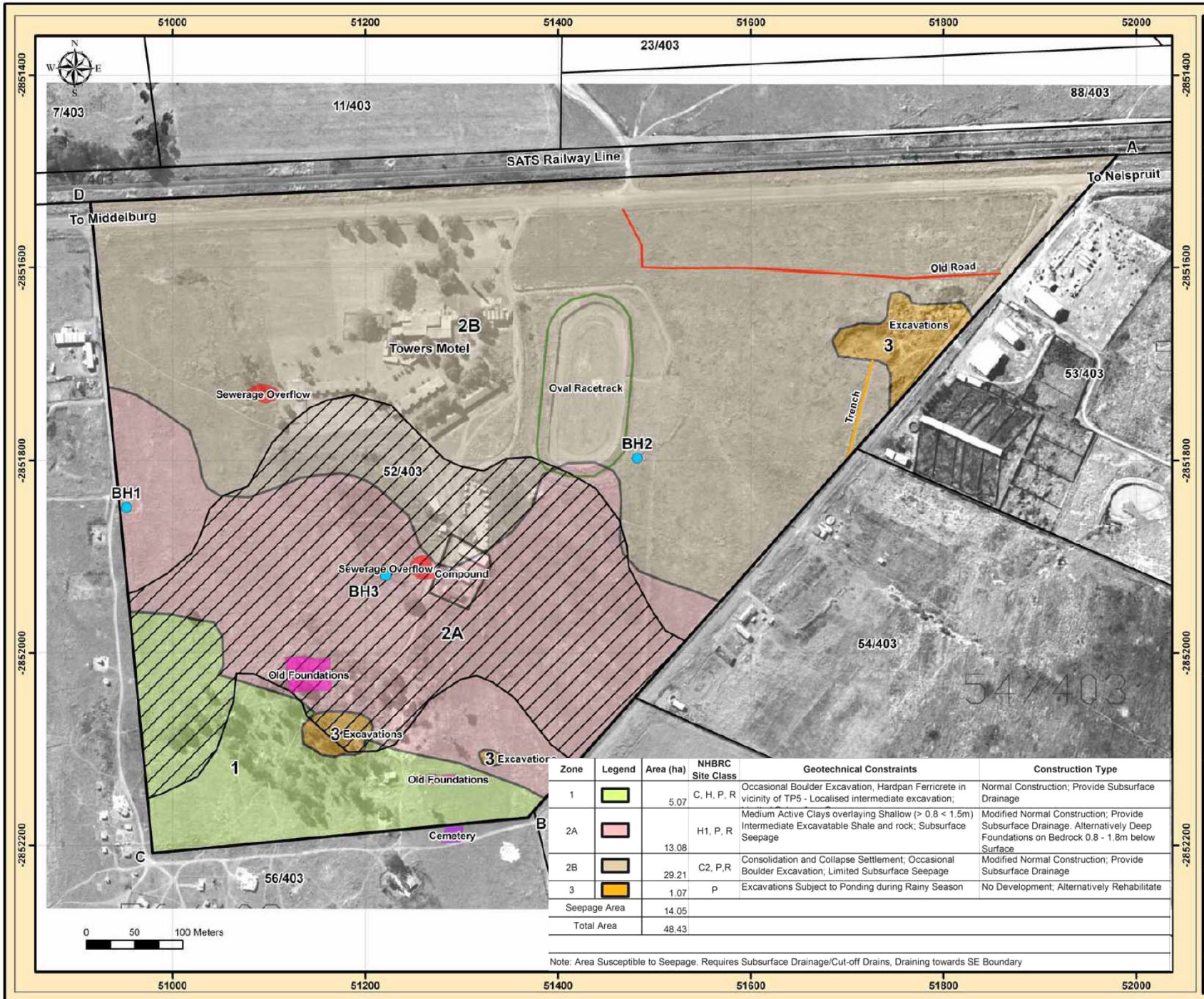
A geotechnical study was undertaken by Mr. P. Hansmeyer of Engeolab cc (referred to as Hansmeyer, 2009). A copy of the report is provided in Appendix 11. For a description of the methodology used, please refer to Appendix 11.

Hansmeyer (2009) indicated that the site is underlain by colluvial cover soils, scattered dropstones and some boulders (associated with Dwyka tillite and intrusive diabase), well cemented pedocrete as well as residual soils (derived from insitu decomposed diabase, shale and tillite).

In general, the average transported soil profile in the area consists of thin silty/sandy topsoil (0.5 – 0.8m). This is generally underlain by occasional pedocrete and decomposed residuum associated with Dwyka tillite or older Loskop shale.

The underlying pebble marker (which extends to some 1.5m below surface) is mainly present in the area underlain by intrusive diabase. According to Hansmeyer (2009), this layer contains scattered rounded to sub-rounded pebbles, cobbles and gravels of various origin and on occasion boulders of diabase.

Based on the geology and soils of the site, Hansmeyer (2009) divided the development site into 4 geotechnical zones as indicated in Figure 5.9.



Zone	Legend	Area (ha)	NHBRC Site Class	Geotechnical Constraints	Construction Type
1		5.07	C, H, P, R	Occasional Boulder Excavation, Hardpan Ferricrete in vicinity of TP5 - Localised intermediate excavation;	Normal Construction; Provide Subsurface Drainage
2A		13.08	H1, P, R	Medium Active Clays overlaying Shallow (> 0.8 < 1.5m) Intermediate Excavatable Shale and rock; Subsurface Seepage	Modified Normal Construction; Provide Subsurface Drainage. Alternatively Deep Foundations on Bedrock 0.8 - 1.8m below Surface
2B		29.21	C2, P,R	Consolidation and Collapse Settlement; Occasional Boulder Excavation; Limited Subsurface Seepage	Modified Normal Construction; Provide Subsurface Drainage
3		1.07	P	Excavations Subject to Ponding during Rainy Season	No Development; Alternatively Rehabilitate
Seepage Area		14.05			
Total Area		48.43			

Note: Area Susceptible to Seepage. Requires Subsurface Drainage/Cut-off Drains, Draining towards SE Boundary

Client:

SERISO 630 (PTY) LTD

PORTION 52 RONDEBOSCH 403 JS

Fig: 5 Zonal Plan

- Site Investigated (A - D)
- Boreholes with Numbers
- Old Road
- Trench
- Cadastral Boundaries
- Cemetery
- Compound
- Old Foundations
- Oval Racetrack
- Sewerage Overflow
- Seepage

Figure 5.9: Geotechnical zones of the proposed site (taken from Hansmeyer, 2009)

Town & Regional Planners:

URBAN DYNAMICS
TOWN & REGIONAL PLANNERS

Earth Science Consultants:

ENGEOLAB cc

GIS Consultants:

GEO-DYNAMIC SYSTEMS
GIS & Remote Sensing Consultants

Project No: LL1613

Date: December 2008

Zone 1 – Site Class: C, H, P, R (Figure 5.9)
In the higher lying southern portion of the site (Figure 5.9), tillite of the Dwyka Formation, Karoo Sequence is present. This comprises of gravel and dropstones of various origin in a powdery mix of brown silty sand. Here excavation refusal was encountered between 1.5m and 2m below surface. Hansmeyer (2009) indicated this area as geotechnical Zone 1 (Figure 5.9).

Included within this area of approximately 5 ha is a small area where hardpan ferricrete was recorded along the central western boundary (Figure 5.9). This ferricrete (0.5m thick) was recorded from 0.4m below surface between the colluvial cover soils and deeper diabase residuum. Hansmeyer (2009) indicated that elsewhere the pedocrete was found to be partially cemented, not as well developed and present mainly as ferricrete nodules with the transported layer and occasionally within residual soils.

This zone has the following characteristics:

ZONE 1 (Figure 5.9)	
AREA (ha)	5.07
NHBRC SITE CLASS	C, H, P, R
GEOTECHNICAL CONSTRAINTS	Occasional boulder excavation, Hardpan ferricrete in vicinity of TP5 (Figure 5.9) – localised intermediate excavation, Limited subsurface seepage.
CONSTRUCTION TYPE	Normal construction applies (e.g. slab-on-the-ground and strip footings). Good subsurface drainage is required.

Zone 2A – Site Class: H1, P, R (Figure 5.9)
As indicated in Figure 5.9, the central section of the site is underlain by grey-blue shale of the older Loskop Formation. This shale has a regional dip of some 12^{o} towards the north-west. Hansmeyer (2009) indicated that the orientation of the contact zones with the younger Dwyka tillite and intrusive diabase have been inferred.

The shale bedrock is overlain by 1.0m thick low to medium active sandy silt derived from in situ decomposed shale blanketed by transported silty sand. Hansmeyer (2009) indicated that excavation refusal was usually encountered on less weathered shale bedrock between 0.8m and 1.8m below surface.

Hansmeyer (2009) indicated this area as geotechnical Zone 2A (Figure 5.9) which covers an area of 13 ha. This zone has the following characteristics:

ZONE 2A (Figure 5.9)	
AREA (ha)	13.08
NHBRC SITE CLASS	H1, P, R
GEOTECHNICAL CONSTRAINTS	Medium active clays overlaying shallow (>0.8 <1.5m). Intermediate excavatable shale and rock. Subsurface seepage.
CONSTRUCTION TYPE	Modified normal construction applies. Provide subsurface drainage. Alternatively, deep foundations on bedrock 0.8 – 1.8m below surface.

Zone 2B – Site Class: C2, R and P (Figure 5.9)
In the northern portion of the site, diabase intrusive to the older Loskop shale is present. The diabase is overlain by the transported layer and extends from an average depth of 1.0m to below the maximum reach of the backhoe, some 2.6 m below surface. The diabase is deeply weathered with a characteristic maroon-brown colour, becoming yellowish-maroon with depth, comprising highly compressible, low to medium active silty sand or sandy silt. Occasional diabase gravels and boulders with a typical onion peel weathering pattern occur within the weathered profile.

Hansmeyer (2009) indicated this area as geotechnical Zone 2B (Figure 5.9) which covers an area of 29.2 ha. This zone has the following characteristics:

ZONE 2B (Figure 5.9)	
AREA (ha)	29.2
NHBRC SITE CLASS	C2, R and P
GEOTECHNICAL CONSTRAINTS	Consolidation and collapse settlement. Occasional boulder excavation. Limited subsurface seepage.
CONSTRUCTION TYPE	Modified normal construction applies. Provide subsurface drainage.

Zone 3 – Site Class: P (Figure 5.9)
Hansmeyer (2009) indicated that an area of approximately 1.1 ha comprises shallow excavations and trenches and demarcated this area as geotechnical Zone 3 (Figure 5.9). This zone has the following characteristics:

ZONE 3 (Figure 5.9)	
AREA (ha)	1.1
NHBRC SITE CLASS	P
GEOTECHNICAL CONSTRAINTS	Excavations subject to ponding during rainy season.
CONSTRUCTION TYPE	No development. Alternatively, rehabilitate and zone as public open space.

Seepage area (Figure 5.9)
In addition to the above-mentioned, Hansmeyer (2009) indicated an area of 14.05 ha susceptible to seepage (Figure 5.9) that drains toward the south-eastern boundary. Sub-surface drainage and cut-off drains would be required within this area.

Detailed information regarding allowable bearing capacity, estimated compressibility, active clays, potential settlement, workability of site materials, can be obtained in the geotechnical report provided in Appendix 11.

5.6 Land use

5.6.1 Zoning of the site

Portion 52 of the farm Rondebosch 403 JS (i.e. the site under consideration; Figure 5.1) is zoned for agricultural use.

The site is located on the outskirts of Middelburg and is utilized for business and residential (accommodation facility for contractors) purposes.

5.6.2 Land ownership

The property on which the proposed development will be located is registered to Ivy Jewel 35 (Pty) Ltd (T11896/2012; Appendix 1).

5.6.3 Servitudes

According to Johan Meiring Land Surveyors (as quoted by Urban Dynamics, 2009), the following servitudes traverse the property:

Notarial Deed of Servitude	SG Diagram No.	Affect on property
No. 1009/1959	A2463/1959	Servitude to convey electricity. The servitude is included in the 25m road reserve of the R104 provincial road and will therefore have no affect on the proposed development. In addition, the powerline is located on the opposite side of the provincial road.

5.6.4 Major existing infrastructure

Figure 5.10 provides an aerial view of the said site whilst Figure 5.11 provides a photographic view of the site, the various buildings and infrastructure present on site.

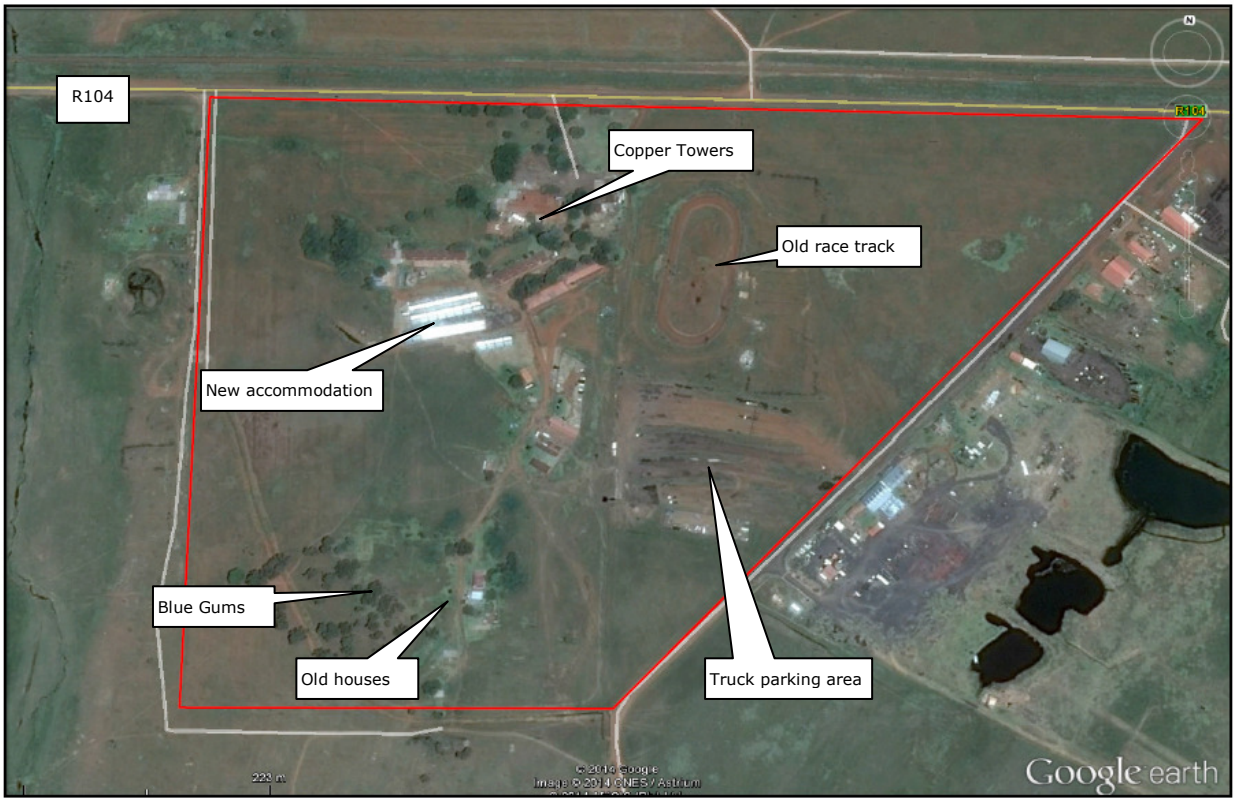


Figure 5.10: Aerial view of site (Google Earth, January 2014)

The tarred R104 provincial road between Middelburg and Belfast is located along the northern boundary of the site (Figure 5.11; Photo 2). A gravel road, which provides access to other portions of the farm Rondebosch 403 JS

(between Nasaret and the R104 provincial road) is located along the eastern boundary of the site (Figure 5.10).

The original Copper Towers establishment is located near the northern boundary of the site (Figure 5.10) and included a ladies bar, sports bar, café, three blocks of flats and three thatched roof houses. These facilities are now used as accommodation for contractors on a short term and longer term basis. Additional wooden structures have been erected on site in order to provide much needed accommodation for contractors. Photos 4, 5, 6, 7, 8 and 9 (Figure 5.11) provide a photographic view of the various types of accommodation facilities provided on site.

The following infrastructure is also present on site:

- an old building utilised as a site office;
- ornamental fountains – no longer in use;
- parking area;
- electric fences;
- Telkom line;
- water tank.

The central and southern portion of the site has also been developed and includes the following:

- Cleared area where trucks are parked (Photo 12; Figure 5.11);
- Enclosed caravan park for contractors;
- Area where chemical toilets are stored (next to caravan park);
- Three rows of rooms (hostel; Photo 7; Figure 5.11);
- Four houses (Photo 16 and 17; Figure 5.11);
- Jojo water tanks (Photo 13; Figure 5.11);
- Eskom powerlines and transformer next to onsite church (Photo 10; Figure 5.11);
- Empty building;
- A number of septic tanks/pits – both old and new (Photo 14 and 15; Figure 5.11) – in various conditions resulting in the pollution of the environment.

A number of cement roads, gravel roads and informal footpaths are present throughout the property as indicated in Figure 5.10 and Figure 5.11.

The eastern portion of the site is fenced off entirely. Access to this portion of the site is obtained from the R104 provincial road via a locked gate and gravel access road. A race track and associated infrastructure is present in this portion of the site (Photo 11; Figure 5.11). In close proximity of the race track, the following infrastructure is also present: Eskom and Telkom lines; two small brick buildings; water tank and gravel road.

A number of old building foundations and excavations are present in the central, southern and eastern portions of the site as indicated in Figure 5.9.

Photo 1: Main entrance and access road to site.

Photo 2: Main access road to site from the provincial road.

Photo 3: The entrance and the old Copper Towers sign

Photo 4: A view of the old rooms of the Copper Towers hotel.

Photo 5: Another view of the old rooms of Copper Towers.

Photo 6: The new wooden structures

Photo 7: Another view of the new structures

Photo 8: Old buildings on site now used for accommodation

Photo 9: A mixture of structures used for accommodation

Photo 10: The church on site

Photo 11: A view of the old race track

Photo 12: A view of the truck parking area

Photo 13: The JoJo tanks storing water onsite.

Photo 14: View of one of the old septic tanks on site.

Photo 15: One of the new septic tanks on site.

Photo 16: The house close to the trench dug to indicate the boundary of the site.

Figure 5.11:

Photographic view of site

Photo 17: A view of the other houses on site.

Three boreholes are present on site. However, only two of the boreholes are equipped. One of the boreholes is located in the north western corner of the site, the second one in the central portion and the third one near the race track (Figure 5.9). The boreholes are used to obtain water for domestic purposes. Water is regularly carted to site from an outside source, indicating that the water supply is not sufficient.

A number of Eskom powerlines and transformers as well as two Telkom lines are present in the northern, central and eastern portions of the site. Eskom powerlines are also present on the adjacent properties along the northern and western boundaries.

5.6.5 Surrounding land uses

The central business district (CBD) of Middelburg is located approximately 4km west of the site (Figure 5.1).

The residential area, Nasaret, is located about 1.5 km south of the proposed new development and Middelburg X22 is located towards the west (Figure 5.1). Middelburg's main industrial area (with industries such as Columbus Stainless (Pty) Ltd.) is located south west of the site (Figure 5.12).

The R104 provincial road between Middelburg and Belfast forms the northern boundary of the site and a gravel road that provides access to the surrounding smallholdings forms the eastern boundary (Figure 5.12). A Spoornet railway line and Eskom powerlines are present on the opposite side of the R104 provincial road, north of the site (Figure 5.12).

The properties located north, east, west and south of the site are all still zoned agricultural although they are utilized for agriculture, residential and/or light industrial purposes as indicated in Figure 5.12.

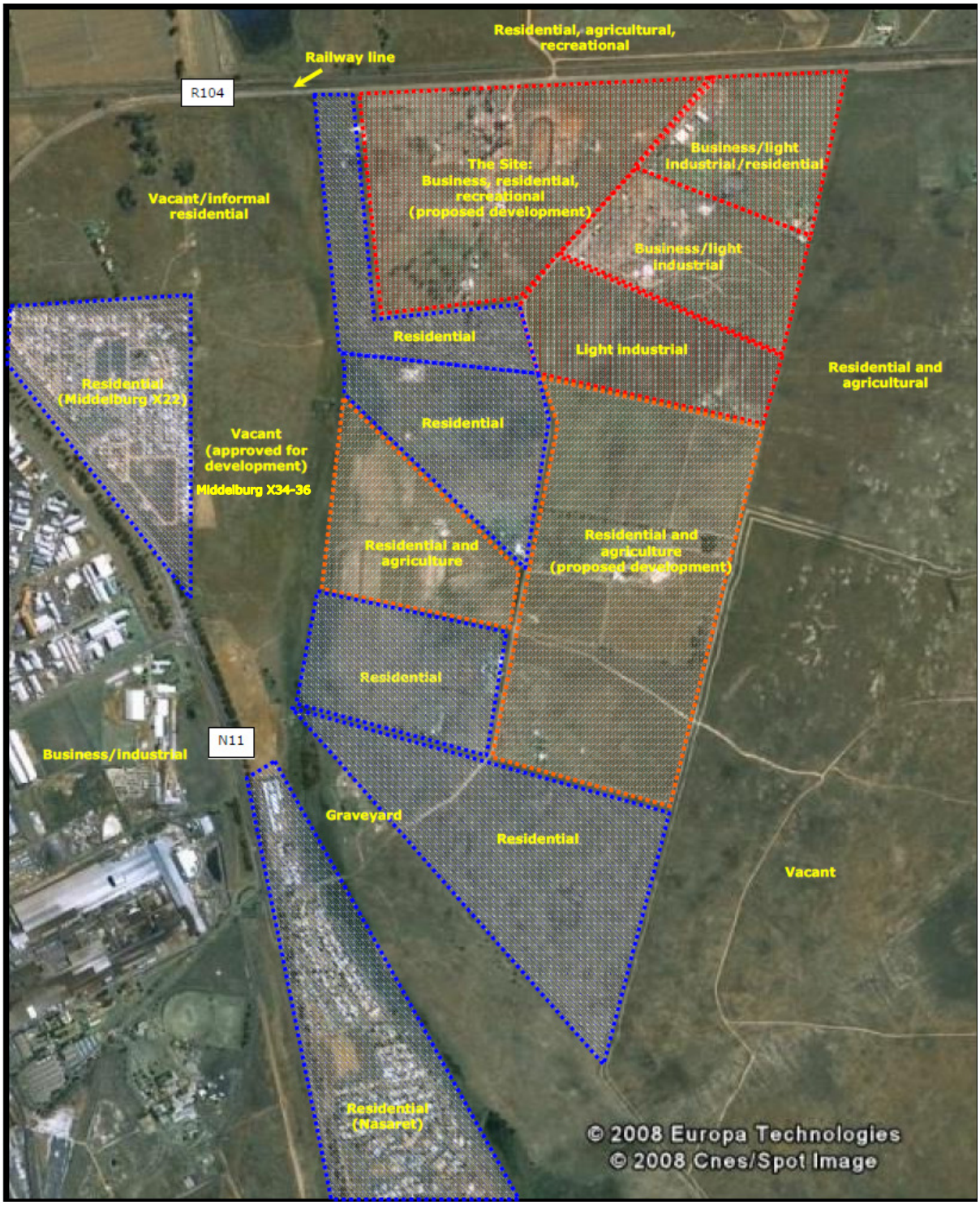


Figure 5.12: Surrounding land uses

5.7 Natural vegetation

5.7.1 General vegetation description

According to the 'The vegetation of South Africa, Lesotho and Swaziland', the study area falls within the Mesic Highveld Grassland Bioregion, specifically the Rand Highveld Grassland (veld type Gm11; Figure 5.11) (Mucina & Rutherford, 2006). The vegetation type was previously referred to by Low and Rebelo (1998) as Moist Sandy Highveld Grassland (38) and Rocky Highveld Grassland (34) and by Acocks (1953) as Bankenveld (61).

This grassland is found at an altitude of 1 300 metres above mean sea level (mamsl) to 1 635 mamsl in areas between rocky ridges from Pretoria to Emalahleni (Witbank). It also extends onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugersdorp.

This vegetation type is species-rich and comprises wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. The most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus*. A high diversity of herbs, many of which belong to the *Asteraceae* family, is also a typical feature. Rocky hills and ridges carry sparse woodlands with *Protea caffra* subsp. *caffra, Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Rhus* is most prominent.

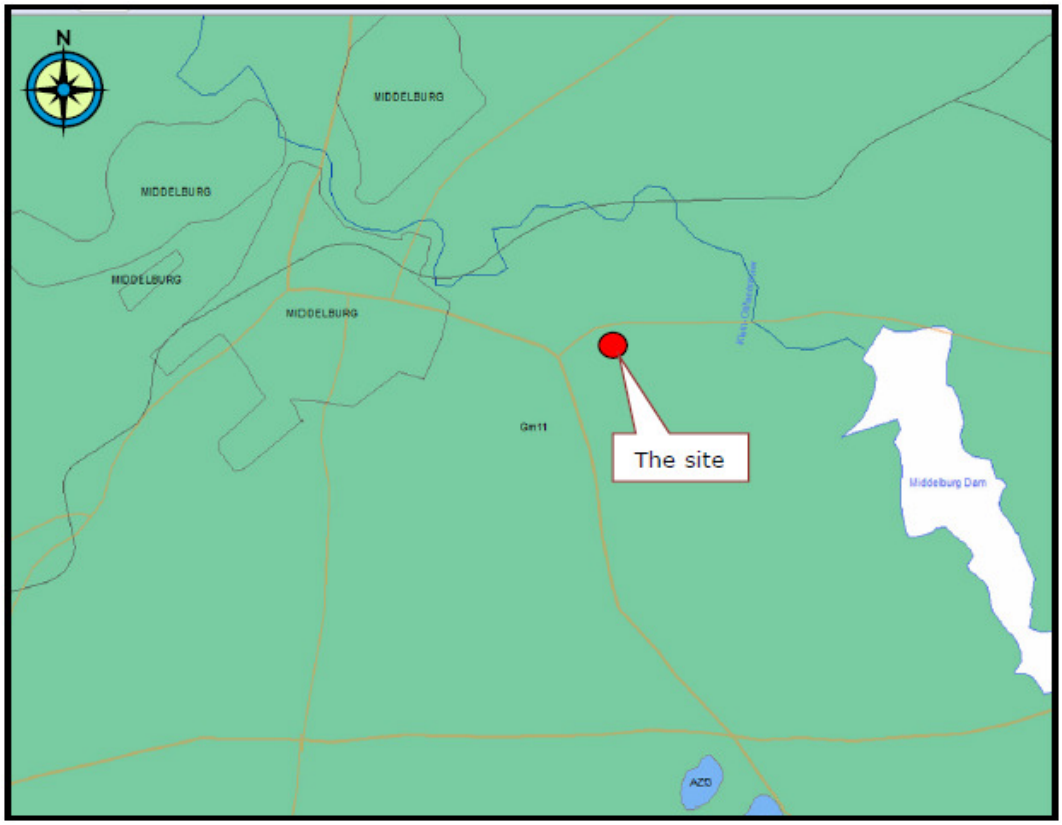


Figure 5.13: Vegetation type of the proposed site (taken from Mucina and Rutherford, 2006)

Almost half of the Rand Highveld Grassland has already been transformed by cultivation, urbanisation, plantations and dams. This vegetation type has

been afforded the status of endangered with a conservation target of 24%. Only approximately 1% of this vegetation type is currently conserved.

The said site overlaps with a listed Threatened Ecosystem, namely Rand Highveld Grassland (GM11), according to the 2011 Schedule (Government Gazette of December 2011) of the Biodiversity Act (Act 10 of 2004). This Threatened Ecosystem is categorised in the said Schedule as Vulnerable.

The said project area does not fall within a phyto centre or phyto region of endemism according to the Mpumalanga Biobase (Emery et al., 2002).

According to the Mpumalanga Biodiversity Conservation Plan (C-Plan; Figure 5.14a), the said site falls within a 'Critical Biodiversity Area' (CBA).

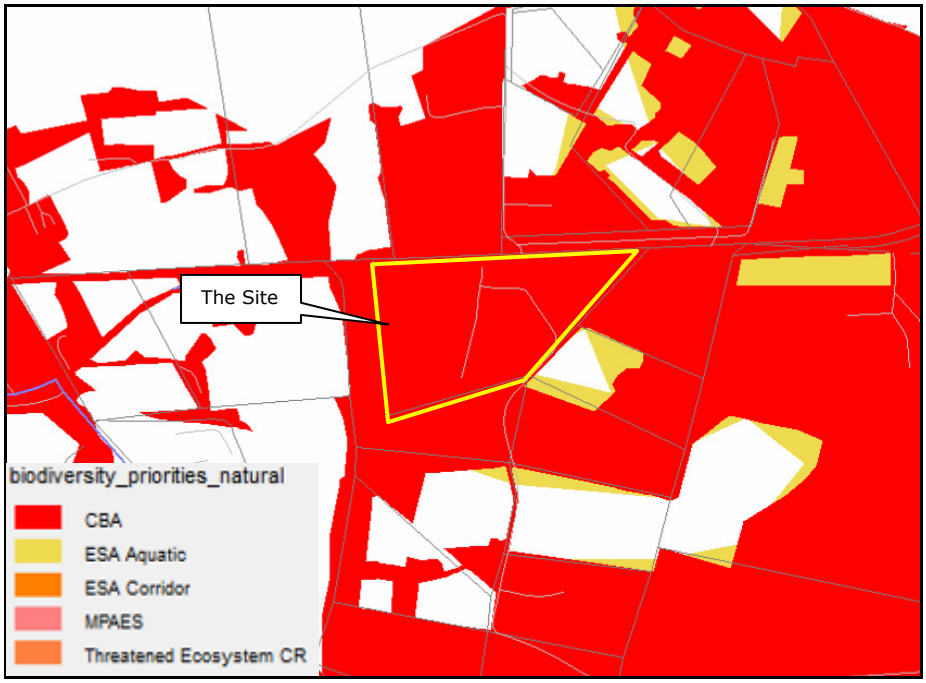


Figure 5.14a: Terrestrial biodiversity assessment (taken from the Mpumalanga Biodiversity Conservation Plan, 2006)

Over the last few years (2007 – 2013), the Mpumalanga Tourism and Parks Agency reviewed and updated the Mpumalanga Biodiversity Conservation Plan (2006) in order to align the spatial data with the bioregional plan requirements of the South African National Biodiversity Institute (SANBI) and surrounding provinces. The main mapping categories used in the MBSP (in descending order of importance in terms of meeting conservation targets), are:

- Protected Areas;
- Critical Biodiversity Areas (Irreplaceable and Optimal);
- Ecological Support Areas;
- Other Natural Areas;
- Modified (Heavily Modified and Moderately Modified-old lands).

According to the updated plan (now referred to as the Mpumalanga Biodiversity Sector Plan (MBSP, 2013)), the majority of the site falls within the category – **Moderately modified (old land)** (Figure 5.14b) and **Heavily modified** (Figure 5.14b). A portion of the southern area is indicated as **Other Natural Areas** (Figure 5.14b) that links up with the nearby stream

area. A small narrow strip along the northern boundary is indicated as CBA (Critical Biodiversity Area) Irreplaceable (Figure 5.14b).

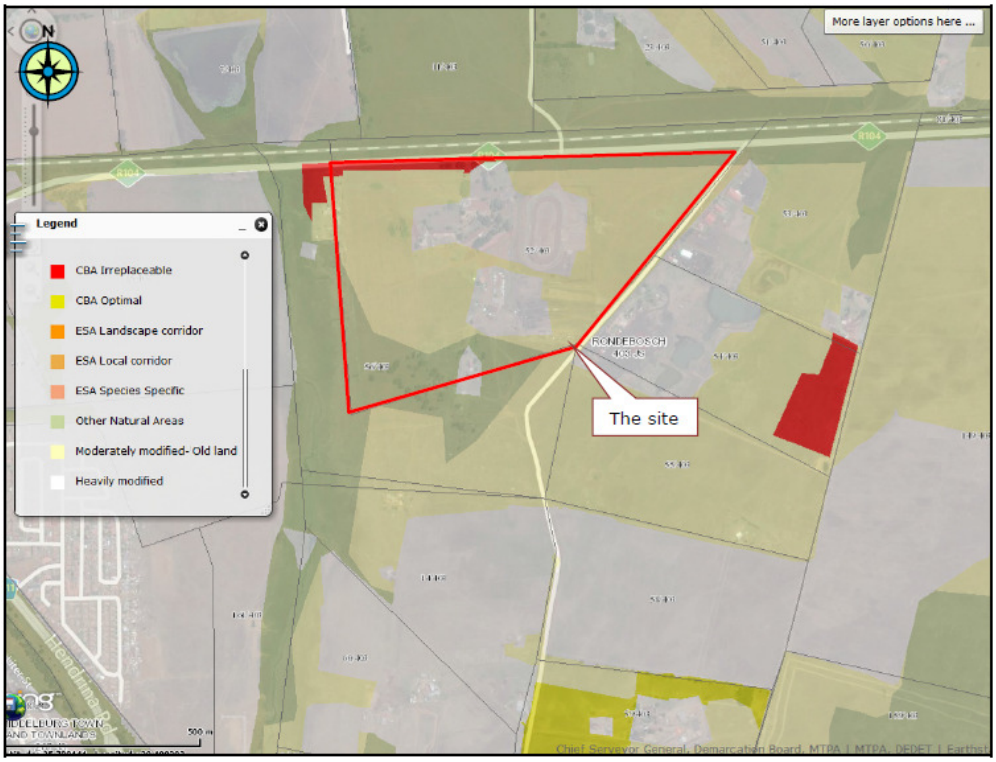


Figure 5.14b: Terrestrial biodiversity assessment (taken from the Mpumalanga Biodiversity Sector Plan, 2013)

The vegetation on site comprises of natural grassland, which has been impacted upon by past agricultural activities, grazing, the construction of the infrastructure as indicated in Section 5.6.4 of this report and the human activities taking place on site. Figure 5.10 provides an aerial view of the site and the remaining vegetation.

In the northern portion of the site, much of the vegetation has been removed for the construction of the buildings, parking areas and access roads. The portion of remaining natural vegetation (dominated by Common Thatching Grass - *Hyparrhenia hirta*) near Copper Towers is slashed on a regular basis.

Many ornamental plants (indigenous and exotic) have been planted in the garden, along the access road and amongst the rows of rooms/flats. A row of mature Pine trees are present along the central portion of the northern boundary acting as a visual barrier between the site and the R104 provincial road. Plant species noted in this portion of the site include:

- Jacaranda trees;
- Palm trees;
- Poplar trees;
- Pine trees;
- Blue Gum trees;
- Syringa trees;
- Pearl Acacia;
- Wattle trees;
- Current tree;
- Oak trees;
- Aloes;
- Irises;
- Kikuyu.

The vegetation in the central portion of the site and near the southern boundary has been heavily impacted upon by the construction of buildings,

excavations, domestic waste and sewage outflow. Large areas of vegetation have been cleared for gravel roads and parking areas (Figure 5.10).

A clump of Blue Gum trees is present in the south western portion of the site (Figure 5.10). The Blue Gum trees are growing in and around the old foundations and excavation. Other exotic trees present around the hostel and houses include Pine trees and Weeping Willow. The most dominant grass species in the disturbed areas (i.e. houses, excavations, waste dump, sewage trenches, etc.) is kikuyu.

Some natural grassland occurs in the western portion of the site. Species identified include:

- *Hyparrhenia hirta* (Common Thatching Grass);
- *Hyparrhenia tamba* (Blue Thatching Grass);
- *Cymbopogon* sp (Turpentine Grass);
- *Eragrostis* spp;
- *Ledebouria ovatifolia* (Jessop);
- *Gazania krebsiana* (Botterblom);
- *Helichrysum caespititium* (Speelwonderboon).

As indicated in Section 5.6.4, the eastern portion of the site is entirely fenced off. Some natural grassland also occurs in this portion of the site (Figure 5.10). The vegetation has however, been impacted upon by the construction of the race track and associated infrastructure, a large excavation, gravel roads and past agricultural activities. A large portion of grassland was cut and cleared in and around the race track.

No trees are present in this area. Khaki weed, Kikuyu grass and Scottish thistle were noted in and adjacent to the excavation.

Wetland Consulting Services (2009) indicated that a wetland was present in the south eastern portion of the site. This area has subsequently been used for a truck parking area (Figure 5.10) and the vegetation removed.

A number of bulbous plants (*Boophone disticha*) were noted south of the excavation near the eastern boundary of the site. Although not on the endangered list, this plant species has to be protected according to Provincial Ordinances.

In summary, the vegetation of the proposed site has been heavily impacted upon with large areas totally cleared of vegetation. Only a small portion of natural grassland is present in the eastern and western portions of the site as indicated in the aerial view (Figure 5.10).

5.7.2 Endangered or rare species

The said site is located within the following quarter degree square: 2529DC.

The following Red Data plant species are recorded on the PRECIS Database of the South African National Biodiversity Institute for the quarter degree square 2529DC and could therefore possibly occur on site:

- *Anacampseros subnuda subsp. lubbersii* – Vulnerable

The status definition of Vulnerable means that the best available evidence indicates that the taxon meets any of the five IUCN criteria for Vulnerable and therefore faces a high risk of extinction in the wild.

Anacampseros subnuda ssp. lubbersii is a small plant with clumping rosettes of succulent leaves. It has been found in the area a few kilometers east of Middelburg. Potentially suitable habitat (namely rocky places) for this plant species does not occur within the study area.

5.7.3 Protected plant species and plants with medicinal value

According to Provincial Ordinances, a number of plant species are protected in Mpumalanga Province, whether they are considered to be threatened or not. This includes, but is not limited to, the following common names: ferns, flame lilies, christmas bells, pineapple flowers, clivia, nerine, crinum, ground lily, fire lily, irises, all orchids.

In addition, a number of plants have medicinal and/or cultural value and need to be removed before construction commences.

The only protected plant species noted on site was the conspicuous Poison Bulb (*Boophone disticha*).

5.7.4 Invader or exotic species

Table 5.5 provides an indication of the declared weeds and alien invasive species noted on site and listed in the Conservation of Agricultural Resources Act (Act 43 of 1983) and Schedule 13 of the Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998).

Table 5.5: Declared weeds and alien invasive plant species

Latin name	Common name	Category
Acacia podalynifolia	Pearl Acacia	Declared invader – Category 1
Acacia mearnsii	Black wattle	Declared invader – Category 2
Cirsium vulgare	Scottish thistle	Declared weed – Category 1
Eucalyptus sp.	Blue Gum	Declared invader – Category 2
Jacaranda mimosifolia	Jacaranda	Declared invader – Category 3
Melia azedarach	Seringa	Declared invader – Category 3
Pennisetum clandestinum	Kikuyu	Proposed declared invader – Category 3
Pinus pinaster	Pine	Declared invader – Category 2
Populus sp.	Poplar	Declared invader - Category 2
Quercus sp.	Oak	Declared invader - Category 3

- ***Category 1:*** *Prohibited and must be controlled.*
- ***Category 2:*** *(commercially used plants) – May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.*
- ***Category 3:*** *(ornamentally used plants). May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, except within the floodline of watercourse/wetlands.*

5.8 Animal life

As indicated in Section 5.7 of this report, the site has been impacted upon by human activity (e.g. buildings, roads, infrastructure, waste, sewage, etc.), which resulted in the disturbance of the vegetation and therefore animal life and animal habitats on site. In addition, the constant human movement on site and in the surrounding area as well as the close proximity of domestic animals such as dogs and cats would deter especially larger animals from inhabiting the site. However, it is expected that smaller animal species (e.g. rodents), birds, reptiles and amphibian species would be found on site, especially in the areas where natural grassland is still present (Figure 5.10).

Previously, grey duiker, scrub hare droppings and mole heaps were noted on site, which indicates that the site is utilized by smaller animal species. Although there are termite mounds on site, no activity from termite eating animals (e.g. aardvark and aardwolf) was noted.

The surrounding area could provide habitat for animal species however, the vegetation on the adjacent properties has also been heavily impacted upon. Businesses are operated from at least two of the properties (Figure 5.12). The properties further east of the site and closer to the Middelburg dam (Figure 5.12) are more likely to provide suitable habitat for various species.

Although no endangered or rare species were noted on site, it does not exclude the possibility that Red Data fauna species may occur on site. This is however, highly unlikely.

5.9 Surface water

The proposed site is located within the Olifants Water Management Area (WMA) and more specifically the B12D quaternary sub-catchment (Figure 5.15). According to Middleton and Bailey (2008), this catchment has a Moderate conservation state and a Largely Modified (Class D) Present Ecological State (PES).

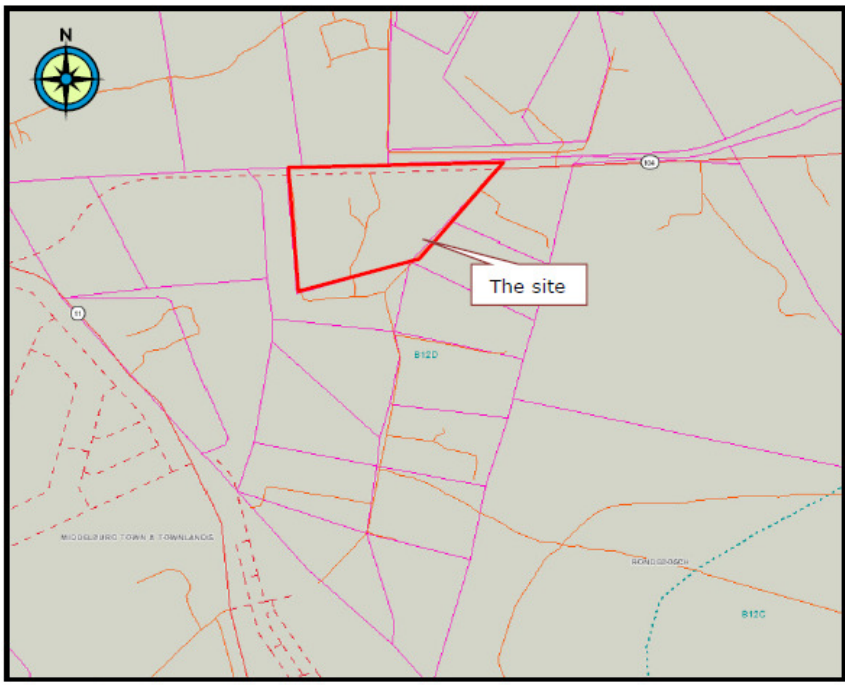


Figure 5.15: Quaternary catchment (taken from Department of Agriculture, Forestry and Fisheries)

No surface water environments (e.g. rivers, streams, dams, etc.) are located on site.

The nearest surface water environment is a non-perennial tributary of the Klein Olifants River, which is located ±100m west of the development site (Figure 5.1). A private property (Portion 56) is located between the site and the stream (Figure 5.12). A drainage area is located ±200m east of the site.

A north-north-east trending watershed is located in approximately the centre of the site. Surface water runoff therefore flows in an easterly and westerly direction towards the gravel road/drainage area and the tributary of the Klein Olifants River (Figure 5.1).

Hansmeyer (2009) indicated that the site drains to the north, west and east at a relatively shallow gradient.

Wetlands

Wetland Consulting Services (2009) indicated that a wetland was present in the south eastern portion of the site. This area has subsequently been used as a truck parking area (Figure 5.10).

A wetland assessment and delineation study was undertaken by Mr. R. Grobler of Imperata Consulting (referred to as Grobler, 2015). A copy of the report is provided in Appendix 13. For a description of the methodology used, please refer to Appendix 13.

According to the Mpumalanga Biodiversity Sector Plan (MBSP, 2013), the majority of the site falls within the category **'Other Natural Areas'** in terms of the freshwater assessment (Figure 5.16). It should be noted that the MBSP freshwater assessment includes information obtained from the National Freshwater Ecosystem Priority Areas (NFEPA) and threatened freshwater ecosystems databases (National Biodiversity Assessment, 2011).

No Critical Biodiversity Areas (CBA's) for aquatic species or Ecological Support Areas (ESA's) for fish or important wetlands/wetland clusters are present on site (Figure 5.16).

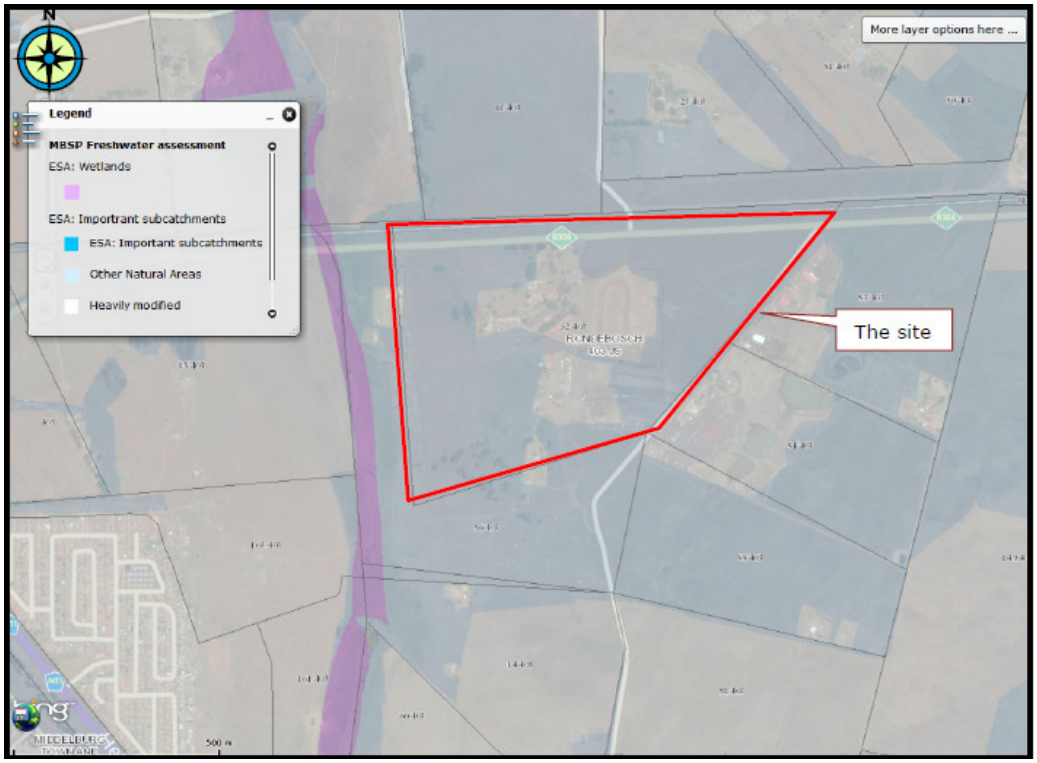


Figure 5.16: Mpumalanga Biodiversity Sector Plan freshwater assessment (taken from MBSP, 2013)

The nearby drainage line/tributary of the Klein Olifants River is indicated as an Ecological Support Area (ESA; Figure 5.16) in terms of the wetlands associated with it.

The study area does not overlap with wetland habitat indicated on the National Freshwater Ecosystem Priority Area (NFEPA) spatial dataset nor with the Mpumalanga Highveld data set.

Wetlands within the development site:
Grobler (2015) created a Topographical Wetness Index Model in order to determine potential areas with an increase in soil moisture conditions within the development site and immediate surrounding area. This information was verified during the site visits conducted.

No natural wetland habitat or other natural watercourses were identified within the development site based on available indicators.

Grobler (2015) did not verify the hillslope seepage wetland delineated by Wetland Consulting (2009) in the south-eastern portion of the study area. This area was found to be associated with shallow soil development that lacked the presence of diagnostic hydromorphic features (such as mottling, gleying and localised iron depletion) and distinct hydrophyte plant species. *In other words, the hillslope seepage wetland area delineated by Wetland Consulting (2009) is not regarded as a wetland. It is a terrestrial area that lacks sufficient wetland indicators.*

A small man-made excavation (Figure 5.17) present within the development site was initially identified as small pan as it contained water in January but was found to be dry during the February site visit. Grobler (2015) indicated that the hydrophyte, *Panicum* cf. *repens*, was recorded within this excavation. The presence of this plant species is as a result of the artificially created wetness conditions as seen during the January site visit.

Diagnostic hydromorphic features and topsoil development that would be associated with a natural pan were absent, but signs of an old excavation were present. This feature is therefore not regarded as a pan watercourse but as a small excavation.

An abandoned quarry that remained dry during both surveys was identified and delineated in the north-eastern portion of the property (Figure 5.17). It lacked wetland features and surface ponding, and is therefore not regarded as a watercourse (Grobler, 2015).

Wetlands within 500m of the development site:
Two wetlands were identified within 500m of the proposed development site namely:

- Channelled valley bottom wetland;
- Unchannelled valley bottom wetland.

Figure 5.17 provides an indication of the location of the said wetlands.

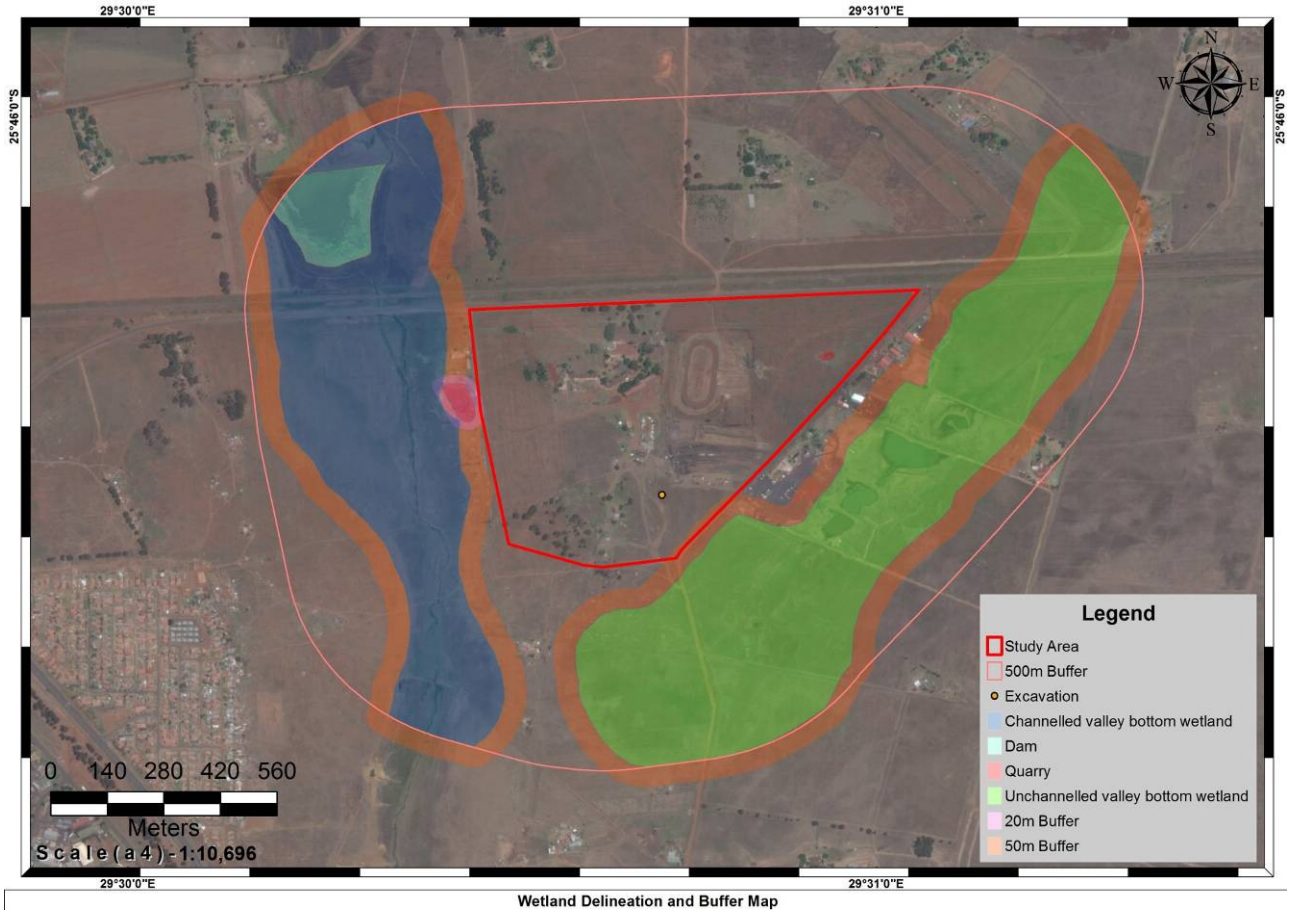


Figure 5.17: Delineated wetlands and watercourses (taken from Grobler, 2015)

Channelled valley bottom wetland (Figure 5.17)

The channelled valley bottom wetland (with seepage components) is located to the west of the development site and flows from south to west. The said wetland covers an area of approximately 38.93 ha within the 500m buffer around the development site. The wetland however extends both in an upstream and downstream direction beyond the 500m buffer.

The Present Ecological State (PES) of this wetland is regarded as 'Moderately modified' (Class C) (i.e. a moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact). Impacts include channel straightening, a linear scar as a result of a pipeline construction through the wetland, probable grazing, old lands, a road (R104 provincial road) crossing, a large dam near its downstream end and an old quarry along its eastern border that contains surface water. Upstream catchment impacts include localised nodes of urbanisation that encroaches into the wetland. Further catchment transformations through urbanisation and development within the wetland itself are the main threats to the ecological integrity of the overall wetland system.

The said wetland overlaps with a listed Threatened Ecosystem, namely Rand Highveld Grassland (GM11), according to the 2011 Schedule (Government Gazette of December 2011) of the Biodiversity Act (Act 10 of 2004). This Threatened Ecosystem is categorised in the said Schedule as Vulnerable.

A very small portion of this wetland (approximately 0.5 ha or 1.3% of the wetland) overlaps with an Irreplaceable Critical Biodiversity Area (November 2013 MBSP data set) immediately upstream of the R104 provincial road crossing.

According to Grobler (2015), the Ecological Importance and Sensitivity (EIS) of this wetland was calculated as High-moderate (Class B/C).

Unchannelled valley bottom wetland (Figure 5.17)
The unchannelled valley bottom wetland originates just south of the development site and flows in a north-eastern direction. The said wetland covers an area of approximately 54.41 ha within the 500m buffer around the development site. The wetland extends in a downstream direction beyond the 500m buffer.

The Present Ecological State (PES) of this wetland is regarded as 'Moderately modified' (Class C) (i.e. a moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact). Within this system, several dams, infrastructure (e.g. R104 provincial road crossing) and alien plant species are present. The ecological integrity of this wetland system is threatened by further encroachment of infrastructure and alien plant species.

The said wetland overlaps with a listed Threatened Ecosystem, namely Rand Highveld Grassland (GM11), according to the 2011 Schedule (Government Gazette of December 2011) of the Biodiversity Act (Act 10 of 2004). This Threatened Ecosystem is categorised in the said Schedule as Vulnerable.

According to Grobler (2015), the Ecological Importance and Sensitivity (EIS) of this wetland was calculated as High-moderate (Class B/C).

Grobler (2015) concluded that no wetland area or other watercourse type (as defined by the National Water Act, 1998 (Act 36 of 1998) overlaps with the development site. The proposed development of the site thus has a low-negligible risk of impacting on wetlands and other watercourses.

5.10 Groundwater

5.10.1 Perched water table

The presence of ferricrete on site indicates a possible perched water table. Ferricrete is usually also associated with the presence of wetlands.

As indicated in Section 5.9, Grobler (2015) did not verify the hillslope seepage wetland delineated by Wetland Consulting (2009) in the south-eastern portion of the study area. This area was found to be associated with shallow soil development that lacked the presence of diagnostic hydromorphic features (such as mottling, gleying and localised iron depletion) and distinct hydrophyte plant species. *In other words, the hillslope seepage wetland area delineated by Wetland Consulting (2009) is not regarded as a wetland. It is a terrestrial area that lacks sufficient wetland indicators.*

Grobler (2015) concluded that no wetland area or other watercourse type (as defined by the National Water Act, 1998 (Act 36 of 1998)) overlaps with the development site. The proposed development of the site thus has a low-negligible risk of impacting on wetlands and other watercourses.

5.10.2 Seepage

Hansmeyer (2009) indicated that some 14ha of the central portion of the site is underlain by Loskop shale (Figure 5.2). Two small sections (referred to as 'future seepage') where well developed pedocrete was recorded is subject to seepage (pedocrete is associated with a seasonal perched water table which in this case varies between 0.4m and 1.0m below surface, Figure 5.9).

According to Hansmeyer (2009), the local NNE trending watershed and the dip of the bedrock (which conform to the topography of the site) ensure that both the surface run-off and deeper seepage drain towards the eastern and western boundaries.

Hansmeyer (2009) indicated that sewerage disposal was by means of two (and most probably more) French drain systems which were blocked and overflowing, causing raw sewerage to pond on surface (Figure 5.9). Hansmeyer (2009) indicated that as the motel had been constructed in the 1970's, the disposal of sewerage had been ongoing for at least 30 years, most probably contributing to the seepage recorded on site.

5.10.3 Hydraulic conductivity

The following hydraulic conductivity parameters (as estimated from the soil classifications on site) were indicated by Hansmeyer (2009):

SOIL CLASSIFICATION	HYDRAULIC CONDUCTIVITY
Colluvium, diabase residuum	1×10^{-4} to 1×10^{-6} cm/s to 1×10^{-9} cm/s
Shale residuum	1×10^{-6} to 1×10^{-8} cm/s
Weathered shale, tillite and diabase	1×10^{-5} to 1×10^{-7} cm/s

Hansmeyer (2009) indicated the risk of groundwater contamination as high in view of the following:

- Land usage included potentially hazardous operations such as boat service station and old fuel tanks;
- Raw sewerage ponding near the blocked French drains.

According to Hansmeyer (2009), the relatively impermeable clay and shallow shale bedrock should restrict downward percolation of contaminants into the groundwater. However, the disposal of sewerage has been ongoing for at least three decades and with the most recent influx of people has most probably compounded the contamination threat. As such, Hansmeyer (2009) indicated that the sewerage disposal method was a serious health threat that required urgent attention. Hansmeyer (2009) further indicated that if septic tanks and French drains are to be installed then appropriate percolation and permeability tests should be undertaken.

5.10.4 Boreholes

Hansmeyer (2009) indicated three boreholes present on site (Figure 5.9). Boreholes 1 and 2 (BH1 & BH2; Figure 5.9) pumped water to the two elevated reservoirs near the old compound and caravan park. According to Hansmeyer (2009), Borehole 3 (BH3) was dry and the pump had been removed.

Hansmeyer (2009) indicated that domestic water was carted to the caravan park's residents on a daily basis and that it was obvious that the boreholes

were unable to provide the Tower Motel community with a constant supply of domestic water.

A water supply potential assessment of two boreholes located on the site was undertaken by Geo Pollution Technologies Gauteng (Pty) Ltd (referred to as Gouws, 2014). A copy of the said report is provided in Appendix 12. The said report should be consulted with regards to the methodology used.

Borehole RDBM1 (referred to as BH1 in Figure 5.9) is currently in use as the water supply borehole on the property while Borehole RDBM2 (referred to as BH2 in Figure 5.9) is an open hole not fitted with any pump or pipes.

Figure 5.18: View of Borehole RDBM1 (taken from Gouws, 2014)

Both boreholes were subjected to step testing and constant discharge aquifer tests in order to gain the sustainable yield information. Table 5.6 provides a summary of the pumping test results.

Table 5.6: Pump test results of Borehole RDBM1 and Borehole RDBM2 (taken from Gouws, 2014).

BOREHOLE NUMBER	RDBM1	RDBM2
BOREHOLE DEPTH (m)	29.86	130
STEP TEST STEPS	2	3
CONSTANT RATE DISCHARGE (L/s)	1.2	0.21
STARTING WATER LEVEL (meters below ground level)	8.83	5.75
FINAL DRAW DOWN (m)	9.84	18.66

Borehole RDBM1 recovered 100% drawdown in 90 minutes while RDBM2 recovered 97% of the drawdown in 12 hours.

According to Gouws (2014), the transmissivity of Borehole RDBM1 was estimated at 10m^2/day and Borehole RDBM2 was estimated at 3.1m^2/day.

Table 5.7 provides a summary of the total volume of water that could potentially be abstracted from the two boreholes.

Table 5.7: Sustainable yields and recommended abstraction (taken from Gouws, 2014).

BOREHOLE NUMBER	SUSTAINABLE YIELD (L/s)	DEVIATION	RECOMMENDED ABSTRACTION (L/hr)
RDBM1	0.8	0.34	2875
RDBM2	0.34	0.46	1208
TOTAL	**1.14**	**0.80**	**4083**

The sustainable yield of Borehole RDBM1 was estimated as 0.80 L/s and at 0.34 L/s for Borehole RDBM2. As indicated in Table 5.7, a volume of 4083 L/hr could be abstracted from the two boreholes bearing the standard deviation in mind.

Table 5.8 indicates the rate at which the boreholes could be pumped if only pumped for 8 hours a day.

Table 5.8: Abstraction rates for 8 hrs per day (taken from Gouws, 2014).

BOREHOLE NUMBER	RECOMMENDED ABSTRACTION RATE FOR 24HR PUMPING (L/h)	ABSTRACTION RATE FOR 8HR PUMPING PER DAY (L/s)	AMOUNT OF WATER ALLOWED TO BE ABSTRACTED PER MONTH (m^3)
RDBM1	0.8	1.39	2073.6
RDBM2	0.34	0.59	881.2
TOTAL	**1.14**	**1.98**	**2954.8**

As indicated in Table 5.8, the maximum amount of water that can be abstracted is 2 954 800 litres per month.

Table 5.9 provides the recommended abstraction rates for both boreholes.

Table 5.9: Abstraction rates per day (taken from Gouws, 2014).

BOREHOLE NUMBER	RDBM1	RDBM2	TOTAL
ABSTRACTION RATE FOR 8HR PUMPING PER DAY (L/s)	1.39	0.59	**1.98**
RECOMMENDED ABSTRACTION FOR 8HR PUMPING PER DAY (L/hr)	5004	2124	**7128**
NUMBER OF PEOPLE SUPPORTED BASED ON 15L/HEAD/DAY	2765	1175	**3940**
AMOUNT OF WATER ALLOWED TO BE ABSTRACTED PER DAY (m^3)	69	29	**98**
AMOUNT OF WATER ALLOWED TO BE ABSTRACTED PER MONTH (m^3)	2073.6	881.2	**2955**

Based on the basic human need of 25 liters per day per person, RDBM1 can supply the basic human need of 2765 people per day while RDBM2 can supply the basic human need of 1175 people per day. This adds up to a total number of 3940 people that the two boreholes can support per day.

The maximum amount of water that can be abstracted per day using Borehole RDBM1 is 69m^3 (69000 L/day) and 29m^3 (29000 L/day) using Borehole RDBM2. This gives a total of 98m^3 or 98000l/day for the two boreholes on the property (Table 5.10).

The estimated sustainable yields for Borehole RDBM1 was indicated at 0.85L/s (2875 L/hr) and 0.34 L/s (1208 L/hr) for Borehole RDBM2. According to Gouws (2014), it is recommended that the discharge during pumping does not exceed 0.80 L/s for Borehole RDBM1 and 0.34 L/s for Borehole RDBM2. Further, it is recommended that pumping only be conducted at 8 hour intervals with 16 hour rest intervals to allow for borehole recovery.

Gouws (2014) recommended that the groundwater quality be tested in view of the fact that the water would be used for human consumption.

5.11 Air quality

The air quality of the site is predominately governed by the various industrial (e.g. power stations, etc.) and mining activities in the Middelburg area.

The air quality of the site is also impacted upon by the following:

- Dust created by the vehicles (especially trucks) utilizing the gravel access road located along the eastern boundary of the site as well as the internal access roads;
- Dust created by windy conditions due to the large areas not vegetated;
- Smoke emitted from veld fires;
- Smoke emitted from cooking fires at the nearby residential areas;
- Dust from agricultural activities taking place in the surrounding area;
- Emissions from the nearby industrial area;
- Odours as a result of sewage spillage on site.

5.12 Noise

The major contributing factor to the ambient noise level of the site would be as a result of:

- Residential activities of Middelburg X22;
- Activities associated with the accommodation facility operating on site;
- Trains utilizing the nearby railway line;
- Business/light industrial activities taking place on the smallholdings located east of the site;
- Traffic using the adjacent R104 provincial road and gravel access road.

5.13 Sites of archaeological and cultural interest

5.13.1 Archaeology and cultural sensitivity

A Phase I Heritage Impact Assessment (HIA) as required in terms of Section 38 of the National Heritage Resources Act (Act 25 of 1999) was undertaken by Dr. A. van Vollenhoven, an accredited archaeologist. A copy of the report is provided in Appendix 14. For a description of the methodology used as well as an explanation of terminology used, please refer to Appendix 14.

Three sites of cultural heritage significance were located within the development site namely:

- Site 1 – building ruins;
- Site 2 – farm house and outbuildings;
- Site 3 – The Tower Hotel.

All three sites date to the Historical Age, also known as the Colonial era or the recent past. Figure 5.19 provides the location of the three sites identified within the development site.

Figure 5.19: Location of sites of cultural heritage significance identified (taken from van Vollenhoven, 2015).

Site 1 – building ruins (Figure 5.19)

Site 1 consists of the remains of different buildings located close to the blue gum bush (Figure 5.20). It consists of at least two foundations, one of which may have been a house. The first structure is about 20 x 15m and the second about 30 x 8m. Only a low brick wall remains.

Figure 5.20: Foundations of two buildings (Site 1) (taken from van Vollenhoven, 2015)

The site is regarded as having a Low cultural significance. Based on the type of bricks used, it was most likely built during the 1960's. It is therefore less than 60 years in age and is in a ruined state. The field rating thereof is General Protection. Grade C (IVC). According to van Vollenhoven (2015), the site may be demolished. No further action is required.

Site 2 – farm house and outbuildings (Figure 5.19)
Site 2 is a farm house and outbuildings which most likely dates to the 1920's (Figure 5.21). It is therefore older than 60 years. The buildings have however been changed to a very large extent and therefore not much of the original fabric is left.

Figure 5.21: Farm house and outbuildings (Site 2) (taken from van Vollenhoven, 2015)

The site is regarded as having a Low cultural significance. Although it is older than 60 years in age, it is not unique and has been changed to a large extent (e.g. new doors and windows). The field rating thereof is General Protection Grade C (IVC). According to van Vollenhoven (2015), the site may be demolished. No further action is required.

Site 3 – The Tower Hotel (Figure 5.19)
Site 3 comprises the Tower Hotel which consists of a number of different buildings from different ages. The main building and older rooms (Figure 5.22) appears to date to ca. 1960. However, many changes were made especially during the 1970's. Other buildings (Figure 5.23) are much younger.

Figure 5.22: Main building of the Towers Hotel (Site 3) (taken from van Vollenhoven, 2015)

Figure 5.23: Other buildings (Site 3) (taken from van Vollenhoven, 2015)

The site is regarded as having a Low cultural significance. It is less than 60 years in age and has been changed over the years. The field rating thereof is General Protection Grade C (IVC). According to van Vollenhoven (2015), the site may be demolished. No further action is required.

No graves were noted on the said site (Van Vollenhoven, 2015). In the scoping report mention was made of a small informal graveyard (with possibly three (3) un-marked graves) located on the southern boundary of the site on Portion 56 (i.e. not on the proposed development site). Hansmeyer (2009) also indicated the presence of graves on the said site (Figure 5.9).

Van Vollenhoven (2015) identified no graves within the said area. However, it was indicated that the remains of many old houses were visible that could have been mistaken for graves.

5.13.2 Palaeontological sensitivity

According to the palaeontological map supplied by the South African Heritage Resources Agency (SAHRA, 2014), a desktop palaeontological study is required for the said site (Figure 5.24; legend: green for site). The palaeontological sensitivity is deemed to be moderate as indicated in Figure 5.24.

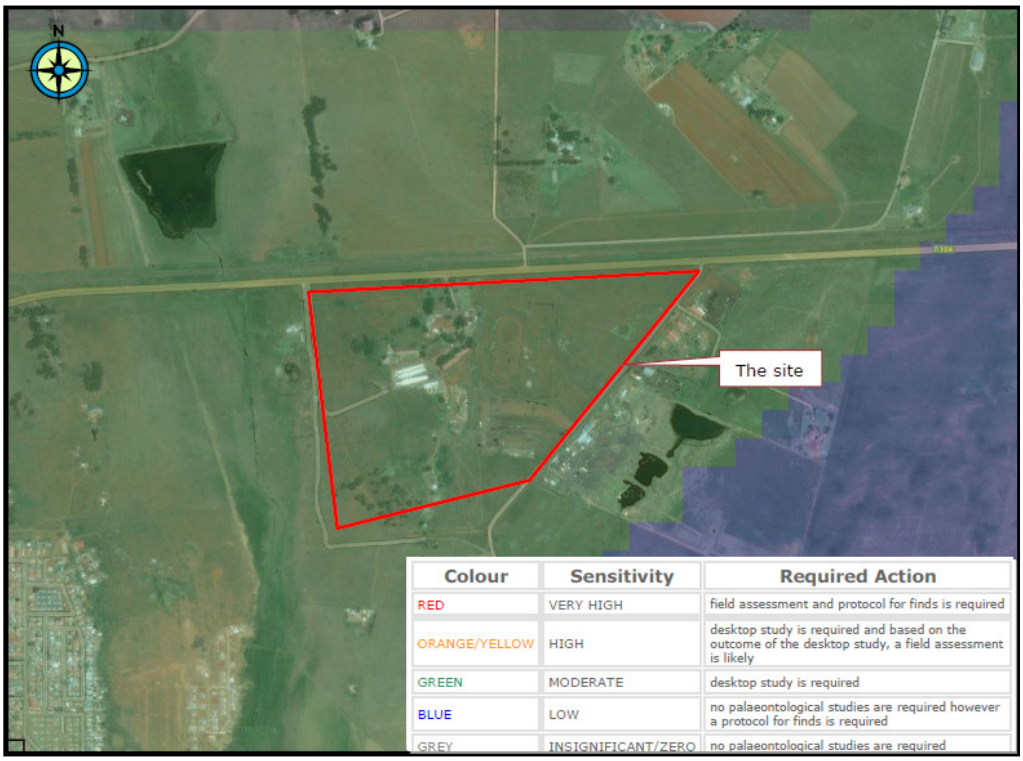


Figure 5.24: Requirement for palaeontological study (taken from SAHRA, 2014)

Dr. Heidi Fourie (Heidi Fourie Consulting) was appointed to conduct a Palaeontological Impact Assessment (referred to as Fourie, 2015). A copy of the said report is provided in Appendix 14 and should be consulted with regards to the methodology used.

The aim of a Desktop Palaeontological Study is to determine whether the proposed development site is important in terms of palaeontology and to make recommendations regarding possible mitigation measures to be implemented during the construction phase.

Outline of the geology and palaeontology

According to Fourie (2015), formations of the Transvaal Supergroup (Vls, Vs) and the Dwyka Group (Pd) of the Karoo Supergroup are mainly associated with the proposed development site.

The Dwyka Group (Pd) is the lowermost unit of the Karoo Supergroup overlain by the Ecca Group and underlain by the Witteberg Group, Bokkeveld or Table Mountain Groups and various other groups. It ranges in age from Late Carboniferous to early Permian. Clastic rocks containing diamictite,

varved shale, conglomerate, pebbly sandstone and mudrock are present. The rocks display features reflecting a glacial and glacially- related origin. Fossils are present (Kent, 198; Visser et al., 1980).

The Transvaal Supergroup is Vaalian in age (2600 – 2100 Ma) and comprises clastic, volcanic and chemical sedimentary rocks. Quartzitic sandstones, mudstones and shale together with a prominent volcanic unit, minor conglomerate, chemical and volcanic members are present in the Pretoria Group. The Pretoria Group is known for stromatolitic fossils in some of the other formations. It is usually not more than 500m thick and is well developed with an age of 2224 $^{+}_{-}$ 21 Ma old.

The Loskop Formation consists of a thick succession of finely layered siltstone, mudstone, feldspathic sandstone and shale. Volcanic rocks and conglomerates also occur. This formation rests on the Selons River Formation and is overlain by the Wilge River Formation. Its age is probably between 2100 – 2200 my (Visser, 1989).

The Rooiberg Group is a 2500-6000m thick succession of feldspathic quartzites, arkoses and shales, with interbedded volcanics and felsites. It consists of two formations, the lower Damwal and the upper Selons River (Vs), restricted in its distribution (Kend, 1980; Snyman, 1996). The Selons River Formation has either a sandstone or a quartzite at its base and mainly consists of red rhyolite (Visser, 1989). A diabase plate is present.

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if Karoo Supergroup strata is present on a site, the palaeontological sensitivity is generally Low to Very High, but on site Moderate for the Loskop Formation and Low for the Rooiberg and the Dwyka Groups.

Background to the palaeontology of the area
Spores and acritarchs have been reported from the interglacial mudrocks, also spores, pollen and plant remains in the interbedded mudrocks of the Dwyka Group as well as the diamictite itself, while anthropod trackways and fish trails are present in places on beeding planes (Visser et al., 1990).

Description of significant fossil occurrences (heritage value)
All Karoo Supergroup geological formations are ranked Low to Very High. At the proposed development site, the impact is potentially Moderate for the Loskop Formation and Low for the Dwyka and Rooiberg Groups as indicated in Table 5.10.

Table 5.10: Palaeontological sensitivity criteria used (Fossil Heritage Layer Browser/SAHRA) (taken from Fourie, 2015)

Rock unit	Significance/ vulnerability	Recommended action
Dwyka Group	Low	No palaeontological studies are required, however a protocol for finds is required.
Loskop Formation	Moderate	Desktop study is required
Rooiberg Group	Low	No palaeontological studies are required, however a protocol for finds is required.

Fourie (2015) indicated no objection to the proposed development of the said site. According to Fourie (2015), the impact of the development on fossil heritage is Moderate and Low and therefore mitigation or conservation measures are not necessary for this development.

A Phase 1 Palaeontological Assessment is not required to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is Moderate and Low as indicated in Table 5.10.

A Protocol for Finds is provided in Appendix 14 due to the LOW palaeontological sensitivity of the Rooiberg and Dwyka Groups and the possible presence of fossils.

5.14 Sensitive landscapes

Grobler (2015) indicated that no wetland area or other watercourse type (as defined by the National Water Act, 1998 (Act 36 of 1998)) overlaps with the development site. The proposed development of the site thus has a low-negligible risk of impacting on wetlands and other watercourses and therefore sensitive landscapes.

5.15 Visual aspects

Due to the relatively flat landscape, the site is visible from the smallholdings located north, east, south and west of the site. The site is also highly visible from the R104 provincial road and the main gravel access road. A row of Pine trees screens the site from the traffic utilizing the R104 provincial road.

The western portion of the site is also visible from the property on the opposite side of the stream and Middelburg X22 (Figure 5.12).

5.16 Traffic

The said site is situated adjacent to the R104 provincial road between Middelburg and Belfast (Figure 5.1). The main access to the site is from this road (Photo 2; Figure 5.9).

The gravel road extending along the eastern boundary of the site provides access to all the small holdings located east and south of the site and connects the R104 provincial road with the N11 national road (Figure 5.1). The site can also be accessed from this road via a private gravel road.

A Traffic Impact Study in order to quantify and determine the impact of the traffic generated by the proposed development on the immediate surrounding road network was undertaken by WSP SA Civil and Structural Engineers (Pty) Ltd (referred to as Makala and Kotze, 2009). A copy of the report is provided in Appendix 15. For a description of the methodology used as well as an explanation of terminology used, please refer to Appendix 15.

5.16.1 Trip generation

Table 5.11 provides an indication of the estimated development trips as a result of the land uses to be included as part of the proposed development.

Table 5.11: Estimated development trips (taken from Makala and Kotze, 2009)

LAND USE	TRIP RATE	ADJ. FACT.	SPLIT %	AM PEAK HOUR			PM PEAK HOUR		
				IN	OUT	TOTAL	IN	OUT	TOTAL
Residential 1	1.1 vph/unit	1	75/25	119	358	477	358	119	477
Residential 3	0.5 vph/unit	1	65/35	108	200	308	200	108	308
Business	AM=20% of PM PM=4.0vph/unit /100m^2	0.4	50/50	13	13	26	63	63	126
Combined School	0.8vph/pupil	0.3	55/45	66	54	120	-	-	-
TOTAL TRIPS				**306**	**625**	**931**	**621**	**290**	**911**

5.16.2 Impact on existing road network

Makala and Kotze (2009) included the following key intersections in their assessment based on the type and extent of the proposed development as well as the expected traffic generation:

- Cowen Ntuli Street/N11 (P49-1);
- Cowen Ntuli Street/Watt Street;
- N11 (P49-1)/Tswelopele Street;
- R104 (P154-4)/gravel access (access to proposed development.

Cowen Ntuli Street/N11

This is currently a 4-way controlled intersection.

Cowen Ntuli Street consists of two approach lanes:

- on the west (i.e. a shared through-left lane plus a shared through-right lane) and
- on the east (i.e. a shared through-right lane plus a separate left continuous lane).

The N11 (P49-1) consists of two approach lanes on the south (i.e. a shared through-right lane plus a separate left continuous lane) and only one approach lane on the north.

Table 5.12 provides a summary of the SIDRA 3 capacity analysis with regards to Cowen Ntuli Street/N11 intersection.

Table 5.12: SIDRA 3 capacity analysis with regards to Cowen Ntuli Street/N11 intersection (taken from Malaka and Kotze, 2009).

SCENARIO	SIDRA 3 CAPACITY ANALYSIS	
	AM PEAK HOUR	PM PEAK HOUR
EXISTING 2009 WEEKDAY AM AND PM PEAK HOUR		
WITHOUT DEVELOPMENT TRAFFIC – WITHOUT SITE ACCESS	Approaches at the intersection were operating at acceptable levels at LOS A and B with average delays of less than 11 seconds.	Approaches at the intersection were operating at acceptable levels at LOS A and C with average delays of less than 8 seconds.
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will operate at acceptable levels between LOS A and B with average delays of less than 15 seconds.	
FUTURE 2014 BACKGROUND WEEKDAY AM AND PM PEAK HOUR (assumed 3% growth in traffic)		
WITHOUT DEVELOPMENT TRAFFIC - WITHOUT SITE ACCESS	Approaches at the intersection will operate at congested LOS E and F with average delays up to about 66 seconds.	
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will operate at improved LOS A to C with average delays of less than 18 seconds.	

Legend: LOS – Level of Service

Makala and Kotze (2009) concluded that the intersection will need to be upgraded to enable the intersection to accommodate the expected additional development traffic generation. This upgrading must be in line with Figure 328712/AL/01 (Appendix 15).

Cowen Ntuli Street/Watt Street
This intersection is currently controlled by means of a 3-phase traffic signal, with the 3rd phase being meant for right-turning traffic along Cowen Ntuli Street.

Cowen Ntuli consists of three approach lanes:
- on the west – a short shared through right lane, a through lane plus a separate left slip lane;
- on the east – a short right turn lane, two through lanes plus a separate short left slip lane.

Watt Street consists of:
- on the south - one wide approach lane that splits into shared through right plus a left slip lane;
- on the north - a short right turn lane, shared through lane plus a left turn lane.

Table 5.13 provides a summary of the SIDRA 3 capacity analysis with regards to Cowen Ntuli/Watt Street intersections.

Table 5.13: SIDRA 3 capacity analysis with regards to Cowen Ntuli Street/ Watt Street (taken from Malaka and Kotze, 2009).

SCENARIO	SIDRA 3 CAPACITY ANALYSIS	
	AM PEAK HOUR	PM PEAK HOUR
EXISTING 2009 WEEKDAY AM AND PM PEAK HOUR		
WITHOUT DEVELOPMENT TRAFFIC – WITHOUT SITE ACCESS	Approaches at the intersection were operating at acceptable levels at LOS A and B with average delays of around 18 seconds.	
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will operate at acceptable levels between LOS A and B with slightly longer delays of about 19 seconds.	
FUTURE 2014 BACKGROUND WEEKDAY AM AND PM PEAK HOUR (assumed 3% growth in traffic)		
WITHOUT DEVELOPMENT TRAFFIC - WITHOUT SITE ACCESS	Approaches at the intersection will continue to operate at acceptable levels at LOS A and B with average delays of around 18 seconds.	
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will continue to operate at acceptable levels between LOS A and B with average delays of less than 20 seconds.	

Legend: LOS – Level of Service

Makala and Kotze (2009) concluded that this intersection has enough spare capacity to accommodate the additional development traffic generations. No upgrades at this intersection are thus required.

N11 (P49-1)/TSWELOPELE STREET
This is currently a 2-phase signalised intersection.

N11 (P49-1) consists of three approach lanes:
- on the north - a separate short right-turn lane plus two through lanes;
- on the south – two through lanes plus a short left slip lane.

Tswelopele Street consists of a fairly wide (6m) approach lane which divides into a right turn lane plus a left slip lane.

Table 5.14 provides a summary of the SIDRA 3 capacity analysis with regards to the N11 (P49-1)/Tswelopele Street intersection.

Table 5.14: SIDRA 3 capacity analysis with regards to the N11 (P49-1)/Tswelopele Street intersection (taken from Malaka and Kotze, 2009).

SCENARIO	SIDRA 3 CAPACITY ANALYSIS	
	AM PEAK HOUR	PM PEAK HOUR
EXISTING 2009 WEEKDAY AM AND PM PEAK HOUR		
WITHOUT DEVELOPMENT TRAFFIC – WITHOUT SITE ACCESS	Approaches at the intersection were operating at acceptable levels at LOS A and B with average delays of less than 17 seconds.	
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will operate at acceptable levels between LOS A and B with slightly longer delays.	
FUTURE 2014 BACKGROUND WEEKDAY AM AND PM PEAK HOUR (assumed 3% growth in traffic)		
WITHOUT DEVELOPMENT TRAFFIC - WITHOUT SITE ACCESS	Approaches at the intersection will continue to operate at acceptable levels at LOS A and B with average delays of less than 17 seconds.	
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will continue to operate at acceptable levels between LOS A and B with average delays around 18 seconds.	

Legend: LOS – Level of Service

Malaka and Kotze (2009) concluded that this intersection has enough spare capacity to accommodate the additional development traffic generations. No upgrades at this intersection are proposed.

R104 (P154-4)/gravel access (site access)
This is currently an informal priority controlled access.

The R104 (P154-4) has the right of way and consists of one approach lane per direction. The gravel access road consists of one informal approach lane.

It is proposed that existing access to the proposed development site will be formalised with short turning lanes and that the intersection will comprise of 4 legs.

Table 5.15 provides a summary of the SIDRA 3 capacity analysis with regards to the R104 (P154-4)/gravel access (site access).

Table 5.15: SIDRA 3 capacity analysis with regards to the R104 (P154-4)/gravel access (site access) (taken from Malaka and Kotze, 2009).

SCENARIO	SIDRA 3 CAPACITY ANALYSIS	
	AM PEAK HOUR	PM PEAK HOUR
EXISTING 2009 WEEKDAY AM AND PM PEAK HOUR		
WITHOUT DEVELOPMENT TRAFFIC – WITHOUT SITE ACCESS	Approaches at the intersection were operating at acceptable levels at LOS A and B with average delays of less than 12 seconds.	
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will operate at acceptable levels between LOS A and C with average delays of less than 17 seconds.	Approaches will operate at acceptable levels between LOS A and D with average delays of less than 27 seconds.
FUTURE 2014 BACKGROUND WEEKDAY AM AND PM PEAK HOUR (assumed 3% growth in traffic)		
WITHOUT DEVELOPMENT TRAFFIC - WITHOUT SITE ACCESS	Approaches at the intersection will continue to operate at acceptable levels at LOS A and B with average delays of less than 12 seconds.	
WITH DEVELOPMENT TRAFFIC – WITH SITE ACCESS	Approaches will continue to operate at acceptable levels between LOS A and C with average delays of less than 17 seconds.	Approaches will operate at acceptable levels between LOS A and D with average delays of less than 28 seconds.

Legend: LOS – Level of Service

Makala and Kotze (2009) concluded that the proposed upgrading of the site access (i.e. four leg intersection and the proposed turning lanes) is acceptable in terms of traffic engineering principles and geometric design standards.

5.16.3 Public transport

Makala and Kotze (2009) indicated that there is an existing Public Transport facility in the form of Bus & Taxi Lay-bys along Cowen Ntuli Street between Watt Street and the N11 (P49-1).

This public transport facility is situated about 2km from the proposed site access along the R104 provincial road. It is however considered too far away for passengers to walk to and from the proposed development. Makala and Kotze (2009) therefore proposed that two public transport facilities (Bus & Taxi Lay-bys) be provided on the downstream sides of the R104/access intersection.

In addition, Makala and Kotze (2009) recommended that a sidewalk at least 1.5m wide be provided along Cowen Ntuli Street (R104 provincial road) to the development site. This would ease and formalise the movement of pedestrians to and from the proposed new and nearby Bus and Taxi Lay-bys.

5.16.4 Road and/or intersection improvements

Makala and Kotze (2009) recommended the following upgradings in order to accommodate the expected development traffic:

- Cowen Ntuli/N11 (P49-1): The western approach (Cowen Ntuli Street) requires road widening to accommodate double right-turn lanes and a shared through- right lane.
- R104 (154-4)/gravel access (site access): the southern leg - two lanes (site access) with widening of the R104 (P154-4) to allow a short turning lane from the west and a short left-turn lane from the east also on the R104 provincial road. It is further proposed that a sidewalk (1.5m wide) be provided along the access road and the R104 provincial road (to the proposed Minibus –Taxi layby's).

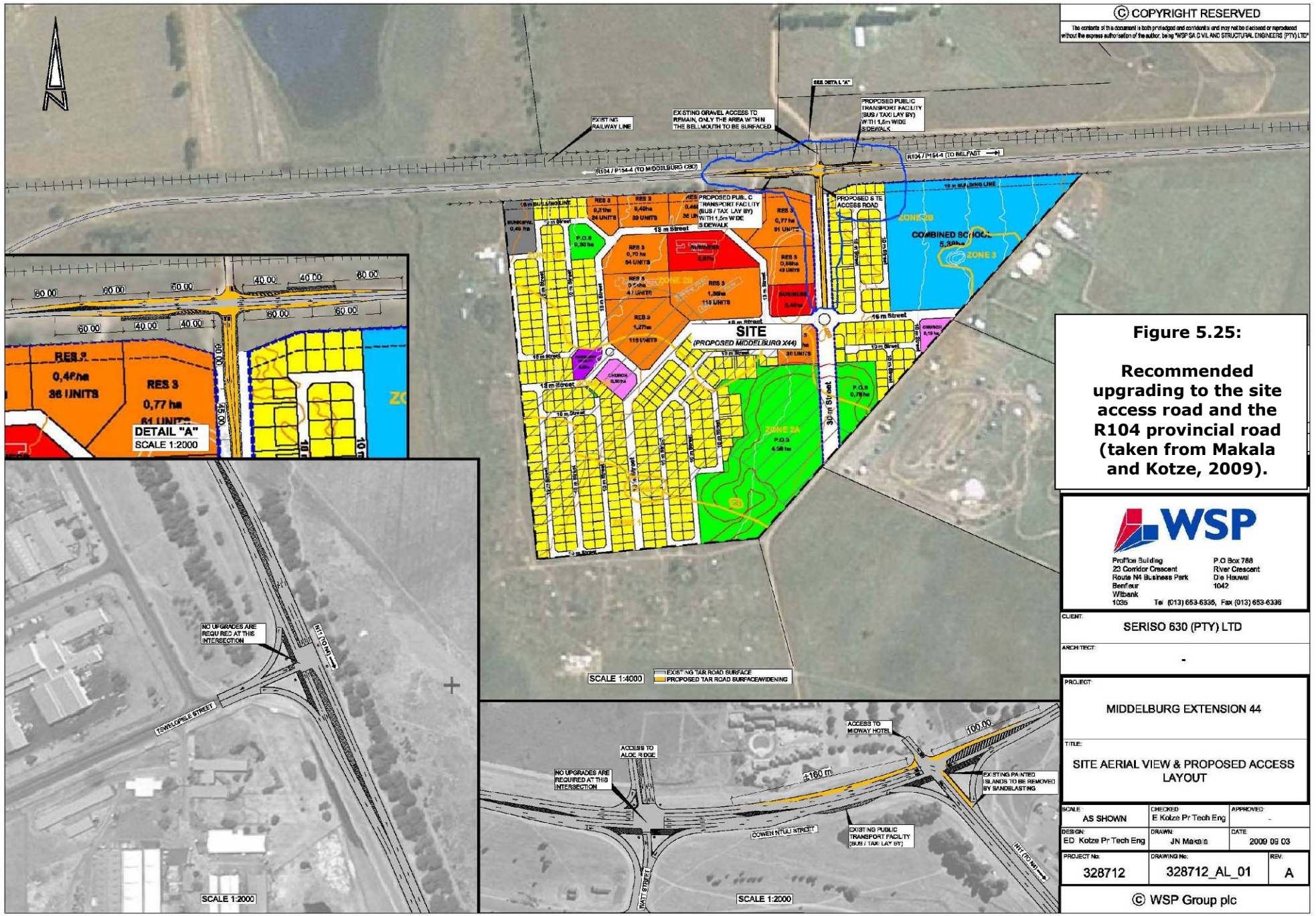


Figure 5.25:

Recommended upgrading to the site access road and the R104 provincial road (taken from Makala and Kotze, 2009).

WSP
Profice Building
23 Corridor Crescent
Route N4 Business Park
Benfleur
Wilbank
1035
P.O Box 788
River Crescent
Die Heuwel
1042
Tel (013) 653-6335, Fax (013) 653-6336

CLIENT: SERISO 630 (PTY) LTD

ARCHITECT: -

PROJECT: MIDDELBURG EXTENSION 44

TITLE: SITE AERIAL VIEW & PROPOSED ACCESS LAYOUT

SCALE	CHECKED	APPROVED
AS SHOWN	E Kotze Pr Tech Eng	-
DESIGN: ED Kotze Pr Tech Eng	DRAWN: JN Makala	DATE: 2009 09 03
PROJECT No: 328712	DRAWING No: 328712_AL_01	REV: A

5.17 Sense of place

The central business district (CBD) of Middelburg is located approximately 4km west of the site (Figure 5.1). The residential area, Nasaret, is located about 1.5 km south of the proposed new development and Middelburg X22 is located towards the west (Figure 5.1). Middelburg's main industrial area (with industries such as Columbus Stainless (Pty) Ltd.) is located south west of the site (Figure 5.12).

The R104 provincial road between Middelburg and Belfast forms the northern boundary of the site and a gravel road that provides access to the surrounding smallholdings forms the eastern boundary.

The properties located north, east, west and south of the site are all still zoned agricultural although they are utilized for a number of land uses (e.g. residential/light industrial/recreation/etc.).

According to Urban Dynamics Inc. (2009), the future direction of development would be to the northern, north eastern and eastern side of Middelburg. This area was also indicated in the Spatial Development Framework (2004) as the hinterland of the town, indicating the direction of growth. In the Steve Tshwete Spatial Development Framework (2010), the proposed site is indicated as hotel (in terms of the original Copper Towers establishment). It is also indicated as Middelburg x44, indicating that residential development is proposed for the said site.

Although the site is currently located in a predominantly rural area, the proposed development can be viewed as a natural extension to the existing and proposed residential areas, Middelburg X22 and Middelburg X34 – 36 (Figure 5.26).

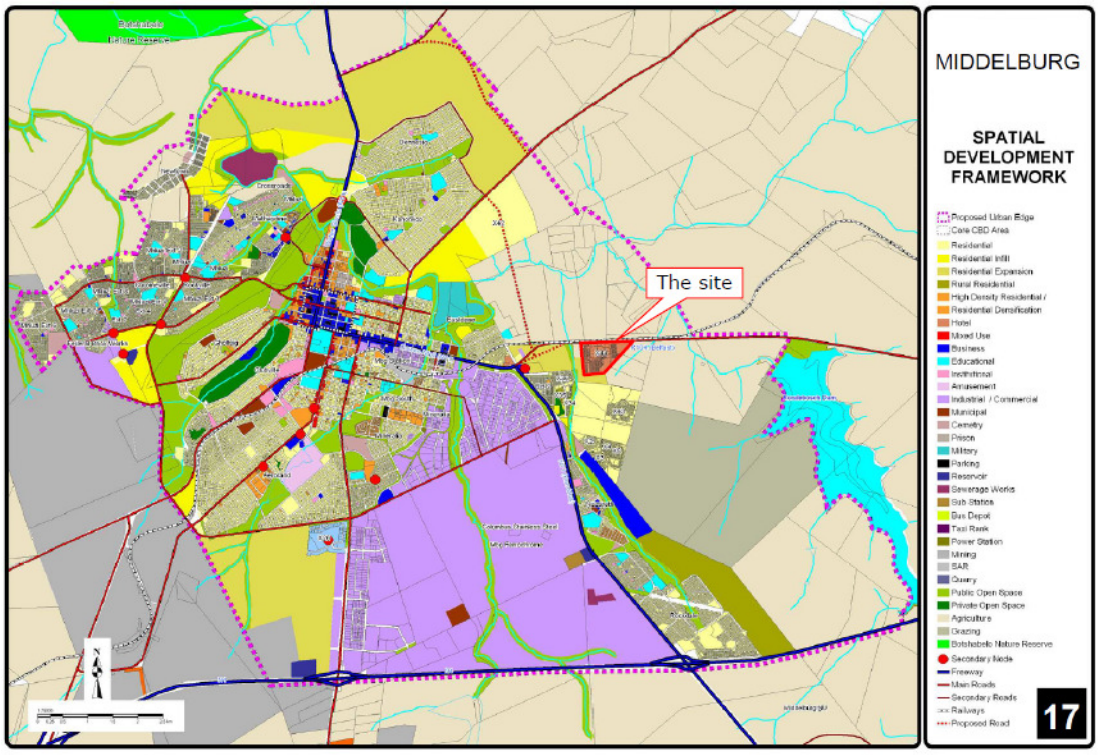


Figure 5.26: The proposed site and the Steve Tshwete Spatial Development Framework (2010)

6. DESCRIPTION OF ALTERNATIVES IDENTIFIED

6.1 Alternative sites

6.1.1 Proposed site

In view of the following, the applicant decided upon the development of the proposed site:

- The proposed site belongs to the applicant;
- The applicant bought the said site in order to establish an accommodation facility using the existing Copper Towers infrastructure;
- The proposed site is located near existing residential suburbs, namely Nasaret and Middelburg X22 (Hlalamnandi), and would be a natural extension of these areas.
- The proposed site forms part of an area indicated in the Spatial Development Framework (2004) as the hinterland of the town, indicating the direction of growth.

As indicated in Section 4.5.5, the Steve Tshwete Local Municipality approved the development of the said property subject to certain conditions (see letter from STLM dated: 14 December 2015; Appendix 10).

6.1.2 Alternative site

The applicant purchased the said site specifically for development purposes and did not make another site available for investigation. In addition, the extension possibilities of the town are restricted due to mining activities and topographical factors. The future direction of development would be to the northern, north eastern and eastern side of Middelburg. The said site is located to the eastern side of Middelburg and is thus ideally located for development.

6.1.3 No Project Option

See Section 6.4 for details regarding the No Project Option.

6.2 Alternative layouts

6.2.1 Layout Plan no. 1 (Figure 2.1)

Figure 2.1 provides an indication of the original layout plan (Layout Plan no. 1) designed by Urban Dynamics Inc. (2009) and included in the scoping report. A copy of the Township Establishment Memorandum compiled by Urban Dynamics Inc. (2009) is provided in Appendix 3.

This layout plan took into account the hillslope seepage wetland identified by Wetland Consulting (2009). This wetland area was demarcated as Public Open Space (Figure 2.1).

According to Urban Dynamics Inc. (2009), the proposed development would comprise of a total of 456 stands, including the following:

ZONING	NUMBER	AVERAGE SIZE (m^2)	PERCENTAGE (%)	AREA (ha)
Residential 1	433	323.88	28.95	14.02
Residential 3	11	6552.64	15.34	7.43
Business 2	2	6550	2.70	1.31
Institutional: Community Facility Combined school Church	 1 1 2	 2074.6 53778 5003.78	 0.43 11.11 1.03	 0.21 5.38 0.50
Municipal	1	4931.42	1.02	0.49
Public Open Space (Park)	5		23.02	11.15
Streets: Internal External			 13.01 3.39	 6.30 1.64
	456		**100%**	**48.43 ha**

Layout Plan no. 1 (Figure 2.1) was rejected subsequent to the recommendations of the engineers in terms of sewer and storm water as indicated in Section 6.2.2.

6.2.2 Layout Plan no. 2 (Figure 6.1)

Figure 6.1 provides Layout Plan no. 2 where the layout of the roads was changed in order to accommodate the sewer and storm water as recommended by the engineers.

This layout plan also took into account the hillslope seepage wetland identified by Wetland Consulting (2009). This wetland area was demarcated as Public Open Space (Figure 6.1).

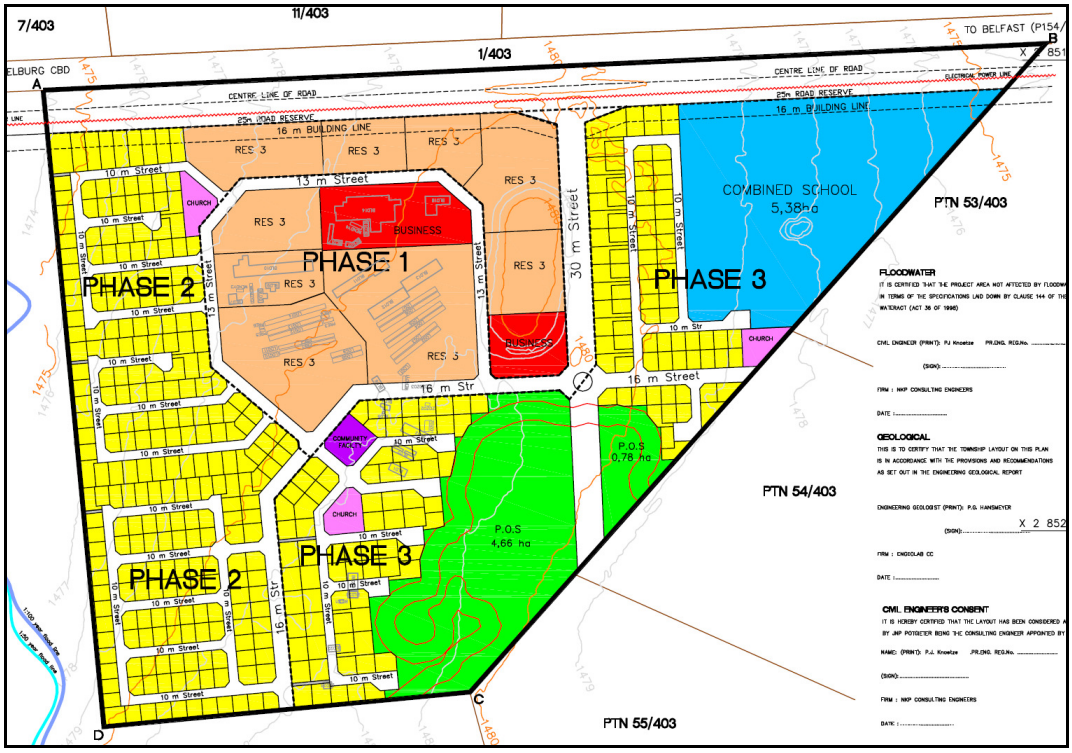


Figure 6.1: Layout Plan no. 2 (designed by Urban Dynamics)

This revised layout plan made provision for less stands (i.e. 435 stands) as indicated in the table below:

ZONING	NUMBER	AVERAGE SIZE (m^2)	PERCENTAGE (%)	AREA (ha)
Residential 1	412	354.61	30.17	14.61
Residential 3	9	9377.77	17.43	8.44
Business 2	2	8000.00	3.30	1.60
Institutional: Community Facility Combined school Church	 1 1 3	 1600	 0.37 11.29 0.99	 0.18 5.47 0.48
Municipal	5	80	0.08	0.04
Public Open Space (Park)	2	2.57ha	10.59	5.13
Streets: Internal External			25.77	12.48
	435		**100%**	**48.43 ha**

In addition, the following changes were also made:

- The Municipal stand catering for the sewage package plant was removed in view of the fact that the development could connect to the nearby Nasaret Outfall Sewer of the STLM.
- The Residential 3 stand (catering for 39 units) was removed since it encroached onto the wetland buffer as identified by Wetland Consulting (2009).
- Three (3) churches were provided as requested by the STLM in their approval letter. One Public Open Space was rezoned to cater for the requested church stand as requested by the STLM in their approval letter.
- The position of the Community Facility was moved to the middle of the development in order to make it more accessible to all residents.
- The Municipal stands provided were to cater for storm water management measures.

Layout Plan no. 2 (Figure 6.1) was rejected subsequent to the findings of the wetland delineation study as indicated in Section 6.2.3.

6.2.3 Layout Plan no. 3 (Figure 6.2)

Grobler (2015) indicated that no wetland area or other watercourse type (as defined by the National Water Act, 1998 (Act 36 of 1998)) overlaps with the development site. In view of the findings of this study, a revised layout plan, Layout Plan no. 3 (Figure 6.2), was compiled.

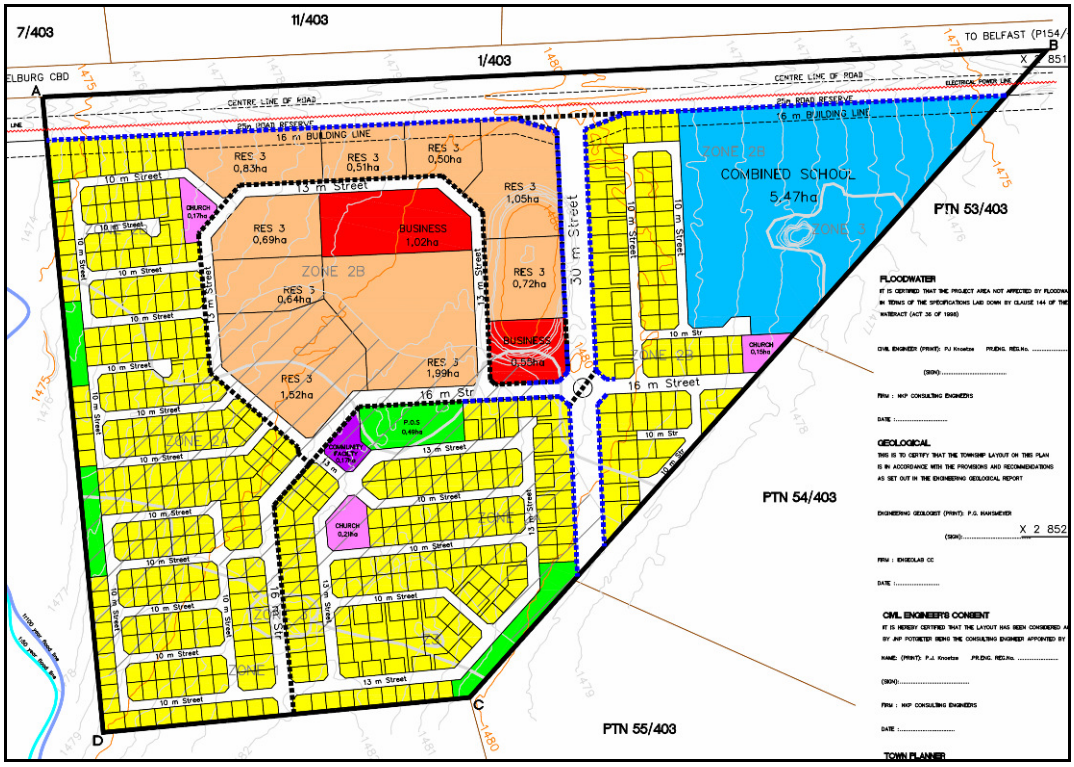


Figure 6.2: Layout Plan no. 3 (designed by Urban Dynamics)

In view of the above-mentioned, this revised layout plan made provision for more stands (i.e. 522 stands) as indicated in the table below:

ZONING	NUMBER	AVERAGE SIZE (m^2)	PERCENTAGE (%)	AREA (ha)
Residential 1	501	346.51	36.85	17.38
Residential 3	9	9377.77	17.43	8.44
Business 2	2	7850	3.24	1.57
Institutional: Community Facility Combined school Church	 1 1 3	 1767	 0.35 11.29 1.09	 0.17 5.47 0.53
Municipal				
Public Open Space (Park)	5		2.75	1.33
Streets: Internal External			27.00	13.56
	522		**100%**	**48.43 ha**

In addition, the following changes were also made:

- More Residential 1 stands provided as more ground was made available for development purposes.
- Three (3) additional Public Open Space stands were provided on the boundaries of the site in order to accommodate the wetland buffer zones identified by Grobler (2015).

Layout Plan no. 3 (Figure 6.2) was rejected subsequent to the findings of the land surveyor as indicated in Section 6.2.4.

6.2.4 Layout Plan no. 4 (Figure 6.3)

On completion of the survey of all existing structures on site by the land surveyor, this information was overlaid onto the proposed layout plan. It was then found that some of the existing structures/buildings had not been accommodated on specific stands. In view of this, Layout Plan no. 4 (Figure 6.3) was compiled in order to ensure the continuation of existing land uses without having to rebuild structures (e.g. churches).

In view of the above-mentioned, this revised layout plan also makes provision for 522 stands as indicated in the table below:

ZONING	NUMBER	AVERAGE SIZE (m^2)	PERCENTAGE (%)	AREA (ha)
Residential 1	475	349.26	34.26	16.59
Residential 3	9	9377.77	17.43	8.44
Business 2	2	7850	3.24	1.57
Institutional: Community Facility Combined school Church	 1 1 3	 2400	 1.22 11.29 1.49	 0.59 5.47 0.72
Municipal				
Public Open Space (Park)	5		3.63	1.76
Streets: Internal External			27.44	13.29
	522		**100%**	**48.43 ha**

However, this layout plan makes provision for less Residential 1 stands. More ground is made available for church stands.

Layout Plan no. 4 (Figure 6.3) is the preferred layout plan for the said development.

6.2.5 No Project Option

See Section 6.4 for details regarding the No Project Option.

6.3 Alternative services

6.3.1 Water

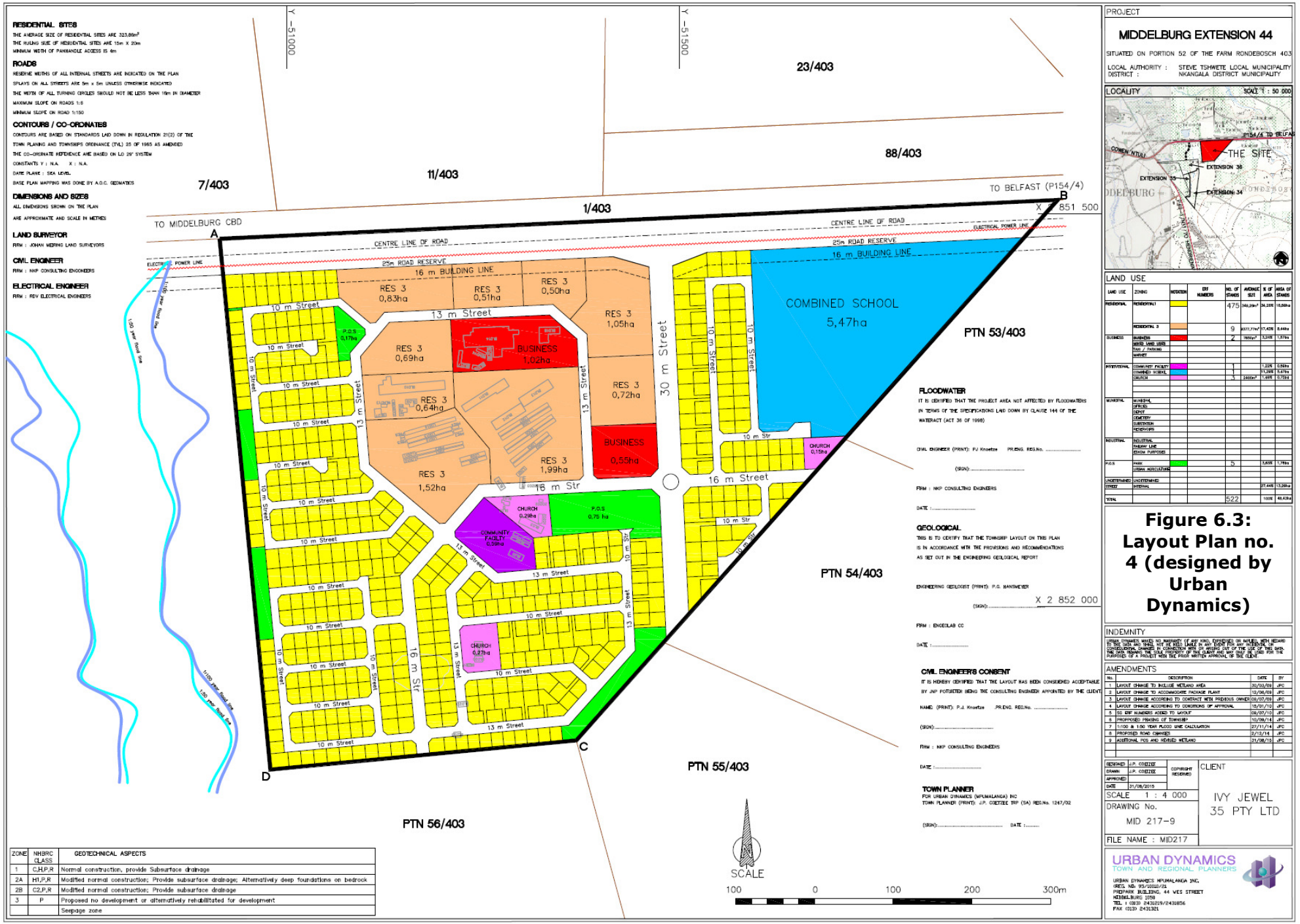
6.3.1.1 Borehole supply

As indicated in Section 2.5.2, water is currently obtained from two boreholes on site.

According to the applicant, the current daily potable water usage is between 50 kl to 120 kl per day. The current daily potable water supply to the existing development is between 70 kl to 120 kl per day. Currently, water is trucked to the development on a daily basis.

In other words, the said boreholes cannot provide the required volume of water and will therefore not be able to supply the overall development with water.

Water supply using boreholes was therefore rejected for the overall development.


RESIDENTIAL SITES
THE AVERAGE SIZE OF RESIDENTIAL SITES ARE 323,86m²
THE RULING SIZE OF RESIDENTIAL SITES ARE 15m X 20m
MINIMUM WIDTH OF PANHANDLE ACCESS IS 4m
ROADS
RESERVE WIDTHS OF ALL INTERNAL STREETS ARE INDICATED ON THE PLAN
SPLAYS ON ALL STREETS ARE 5m x 5m UNLESS OTHERWISE INDICATED
THE WIDTH OF ALL TURNING CIRCLES SHOULD NOT BE LESS THAN 16m IN DIAMETER
MAXIMUM SLOPE ON ROADS 1:6
MINIMUM SLOPE ON ROAD 1:150
CONTOURS / CO-ORDINATES
CONTOURS ARE BASED ON STANDARDS LAID DOWN IN REGULATION 21(2) OF THE TOWN PLANING AND TOWNSHIPS ORDINANCE (TVL) 25 OF 1965 AS AMENDED
THE CO-ORDINATE REFERENCE ARE BASED ON LO 29° SYSTEM
CONSTANTS Y : N.A. X : N.A.
DATE PLANE : SEA LEVEL
BASE PLAN MAPPING WAS DONE BY A.O.C. GEOMATICS
DIMENSIONS AND SIZES
ALL DIMENSIONS SHOWN ON THE PLAN
ARE APPROXIMATE AND SCALE IN METRES
LAND SURVEYOR
FIRM : JOHAN WERING LAND SURVEYORS
CIVIL ENGINEER
FIRM : NKP CONSULTING ENGINEERS
ELECTRICAL ENGINEER
FIRM : RDV ELECTRICAL ENGINEERS
Y – 51000
Y – 51500
23/403
88/403
7/403
11/403
1/403
TO BELFAST (P154/4)
X 851 500
TO MIDDELBURG CBD
A
B
C
D
CENTRE LINE OF ROAD
ELECTRICAL POWER LINE
25m ROAD RESERVE
16 m BUILDING LINE
RES 3 0,83ha
RES 3 0,51ha
RES 3 0,50ha
RES 3 1,05ha
RES 3 0,69ha
BUSINESS 1,02ha
RES 3 0,64ha
RES 3 0,72ha
BUSINESS 0,55ha
RES 3 1,52ha
RES 3 1,99ha
COMBINED SCHOOL 5,47ha
CHURCH 0,15ha
CHURCH 0,29ha
P.O.S 0,75 ha
COMMUNITY FACILITY 0,58ha
CHURCH 0,27ha
P.O.S 0,17ha
10 m Street
13 m Street
16 m Street
30 m Street
16 m Str
13 m Str
10 m Str
PTN 53/403
PTN 54/403
PTN 55/403
PTN 56/403
1:100 year flood line
1:50 year flood line
FLOODWATER
IT IS CERTIFIED THAT THE PROJECT AREA NOT AFFECTED BY FLOODWATERS IN TERMS OF THE SPECIFICATIONS LAID DOWN BY CLAUSE 144 OF THE WATERACT (ACT 36 OF 1998)
CIVIL ENGINEER (PRINT): PJ Knoetze PR.ENG. REG.No. .....
(SIGN):.....
FIRM : NKP CONSULTING ENGINEERS
DATE :.....
GEOLOGICAL
THIS IS TO CERTIFY THAT THE TOWNSHIP LAYOUT ON THIS PLAN IS IN ACCORDANCE WITH THE PROVISIONS AND RECOMMENDATIONS AS SET OUT IN THE ENGINEERING GEOLOGICAL REPORT
ENGINEERING GEOLOGIST (PRINT): P.G. HANSMEYER
X 2 852 000
(SIGN):.....
FIRM : ENGEOLAB CC
DATE :.....
CIVIL ENGINEER'S CONSENT
IT IS HEREBY CERTIFIED THAT THE LAYOUT HAS BEEN CONSIDERED ACCEPTABLE BY JNP POTGIETER BEING THE CONSULTING ENGINEER APPOINTED BY THE CLIENT
NAME: (PRINT): P.J. Knoetze PR.ENG. REG.No. .....
(SIGN):.....
FIRM : NKP CONSULTING ENGINEERS
DATE :.....
TOWN PLANNER
FOR URBAN DYNAMICS (MPUMALANGA) INC
TOWN PLANNER (PRINT): J.P. GIETJEE TRP (SA) REG.No. 1247/02
(SIGN):..... DATE :.....
SCALE
100 0 100 200 300m
ZONE | NHBRC CLASS | GEOTECHNICAL ASPECTS
1 | C,H,P,R | Normal construction, provide Subsurface drainage
2A | H1,P,R | Modified normal construction; Provide subsurface drainage; Alternatively deep foundations on bedrock
2B | C2,P,R | Modified normal construction; Provide subsurface drainage
3 | P | Proposed no development or alternatively rehabilitated for development
Seepage zone
PROJECT
MIDDELBURG EXTENSION 44
SITUATED ON PORTION 52 OF THE FARM RONDEBOSCH 403
LOCAL AUTHORITY : STEVE TSHWETE LOCAL MUNICIPALITY
DISTRICT : NKANGALA DISTRICT MUNICIPALITY
LOCALITY
SCALE 1 : 50 000
P154/4 TO BELFAST
THE SITE
EXTENSION 38
EXTENSION 35
EXTENSION 34
COMEN NTJAU
MIDDELBURG
RONDEBOSCH
TO MIDDELBURG CBD
LAND USE
LAND USE | ZONING | NOTATION | ERF NUMBERS | NO. OF STANDS | AVERAGE SIZE | % OF AREA | AREA OF STANDS
RESIDENTIAL | RESIDENTIAL1 | | | 475 | 348,26m² | 34,28% | 16,56ha
RESIDENTIAL 3 | | | 9 | 8372,71m² | 17,43% | 8,44ha
BUSINESS | BUSINESS | | | 2 | 7650m² | 3,24% | 1,57ha
MIXED LAND USES
TAXI / PARKING
MARKET
INSTITUTIONAL | COMMUNITY FACILITY | | | 1 | | 1,22% | 0,59ha
COMBINED SCHOOL | | | 1 | | 11,29% | 5,47ha
CHURCH | | | 3 | 2400m² | 1,68% | 0,72ha
MUNICIPAL | MUNICIPAL
OFFICES
DEPOT
CEMETERY
SUBSTATION
RESERVOIRS
INDUSTRIAL | INDUSTRIAL
FARMY LINE
OTHER PURPOSES
P.O.S | PARK | | | 5 | | 3,93% | 1,79ha
URBAN AGRICULTURE
UNDETERMINED | UNDETERMINED
STREET | INTERNAL | | | | | 27,44% | 13,28ha
TOTAL | | | | 522 | | 100% | 48,43ha
Figure 6.3: Layout Plan no. 4 (designed by Urban Dynamics)
INDEMNITY
AMENDMENTS
No. | DESCRIPTION | DATE | BY
1 | LAYOUT CHANGE TO INCLUDE WETLAND AREA | 30/03/09 | JPC
2 | LAYOUT CHANGE TO ACCOMMODATE PACKAGE PLANT | 15/06/09 | JPC
3 | LAYOUT CHANGE ACCORDING TO CONTRACT WITH PREVIOUS OWNER | 08/07/09 | JPC
4 | LAYOUT CHANGE ACCORDING TO CONDITIONS OF APPROVAL | 15/01/10 | JPC
5 | SG ERF NUMBERS ADDED TO LAYOUT | 08/07/10 | JPC
6 | PROPOSED PHASING OF TOWNSHIP | 10/06/14 | JPC
7 | 1:100 & 1:50 YEAR FLOOD LINE CALCULATION | 27/11/14 | JPC
8 | PROPOSED ROAD CHANGES | 2/12/14 | JPC
9 | ADDITIONAL POS AND REVISED WETLAND | 31/08/15 | JPC
DESIGNED J.P. GOETZEE
DRAWN J.P. GOETZEE
APPROVED
DATE 31/08/2015
COPYRIGHT RESERVED
SCALE 1 : 4 000
DRAWING No. MID 217-9
FILE NAME : MID217
CLIENT
IVY JEWEL 35 PTY LTD
URBAN DYNAMICS
TOWN AND REGIONAL PLANNERS
URBAN DYNAMICS MPUMALANGA INC.
REG. NO. 95/02551/21
PROPARK BUILDING, 44 WES STREET
MIDDELBURG 1050
TEL : (013) 2432029/2430856
FAX (013) 2431321

6.3.1.2 Water abstraction from river

Water abstraction from the nearby tributary of the Klein Olifants River is currently not taking place.

This option for the overall development was also not considered in view of the reliability/sustainability of the water resource, the volume of water required, the quality of the said water source (i.e. could be polluted by sewage) and the requirement for a water use licence.

Based on the above-mentioned, water abstraction from the river was not considered for the overall development.

6.3.1.3 Municipal water supply

As indicated in Section 2.5.2, a potable water connection is available on the newly installed Rockdale bulk supply pipeline located towards the south eastern side of the site. This pipeline is supplied from the 20 Ml Rockdale Reservoir Complex located next to the N4 national road, which in turn is supplied by the Vaalbank Water Treatment Works.

Afri-Infra (2015) indicated that an 800m long, 160mm diameter uPVC bulk connection pipeline from the Rockdale bulk supply line to the proposed development is proposed.

According to Afri-Infra (2015), the design of the new Rockdale bulk supply line allowed for the supply of water to the proposed development. However, the following must still be confirmed:

- If sufficient pressure is available in the bulk supply pipeline to enable smooth operation of an internal water network;
- If the bulk supply pipeline has a valve chamber and connection point available for connection of the internal network onto the bulk supply.

For the overall development, connecting to this municipal water pipeline would be the preferred long term option.

6.3.1.4 Combination of borehole supply and municipal water

The 2 onsite boreholes might continue to be used once the overall development is connected to the above-mentioned municipal bulk water supply pipeline.

The continued use of the onsite boreholes would be subject to obtaining a water use licence for this water usage and the recommendations of the groundwater study.

6.3.1.5 No Project Option

See Section 6.4 for details regarding the No Project Option.

6.3.2 Sewage

6.3.2.1 Septic tanks

As indicated in Section 2.5.3, septic tanks are currently utilized for sewage disposal at the various buildings. According to the applicant, all grey and black water has been rerouted to one central, low point (Figure 2.3) where it flows into separate septic/conservancy tanks. The total capacity of the septic/conservancy tanks is 56 000 litres. The Steve Tshwete Local

Municipality empties the tanks 3 days a week, i.e. 3 or 4 loads at a time (1 load = 7000 litres).

It is proposed that the existing onsite septic/conservancy tanks will be decommissioned and connected to the proposed waterborne sewer network. The said septic tanks will however remain in use during the development of Phase 1.

Septic/conservancy tanks were not considered for the overall development in view of being able to connect to the nearby STLM as indicated in Section 6.3.2.3.

In view of the above-mentioned, the use of septic/conservancy tanks is no longer considered an option for the overall development.

6.3.2.2 Onsite sewage package plant

An onsite sewage package plant was considered in the initial planning of the overall development. A separate Municipal stand was provided to cater for the said sewage package plant as indicated in Section 2.4 and Figure 2.1.

As indicated in Section 6.2.2, the Municipal stand catering for the sewage package plant was however removed from Layout Plan no. 2 (Figure 6.1) in view of the fact that the development could connect to the nearby Nasaret Outfall Sewer of the STLM.

In view of the above-mentioned, an onsite sewage package plant is no longer considered an option for the overall development.

6.3.2.3 Connecting to municipal sewer

As indicated in Section 2.5.3, Afri-Infra (2015) indicated that a full waterborne sewer system is proposed for the development that will connect to an existing municipal outfall sewer approximately 350m west of the site by means of a 250mm diameter connector outfall sewer. According to Afri-Infra (2015), it is assumed that the existing municipal outfall sewer has sufficient capacity to accommodate the additional flow (i.e. based on the current drainage area).

It is proposed that the existing onsite septic/conservancy tanks will be decommissioned and connected to the proposed waterborne sewer network. The said septic tanks will however remain in use during the development of Phase 1.

In view of the local watershed present on site, a pump station (with a delivery capacity of approximately 10 l/s at a duty point of 15.3m, and a rising main of 550m long, 110mm diameter) will be constructed at the low point of the eastern drainage area in order to pump the sewage across the watershed into the western drainage area's reticulation. According to Afri-Infra (2015), this will only be required during Phase 3 of the development.

Connecting to the nearby municipal sewer is the preferred and long term option for the overall development.

6.3.2.4 Combination of septic/conservancy tanks and municipal sewer

It is proposed that the existing onsite septic/conservancy tanks will be decommissioned and connected to the proposed waterborne sewer network.

The said septic tanks will however remain in use during the development of Phase 1. There might thus be an overlap in terms of the use of septic/conservancy tanks and connecting with the municipal sewer.

6.3.2.5 No Project Option

See Section 6.4 for details regarding the No Project Option.

6.3.3 Electricity

6.3.3.1 Eskom supply

As indicated in Section 2.5.1, the said site is currently supplied with electricity from Eskom. This usage will continue until such time that the Steve Tshwete Local Municipality is able to provide the required electricity.

6.3.3.2 Municipal supply

As indicated in Section 2.5.1, the development will be supplied with electricity from the medium voltage distribution network (11 kV) of the Steve Tshwete Local Municipality. The developer will be responsible for the installation of the internal bulk electrical infrastructure after which the municipality will take over and maintain the installed infrastructure. The usage of this development is estimated at 3.7 MVA.

Connecting to the municipal electricity supply is the preferred and long term option for the overall development.

6.3.3.3 No Project Option

See Section 6.4 for details regarding the No Project Option.

6.3.4 Waste Disposal

6.3.4.1 Municipal waste disposal

As indicated in Section 2.5.4, the refuse will be collected by the Steve Tshwete Local Municipality's refuse removal unit and will be disposed of at the Middelburg Rietfontein Waste Disposal Site. The applicant indicated that recycling would also be encouraged on site in order to reduce the amount of waste to be disposed of.

Municipal waste disposal is the preferred and long term option for the overall development.

6.3.4.2 Onsite waste disposal

Before any waste can be disposed of onsite (i.e. within an excavation), the required Environmental Authorisation, Waste Management Licence and Water Use Licence need to be obtained. The waste site would then have to be managed according to the approval obtained.

In view of the above-mentioned, onsite waste disposal was not considered an option for the overall development.

6.3.4.3 No Project Option

See Section 6.4 for details regarding the No Project Option.

6.3.5 Storm water control measures

According to the engineers, Layout Plan no. 1 (Figure 2.1) did not accommodate the storm water control measures to be implemented on the said site.

As indicated in Section 6.2.2, the layout of the roads was changed in Layout Plan no. 2 (Figure 6.1) in order to accommodate the sewer and storm water as recommended by the engineers. Figure 2.6 provides a layout plan indicating the proposed storm water system.

In Section 2.5.6, Afri-Infra (2015) indicated that the western portion of the proposed storm water drainage system will drain towards a well defined drainage area located in close proximity to the western boundary of the site. The eastern portion of the proposed storm water drainage system will drain towards the R104 provincial road and the Klein Olifants River.

According to Afri-Infra (2015), the storm water infrastructure will be designed for the 1:5 and 1:25 year return periods to cater for the minor and major system respectively. Infrastructure will consist of a piped conduit system, associated kerb and grid inlets and outlet structures. Drainage outlets will be properly safeguarded to prevent erosion and unnecessary damage to the drainage area and associated wetland area.

A new storm water management plan was compiled in line with the latest layout plan (i.e. Layout Plan No. 4; Figure 6.3) as indicated in Figure 6.4.

Further details with regards to storm water are provided in Section 2.5.6.

See Section 6.4 for details regarding the No Project Option.

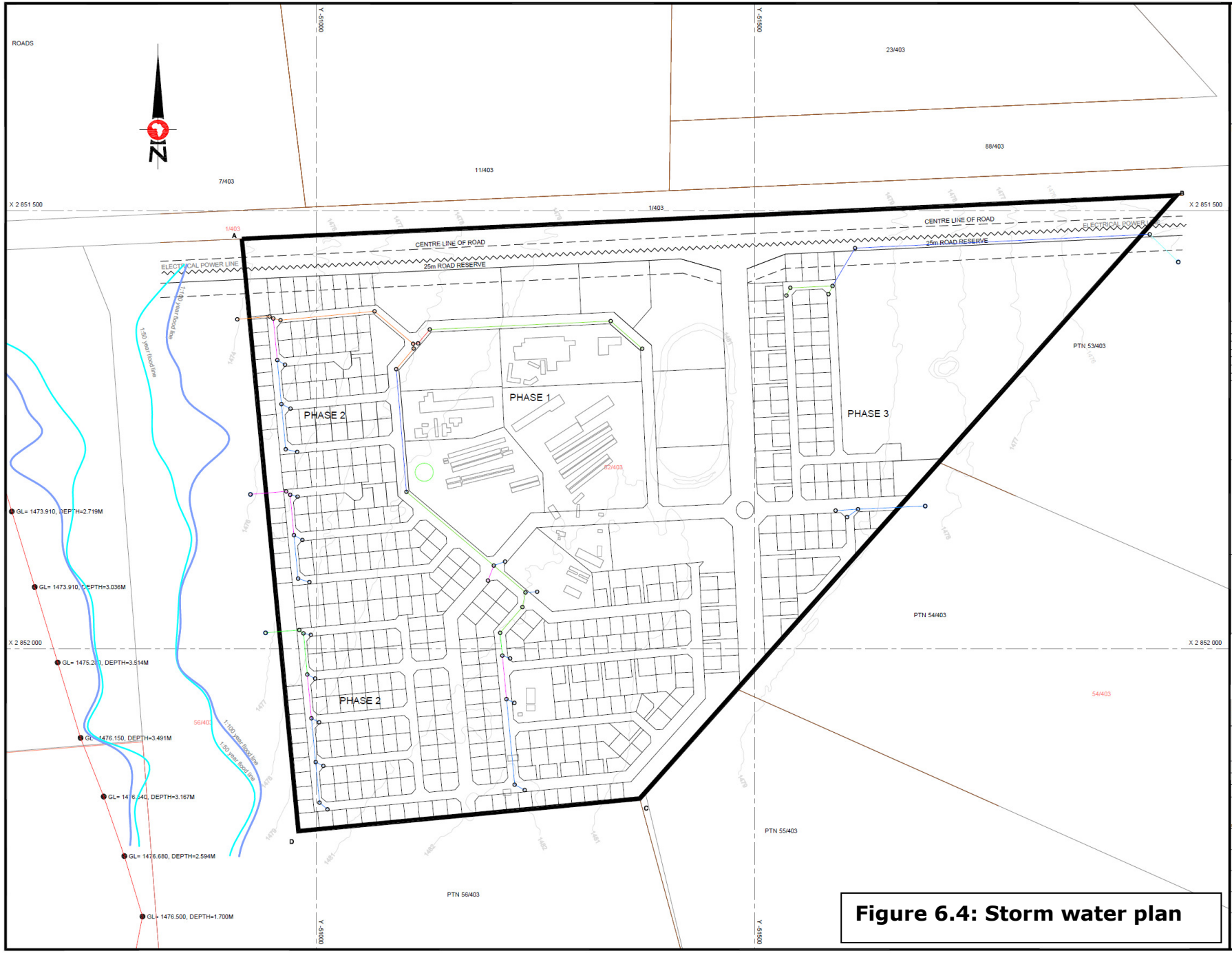


Figure 6.4: Storm water plan

NOTES

LEGEND

- 450mm Ø uPVC PIPE
- 525mm Ø uPVC PIPE
- 600mm Ø uPVC PIPE
- 675mm Ø uPVC PIPE
- 750mm Ø uPVC PIPE
- 900mm Ø uPVC PIPE
- 1050mm Ø uPVC PIPE
- 1200mm Ø uPVC PIPE

AMENDMENTS

NO. /CODE	DATE	INITIALS	DESCRIPTION
REV.B	10/15	E.J.	LAYOUT REVISED AS WELL AS SERVICES

CLIENT

IVY JEWEL GROUP (PTY) LTD

CORNER OF EKSTEEN AND WATER SISULU STREETS
25 TOWN SQUARE BUILDING
MIDDELBURG
1050

TEL: (013) 282 0238
FAX: (013) 282 0238
CELL: 083 304 2277
E-MAIL : estelle@mailfx.co.za
estelle@avidestates.co.za

PROJECT

ENGINEERING SERVICES FOR THE RESIDENTIAL DEVELOPMENT OF PTN 52 OF FARM RONDEBOSCH 403JS / MIDDELBURG EXT.44

DRAWING TITLE

STORMWATER LAYOUT

AFRI-INFRA GROUP (Pty) Ltd
CONSULTING ENGINEERS AND PROJECT MANAGERS
PO BOX 1815
MIDDELBURG, 1050
MIDLANDS OFFICE PARK,
UNIT 5, BLOCK C
2 WALTER SISULU STREET, MIDDELBURG
TEL: (013) 282 8426/8
FAX: (013) 282 8424
E-MAIL: [illegible]@afri-infra.com
hennie@afri-infra.com

sanas ISO 9001:2008

DESIGNED BY	K.G.	DRAWN BY	L.J.B.
DESIGN CHECKED	B.G.L.	DRAWING CHECKED	E.J.

APPROVED BY

FOR AFRI-INFRA GROUP (PTY) LTD. DATE

CONTRACT NUMBER
--

FILE NUMBER
--

SCALE	SHEET SIZE
1:2000	A1

DATE
OCTOBER 2015

DRAWING NUMBER
2014/15/L02 REV.B

6.3.6 Roads

As indicated in Section 6.2, four different layout plans were provided with four different road layouts.

Figure 2.1 provides an indication of the original layout plan (Layout Plan no. 1) designed by Urban Dynamics Inc. (2009) and the original road layout. However as indicated in Section 6.2.2, the layout of the roads was changed as indicated in Layout Plan no. 2 (Figure 6.1) in order to accommodate the sewer and storm water as recommended by the engineers. The general road layout as provided in Layout Plan no. 2 (Figure 6.1) was thus also used in Layout Plan no. 3 (Figure 6.2) and Layout Plan. 4 (Figure 6.3).

According to Urban Dynamics Inc. (2009), the existing access road to Towers will be upgraded to be 7.4m wide with a 30m road reserve. The intersection of the R104 and the new access road will be provided with signage and road markings as required by the Department of Roads and Transport and the Steve Tshwete Local Municipality. The road will be sealed with hot-mix asphalt and will have 20-25 mm thick precast concrete kerbs.

Figure 6.5 provides the new road layout in line with the latest layout plan (i.e. Layout Plan No. 4; Figure 6.3).

Further details with regards to the roads are provided in Section 2.5.5.

See Section 6.4 for details regarding the No Project Option.

6.4 The 'No Project Option'

The 'no project option' is the alternative of not going ahead with the proposed development. The 'no project option' is only considered if it is found that the development will have significant negative impacts on the environment, which cannot be mitigated or managed.

If the 'no project option' in terms of the proposed development was exercised, it would mean that a new site would have to be investigated, the potential impacts on the environment determined, the interested and affected parties consulted and a new layout would have to be designed. Other uses for the site would also have to be investigated.

No project impacts would result in the project applicant having to find another site for the proposed development or continue managing the site as required in terms of the approved zoning of the site.

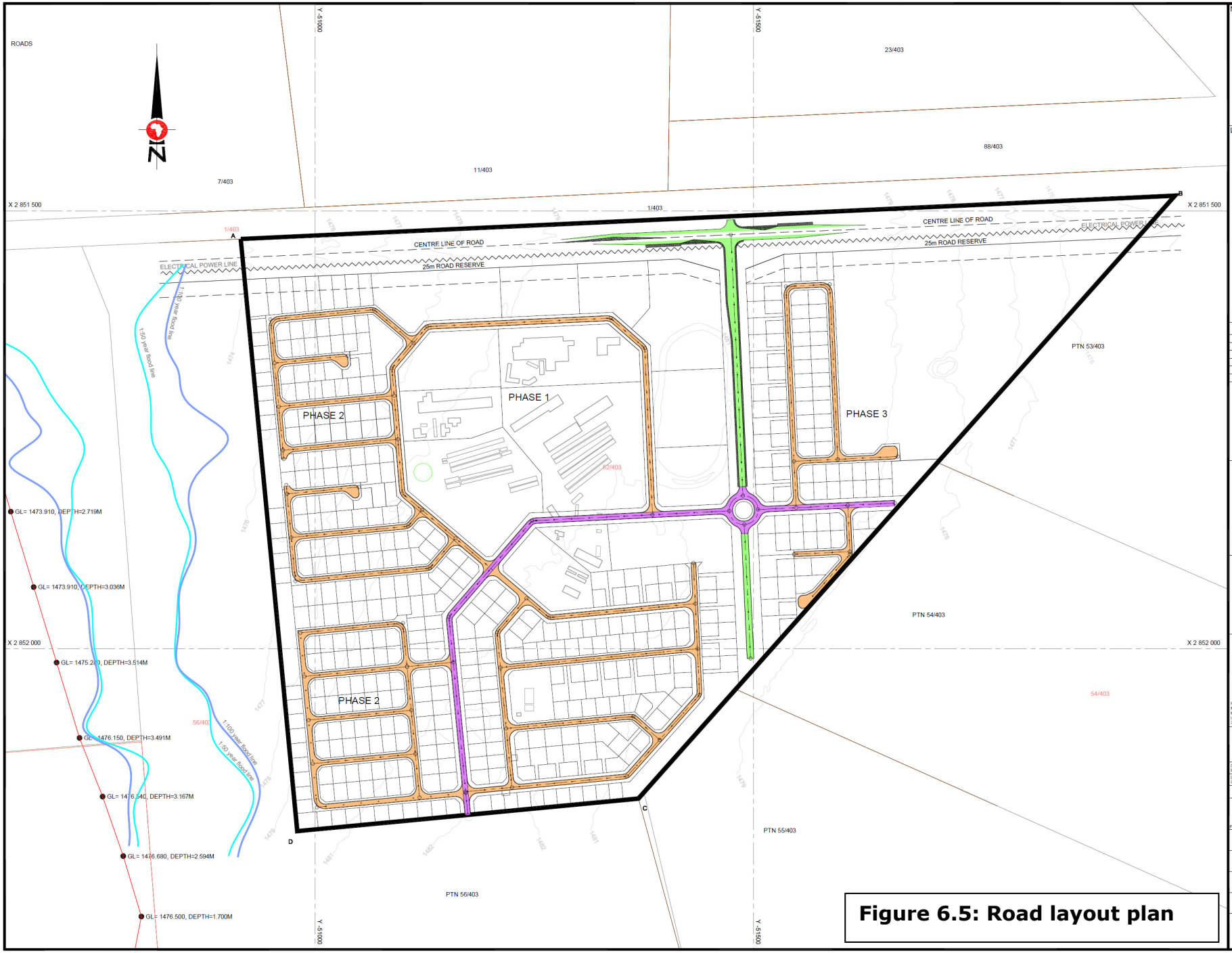


Figure 6.5: Road layout plan

NOTES

LEGEND

- 7.4m ROAD - 450m
- 6.0m ROAD - 752m
- 5.5m ROAD - 4528m

AMENDMENTS

NO. / CODE	DATE	INITIALS	DESCRIPTION
REV.B	10/15	E.J.	LAYOUT REVISED AS WELL AS SERVICES

CLIENT

IVY JEWEL GROUP (PTY) LTD

CORNER OF EKSTEEN AND WATER SISULU STREETS
25 TOWN SQUARE BUILDING
MIDDELBURG
1050

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estelle@davidestates.co.za

PROJECT

ENGINEERING SERVICES FOR THE RESIDENTIAL DEVELOPMENT OF PTN 52 OF FARM RONDEBOSCH 403JS / MIDDELBURG EXT.44

DRAWING TITLE

ROADS LAYOUT

AFRI-INFRA GROUP (Pty) Ltd
CONSULTING ENGINEERS AND PROJECT MANAGERS
PO BOX 1915
MIDDELBURG, 1050
MIDLANDS OFFICE PARK,
UNIT 6, BLOCK C
2 WALTER SISULU STREET, MIDDELBURG
TEL: (013) 282 8426/8
FAX: (013) 282 9424
e-MAIL : almarie@afri-infra.com
hennie@afri-infra.com

DESIGNED BY	K.C.	DRAWN BY	L.J.B.
DESIGN CHECKED	B.C.L.	DRAWING CHECKED	E.J.

APPROVED BY

FOR AFRI-INFRA GROUP (PTY) LTD. DATE

CONTRACT NUMBER
--

FILE NUMBER
--

SCALE	SHEET SIZE
1:2000	A1

DATE
OCTOBER 2015

DRAWING NUMBER
2014/15-L03 REV.B

6.5 Need and desirability of development

6.5.1 Need for the development:

Urban Dynamics (2009) indicated the need for the development as follows:

'The need for housing within the area of jurisdiction of the Steve Tshwete Local Municipality is an undeniable fact.

Seen in the light that the extension possibilities of the town are restricted due to topographical factors in a western direction and the mining activities in a southern and western direction, the logical future direction of development proves to be the northern to north-eastern and eastern side of the town. This area is also indicated on the Spatial Development Framework 2004 as the hinterland of the town, indicating the direction of growth.

Mpumalanga has long been synonymous with mining activity in South Africa. Mining has made an important contribution to the national economy and provided the impetus for both the development of an extensive physical infrastructure and the establishment of the country's secondary industry.

Today some have estimated that Mpumalanga has 217 big and small mines strewn across the province, which contribute 22.3 percent of the provincial Gross Value Added, or the value of the final goods and services produced in the province. In 2002, there was an estimated 60 000 workers employed in mining alone in Mpumalanga and between 1998 and 2002 mining has also been one of the top exporters and earners of valuable foreign exchange.

Impressive as they may be, these figures may actually understate the importance and role of mining in Mpumalanga. This province is endowed with extensive mineral deposits of coal, gold, platinum, and vanadium, to name a few. But above all, this is a province responsible for approximately 83% of total coal production in the country. (Source www.mpumalanga.gov.za).

Cognisance has been taken of the new regional developments e.g. the Platinum corridor or better known as the Eastern limb platinum corridor. The planning of this development has already contributed to large fluctuations in the property market in Lydenburg, Burgersfort/Steelpoort, Dullstroom and Groblersdal, being the traditional residential townships located in close proximity to the said corridor.

The re-opening of the moth balled Komati and Camden Power stations, and the upgrading of Arnot Power Station will also result in more job opportunities in the region. As a result of the above mentioned investment in the area, not only the mining sector will benefit, but all ancillary services and industries. This in turn will result in the creation of more job opportunities which in turn will create a demand for housing.

This is specifically the case in Middelburg. Recent market research conducted by Fernridge Consulting in the Middelburg area has shown that there is a demand for housing in the price range between R400 000 and R 650 000. It further indicated that there was a 4% annual growth in the middle and higher income households between 2001 and 2007 and a projected growth of 12% between 2007 and 2011 for the same household group. This furthermore indicates the need for housing that is on the rise in Middelburg'.

6.5.2 Desirability of the development

Urban Dynamics (2009) indicated the desirability of the development as follows:

'It is not enough to motivate the proposed development only in terms of need, but it must also be evaluated in terms of desirability.

The aspect that immediately comes to mind is the fact that the development is in close proximity to Columbus Steel, Ferrochrome and other industries which are major employers. The main industrial area of Middelburg lies within 2km from the proposed development. The development thus gives people the opportunity to reside closer to the workplace.

The development is furthermore within easy access of the N4 highway. This provides an opportunity for people who travel for their jobs to minimize travelling time by residing in close proximity to the highway. Mines and power stations around Middelburg are easily accessible through the N4-highway which is only approximately 6km from the proposed residential area.

Furthermore, the implementation phase will have a positive economic impact as far as job creation is concerned and poses to have a positive impact on overall development within the town boundaries. A letter was received from the Steve Tshwete Local Municipality confirming that similar development located adjacent to the proposed development is within the urban edge as defined by the SDF. Therefore the proposed township development is likely to be supported by the municipality on condition that the bulk infrastructure is upgraded to meet the demand of the proposed development.

In this economic climate it might come across as foolish to invest in such a development if there are no prospects towards an upside on the housing market, However Mr. Tony Clarke, Managing Director of Rawson Properties rightly pointed out that he expects residential growth to rise by 60% in 2011 and the upswing in the housing market can be expected as early as next year (Business Beeld, 9 May 2008).

The proposed development will also comply and strive to comply with the following principles of the Development Facilitation Act 67 of 1995:

a) Policy, administrative practice and laws should provide for urban and rural land development and should facilitate the development of formal and informal, existing and new settlements.

b) Policy, administrative practice and laws should promote efficient and integrated land development in that they –

- *Promote the integration of the social, economic, institutional and physical aspects of land development;*
- *Promote integrated land development in rural and urban areas in support of each other;*
- *Promote the availability of residential and employment opportunities in close proximity to or integrated with each other;*
- *Optimize the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;*
- *Encourage environmentally sustainable land development practices and processes.*

c) Policy, administrative practice and laws should promote sustainable land development at the required scale in that they should –

- *Promote land development which is within the fiscal, institutional and administrative means of the Republic;*
- *Promote the establishment of viable communities;*
- *Promote sustained protection of the environment;*
- *Meet the basic needs of all citizens in an affordable way; and*
- *Ensure the safe utilization of land by taking into consideration factors such as geological formations and hazardous undermined areas.*

d) Each proposed land development area should be judged on its own merits and no particular use of land, such as residential, commercial, conservational, industrial, community facility, mining, agricultural or public use, should in advance or in general be regarded as being less important or desirable than any other use of land. Land development should result in security of tenure, provide for the widest possible range of tenure alternatives, including individual and communal tenure, and in cases where land development takes the form of upgrading an existing settlement, not deprive beneficial occupiers of homes or land or, where it is necessary for land or homes occupied by them to be utilized for other purposes,

their interests in such land or homes should be reasonably accommodated in some other manner.

e) *A competent authority at national, provincial and local government level should co-ordinate the interests of the various sectors involved in or affected by land development so as to minimize conflicting demands on scarce resources.*

f) *Policy, administrative practice and laws relating to land development should stimulate the effective functioning of a land development market based on open competition between suppliers of goods and services.*