

**ENVIRONMENTAL IMPACT ASSESSMENT  
(EIA) REPORT FOR  
THE PROPOSED RESIDENTIAL  
DEVELOPMENT ON PORTION 73 OF THE  
FARM WATERKLOOF 305 JQ, RUSTENBURG,  
NORTH WEST PROVINCE**

**REF: NWP/EIA/27/2013**

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## LIST OF DEFINITIONS, ABBREVIATIONS AND ACRONYMS

BID .....	Background Information Document
BOD.....	Biological Oxygen Demand
BPDM.....	Bojanala Platinum District Municipality
CBA.....	Critical Biodiversity Areas
CBD.....	Central Business District
CARA .....	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
CFC.....	Chloro Fluoro Carbons
CSIR.....	Council for Scientific and Industrial Research
DAFF .....	Department of Agriculture, Forestry & Fisheries
DEA.....	Department of Environmental Affairs
DPWRT .....	Department of Public Works, Roads & Transport
DWA.....	Department of Water Affairs
EAP.....	Environmental Assessment Practitioner
ECA.....	Environment Conservation Act, 1989 (Act 73 of 1989)
ECO.....	Environmental Control Officer
EIA.....	Environmental Impact Assessment
EIR.....	Environmental Impact Report
EMF.....	Environmental Management Framework
EMP.....	Environmental Management Programme
EO.....	Environmental Officer
GDP.....	Gross Domestic Product
GGP.....	Gross Geographical Product
GNR.....	Government Notice Regulation
GPS.....	Global Positioning System
I&AP.....	Interested and Affected Party
ID.....	Identification Document
LUMS .....	Rustenburg Land Use Management Scheme
mamsl.....	metres above mean sea level
MAP.....	Mean Annual Precipitation
MAR.....	Mean Annual Runoff
MPE.....	Magaliesberg Protected Environment
NEMA.....	National Environmental Management Act, 1998 (Act 107 of 1998) as amended
NEMBA .....	National Environmental Management Biodiversity Act, 2004 (Act 10 of 2004)
NHRA .....	National Heritage Resources Act, 1999 (Act 25 of 1999)
NWA.....	National Water Act, 1998 (Act 36 of 1998)
NW DEDECT.....	North West Department of Economic Development, Environment, Conservation and Tourism
OHSA.....	Occupational Health and Safety Act, 1983 (Act 85 of 1983)
PPE.....	Personal Protective Equipment
PPP.....	Public Participation Process
RLM.....	Rustenburg Local Municipality
ROCLA.....	Rustenburg Olifantsnek Corridor Landowners Association
SABS.....	South African Bureau of Standards
SAHRA.....	South African Heritage Resources Agency
SANBI.....	South African National Biodiversity Institute
SANS.....	South African National Standards

SDF .....	Spatial Development Framework
SEA .....	Strategic Environmental Assessment
SPUD .....	Solar-powered Dehydration
SS.....	Suspended Solids
VOC.....	Volatile Organic Compounds
WMA.....	Water Management Area

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## 1 INTRODUCTION

### 1.1 Background

HydroScience cc, an independent Environmental Assessment Practitioner (EAP), has been appointed by Christo Weyer Familie Trust, to undertake a full Environmental Impact Assessment (EIA) and submit a Scoping Report as well as an Environmental Impact Report (EIR) to the relevant authority to apply for environmental authorisation for the proposed residential development on Portion 73 of the farm Waterkloof 305 JQ, Rustenburg, in the North West Province.

As part of the EIA process (Figure 1-1), an application, in terms of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998), as amended, and associated EIA Regulations of 2010, has been submitted to the North West Department of Economic Development, Environment, Conservation and Tourism (NW DEDECT). On the 1<sup>st</sup> of August 2013, acknowledgement of receipt (including reference number) was received from NW DEDECT and the Public Participation Process (PPP) subsequently commenced.

The Scoping Report and plan of study for EIA was submitted to NW DEDECT on 31 October 2013 and was subsequently accepted on 12 December 2013.

This EIA report contains the relevant and applicable information required for a comprehensive understanding of the project as well as the suggested mitigation for the potential impacts which may be exerted by this project.

### 1.2 Details of Proponent

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<b>Contact person:</b>	Christo Weyer
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### 1.3 Details of EAP

<b>Company:</b>	HydroScience cc
<b>Registration no:</b>	2008/056910/23
<b>Contact person:</b>	Ms Paulette Jacobs
<b>Postal address:</b>	P.O. Box 1322, Ruimsig, 1732
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The EAPs who compiled this EIA Report include Ms Paulette Jacobs (Director, HydroScience) and Ms Louise van Wyk (Senior Environmental Scientist, HydroScience) both of whom have undertaken many EIAs for similar activities, projects and developments. The Curriculum Vitae of the aforementioned professionals, as well as project lists and company profile indicating previous experience in similar projects are included in Appendix A.

#### **1.4 Details of Property**

<b>Province:</b>	North West Province
<b>District municipality:</b>	Bojanala Platinum District Municipality (BPDM)
<b>Local municipality:</b>	Rustenburg Local Municipality (RLM)
<b>Farm:</b>	Waterkloof 305 JQ
<b>Farm portions:</b>	73
<b>Surveyor General (SG) code:</b>	T0JQ00000000030500073
<b>Title Deed:</b>	T15010/1997
<b>Registration date:</b>	1997/02/21
<b>Size:</b>	41.65 Ha
<b>Owner:</b>	Christo Weyer Familie Trust
<b>Future name:</b>	Waterkloof Hill Extension 4

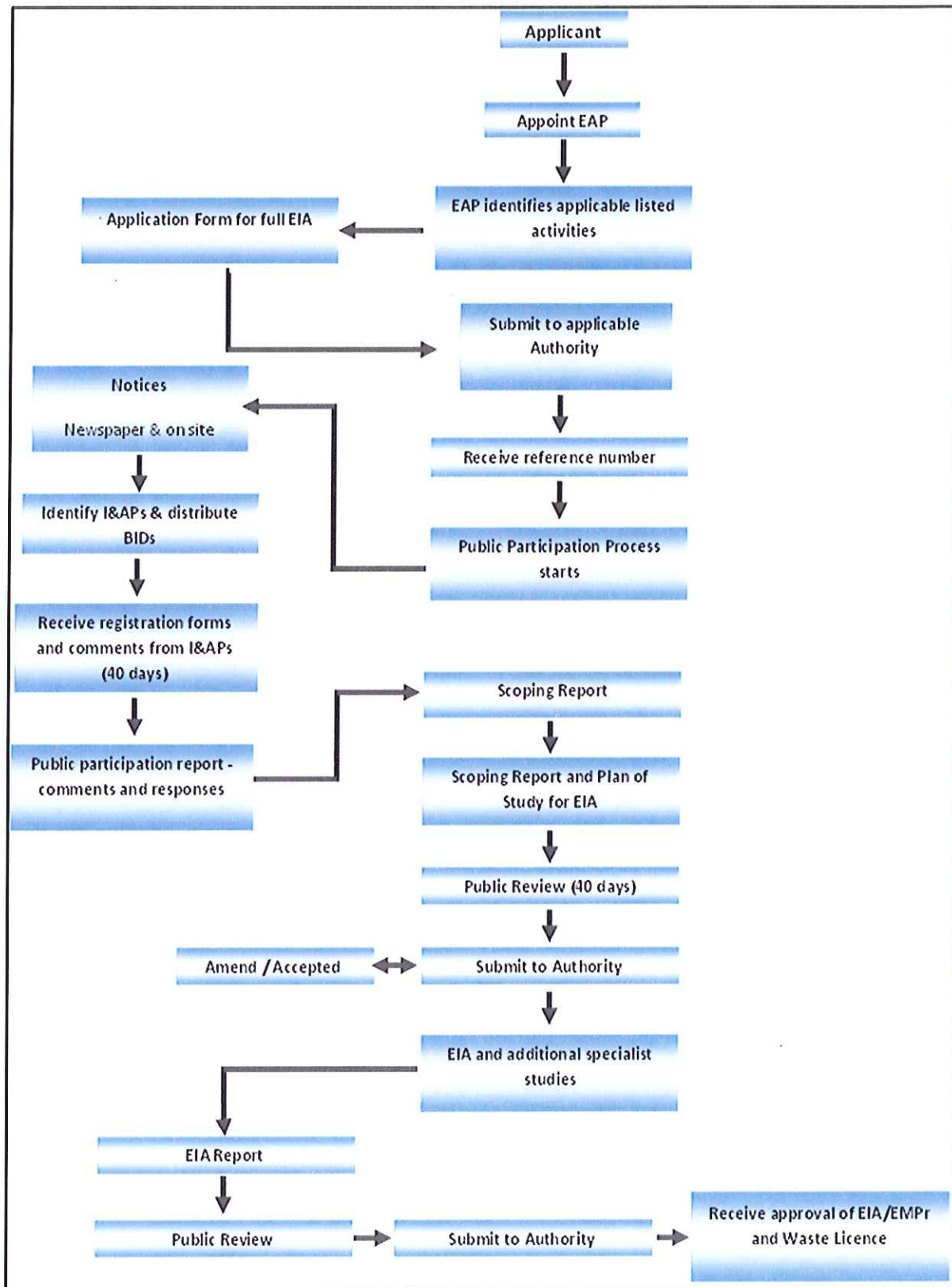


Figure 1-1: Simplified diagram explaining the EIA process

## 2 DESCRIPTION OF THE ACTIVITY

### 2.1 Nature

Portion 73 of the farm Waterkloof 305 JQ, is 41.65ha in size and is currently largely undeveloped but disturbed due to historic agricultural practises. In the process of developing the site into a residential township (Waterkloof Hill X4), the following main activities will take place:

- Vegetation will be cleared during earth works and construction phase;
- Bulk services (sewage, electricity, water supply and roads) will be installed; and
- Structures (residential units) will be built during the construction phase.

The planned infrastructure will include:

- Residential units (836 units) - 14 residential 2 stands across 29.84ha at 30 units/ha;
- Private open space – 10 stands across 2.01ha
- Access (0.13ha for access control) and internal roads (across 9.86ha) (3526m), from Serengeti Drive two (2) internal entrance roads will be developed (Malawi Drive 27m, Botswana Drive 27m) and three (3) roads within the estate (Sahara Avenue, Okavango Drive, Zanzibar Avenue);
- Infrastructure for bulk services (water supply and sewage).

The layout of the residential development can be seen in Figure 2-1.

### 2.2 Motivation

**Objective:** The main objective of the project is to establish a residential development that will contribute to the development and growth of Rustenburg, consequently adding to the Gross Domestic Product (GDP) of the city as a whole.

**Need:** According to the Rustenburg Spatial Development Framework (SDF, 2010), the total population of Rustenburg has increased from 395 000 in 2001 to nearly 450 000 in 2007. This represents an increase of 13.6% over this period and thus implies an annual growth rate of approximately 2.3%. A notable feature is that the growth in the number of households (25.6%) was nearly double that of the population figures, translating into a household growth rate of 4.3% per annum. Approximately 84% of the Rustenburg Municipal Area population can be classified as urbanized, residing in either urban or rural settlements. Only 10% of the total population lives on farms. Furthermore, the agricultural sector only accounted for 3.4% of the employed population in 2007, this slightly decreased from 4.1% in 2001. A low percentage of the male population (2.6%) is involved in the agricultural sector.

The Rustenburg Housing Sector Plan analysed the total overall municipal housing need, as well as the spatial disaggregation housing need per settlement cluster. According to these figures, the total backlog (which comprises of informal structures in informal settlements, informal structures in backyards, traditional houses constructed of traditional materials and other informal categories), is estimated to be approximately 58 600 units. This backlog is mostly concentrated in the Boitekong/Kanana Cluster ( $\pm 14\ 000$ ), the Thekwane-Mfidikoe-Photsaneng Cluster ( $\pm 12\ 000$ ) and the Rustenburg/Thlabane cluster ( $\pm 6\ 000$ ) (SDF, 2010).

The potential future growth of the municipality, resulting from both natural growth, as well as immigration to the area due to its high economic growth rate, will result in an additional demand for housing up to 2015. The total additional demand over this period is estimated to be approximately 57 000 units. This figure includes both affordable housing units to be provided through the public sector, as well as bonded houses to be provided through the

private sector (SDF, 2010).

**Benefit:** A socio-economic benefit to the Rustenburg area and to surrounding landowners to the project site (increase in property value).

**Urban sprawl:** The development is not regarded as urban sprawl, due to the fact that other developments are adjacently situated to the site and the project area is located within the urban edge. The proposed project promotes densification as it is regarded as in-fill between other developments.



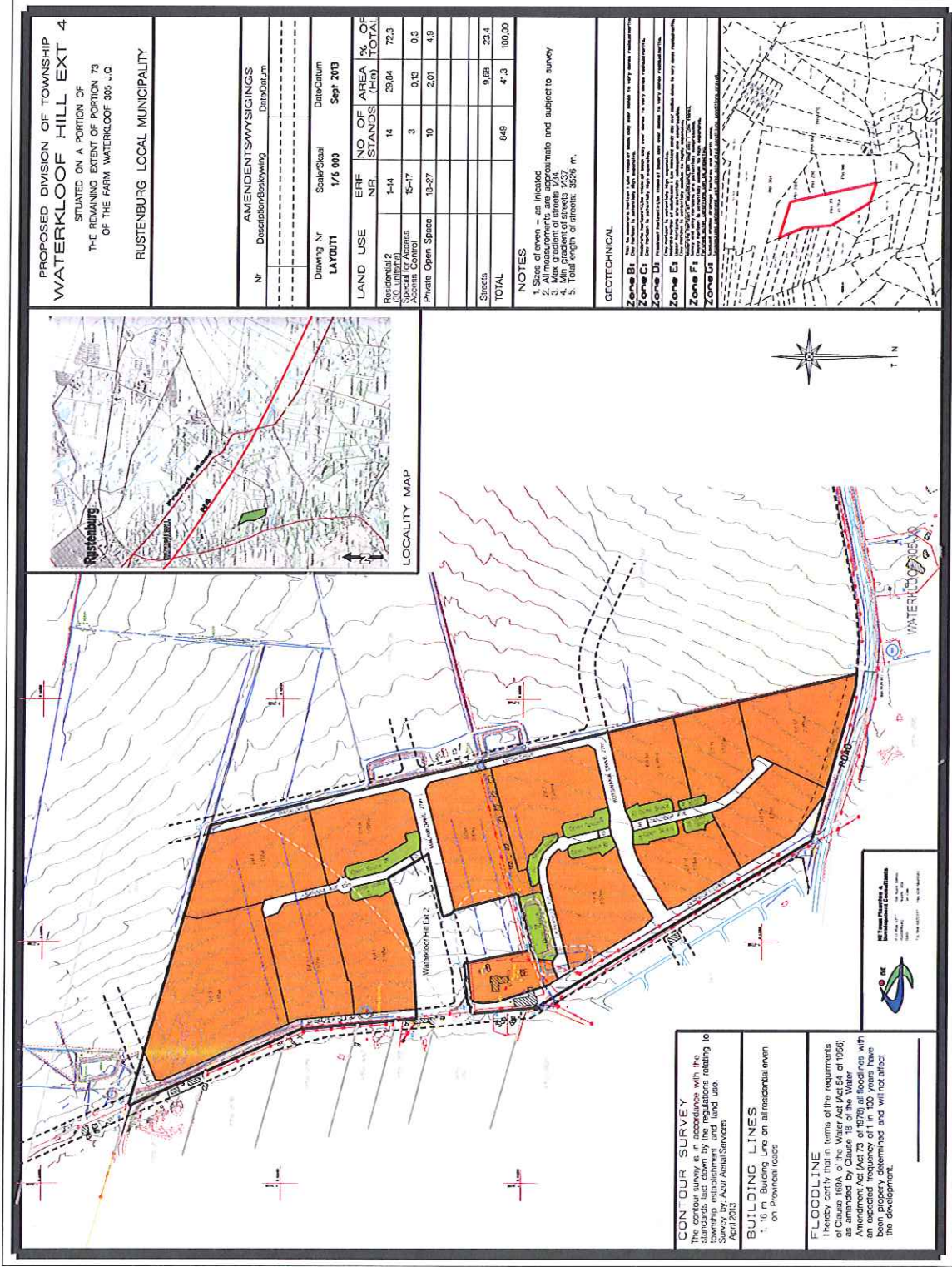


Figure 2-1: The proposed layout for the project area



### **3 LEGAL REQUIREMENTS AND GUIDELINES**

#### **3.1 Constitution of South Africa, 1996 (Act 108 of 1996)**

The Constitution of South Africa, 1996 (Act 108 of 1996) places a duty on the State to protect the environment. Section 24 states that:

“Everyone has the right

- a. to an environment that is not harmful to their health or well-being; and
- b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that
  - i. prevent pollution and ecological degradation;
  - ii. promote conservation; and
  - iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

This right is given effect in several articles of national legislation discussed below.

Section 26 also states that:

- Everyone has the right to have access to adequate housing.
- The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of this right.

#### **3.2 National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) as amended, and associated Regulations of 2010**

##### **3.2.1 Sustainable development**

The principle of Sustainable Development has been established in the Constitution of the Republic of South Africa, 1996 (Act 108 of 1996) and given effect by NEMA and the Environment Conservation Act (ECA), 1989 (Act 73 of 1989). Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations. Thus, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;
- That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner;
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;
- Negative impacts on the environment, on people's environmental rights be anticipated; and, prevented, and where they cannot altogether be prevented, are minimised and remedied.

The principles underpinning environmental management contained in the NEMA must be taken into account by any organ of state in the exercise of any power that may impact on the environment.

### 3.2.2 NEMA Regulations

Government Notice Regulations (GNR) 543, 544, 545 and 546 of 18 June 2010 contain the regulations pertaining to EIA under sections 24(5), 24M and 44 of the NEMA. The project falls under the listed activities of GNR 545 (Listing Notice 2, 18 June 2010) for which a full EIA is required according to legislation:

**Activity 15:** Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use, where the total area to be transformed is 20 hectares or more.

GNR 543 stipulates requirements in terms of processes to be followed and information to be included in documentation. The Public Participation Process (PPP) was carried out in accordance with Chapter 6 of NEMA as amended and in support of the EIA Regulations, 2010 (GNR 543 section 54 – 57) and associated guidelines.

GNR 546 is not applicable as the site is located outside the Magaliesberg Protected Environment (MPE), the MPE buffer zone and any Critical Biodiversity Areas (CBA) 1.

### 3.3 Conservation of Agricultural Resources Act (CARA), 1983 (Act 43 of 1983)

The aim of the Act is to provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

To achieve this aim, the following objectives are included:

- To provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land;
- The combating and prevention of erosion and weakening or destruction of the water sources, and
- The protection of the vegetation and the combating of weeds and invader plants.

The landowners previously farmed with chillies and wheat, but farming activities have ceased since 2007 due to the proposed golf estate development that would have included the development of residential homes on this portion of farmland.

### 3.4 National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act 10 of 2004)

Although South Africa became a signatory to the Convention of Biological Diversity in 1998, the more recent enactment of national legislation has affirmed our country's commitment to biodiversity and conservation. NEMBA has been promulgated by the South African President and was published in the Government Gazette in June 2004 (Volume 467; No. 26426). One of the objectives of this Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and to ensure the sustainable use of indigenous biological resources.

Threatened and Protected Species Regulations: Part 2 of NEMBA provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival. In February 2007, this was achieved as the Minister of Environmental Affairs and

Tourism published a list of Critically Rare, Endangered, Vulnerable and Protected Species, according to Section 56(1) of the Act.

The project area is located on the boundary and outside of the MPE buffer zone; therefore legislation regarding protected environments is not applicable.

### **3.5 National Forests Act, 1998 (Act 84 of 1998)**

Natural forests and woodlands form an important part of the environment and need to be conserved and developed according to the principles of sustainable management. They also have an impact on the environment and need to be managed appropriately, this includes invaders like Eucalyptus or Pinus species encroaching the riparian vegetation that impact on indigenous flora and river flows. The purpose of this Act is to:

- Promote the sustainable management and development of forests for the benefit of all;
- Create the conditions necessary to restructure forestry;
- Provide special measures for the protection of certain forests and trees;
- Promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes;
- Promote community forestry; and
- Promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged or by unfair discrimination.

In this proposed project, it is specifically with reference to Protected Tree species.

### **3.6 National Heritage Resources Act (NHRA), 1999 (Act 25 of 1999)**

Aspects concerning the conservation of cultural resources are dealt with mainly in two acts. These are the NHRA and the NEMA.

According to the NHRA, the following is protected as cultural heritage resources:

- a. Archaeological artefacts, structures and sites older than 100 years
- b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography
- c. Objects of decorative and visual arts
- d. Military objects, structures and sites older than 75 years
- e. Historical objects, structures and sites older than 60 years
- f. Proclaimed heritage sites
- g. Grave yards and graves older than 60 years
- h. Meteorites and fossils
- i. Objects, structures and sites of scientific or technological value.

The national estate includes the following:

- a. Places, buildings, structures and equipment of cultural significance
- b. Places to which oral traditions are attached or which are associated with living heritage
- c. Historical settlements and townscapes
- d. Landscapes and features of cultural significance
- e. Geological sites of scientific or cultural importance
- f. Archaeological and paleontological importance
- g. Graves and burial grounds
- h. Sites of significance relating to the history of slavery
- i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)

### 3.7 Other supporting documentation

Other documents considered during the EIA process include:

- Rustenburg Spatial Development Framework (SDF), North West, 2010.
- Rustenburg Strategic Environmental Assessment (SEA), 2003. Eco Assessments ecological and environmental consultants in association with African EPA, Motso planning and development consultants, MetroGIS. September 2003.
- Rustenburg Land Use Management Scheme (LUMS), 2005.
- Magaliesberg Protected Environment (MPE) Environmental Management Framework (EMF) and Plan. Draft. October 2007.

The development of this property was previously approved as part of a golf estate on 14 July 2008 (Ref: NWP/EIA/145/2006) (Appendix B).

## 4 ENVIRONMENTAL SETTING

### 4.1 Site Description

The proposed residential development will be established on Portion 73 of the farm Waterkloof 305 JQ, Rustenburg, North West Province. The proposed portion of land is situated approximately 6.4 km south of the Rustenburg Central Business District (CBD) on the D1641. The site can be accessed via a gravel road from the R24 to the western boundary of the site or from a road (Serengeti Drive) off the D1641 on the southern boundary of the site. Global Positioning System (GPS) coordinates are 25° 43' 40" South and 27° 16' 19" East (please refer to the locality map, Figure 4-1 and Figure 4-2). The farm is bordered by agricultural land and farmsteads on the western, northern and eastern boundary of the site. South west of the site another residential development (Savanna Falls) has already been established. Directly south of the site is the D1641, with a disturbed natural site further south. An illustration of the surrounding land use can be seen in Figure 4-3. Photos indicating the surrounding land use can be seen in Appendix C. The current site layout can be seen in Figure 4-4.

The project area is currently mostly undeveloped, excluding a farmstead and small accommodation units for workers. The remainder of the site has been disturbed by agricultural activities. The Rustenburg SEA identified the current land use as mixed land use, predominantly agriculture. According to the Rustenburg SDF (2010), the proposed/planned project area zoning is "Single Residential", and therefore this project is in line with the SDF. Other land uses within the vicinity include guest houses (Bambalela, Pine Inn Lodge), Car sales and other small businesses, Churches (Vantage Point, Waterval Gemeente) and a nursery school (Klein Hoewe). Regionally, the property falls within the RLM, which, in turn, forms part of the BPDM.







Figure 4-2: Google™ locality map of Portion 73 on the farm Waterkloof 305 JQ



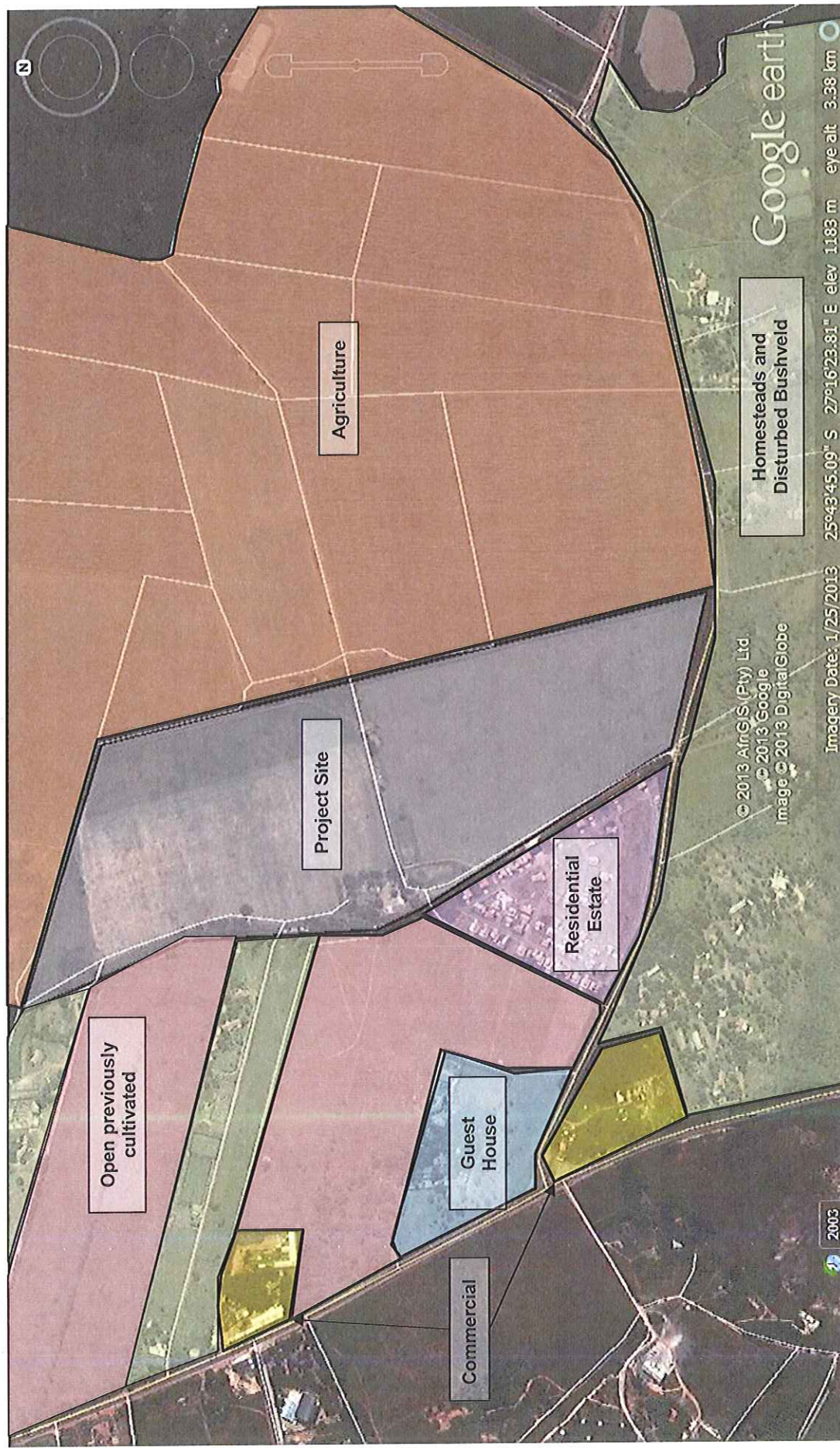


Figure 4-3: Google™ image showing current surrounding land use





Figure 4-4: Current layout of the project area

## 4.2 Physical Environment

The physical environment includes biotic factors such as fauna and flora as well as abiotic factors such as temperature, wind, precipitation (rainfall), evaporation, air quality, topography, geology and the soil type that is characteristic of this site/area. The information in this section (Section 4.2 and 4.3) was pre-dominantly adapted from the Rustenburg SEA (2003), Rustenburg SDF (2010), DEA Draft Macroscale Siting Report (2012), MPE EMF (2007) were applicable and the SANBI (South African National Biodiversity Institute) BGIS system.

### 4.2.1 Climate

Rustenburg falls within the Summer Rainfall Climatic Zone. The area is characteristically warm to hot with rainfall that is erratic and extremely variable, ranging from 450 to 750mm per year.

The mean circulation of the atmosphere is predominantly anti-cyclonic throughout the year, except near the surface where meso-scale circulations prevail (Matrix Environmental Consultants, 2001). Fine conditions with little or no rainfall, and light variable winds with a northerly component occur over the region. Elevated inversions, which occur as a result of the anticyclonic subsidence, suppress the diffusion and vertical dispersion of pollutants by reducing the depth of the mixing layer.

Seasonal variations in the position and the intensity of the high pressure cells determine the extent to which the tropical easterly circulation and the circumpolar westerlies are able to impact on the atmosphere over the region. The tropical easterlies, and the occurrence of easterly waves and flows, affect the region throughout the year resulting in airflow with a north-easterly to north-westerly component, but their influence is generally weaker during the winter months.

The winter weather is dominated by perturbations in the westerly circulation as a result of the succession of cold fronts moving over the region. The passage of a cold front is characterised by pronounced variations in wind direction, wind speed, temperature, humidity and surface pressure. Airflow ahead of the cold front has a distinct north-north-westerly to north-easterly component. Following the cold front, the northerly wind is replaced by winds with a distinct southerly component.

During the summer months, the anti-cyclonic belt weakens and shifts southwards, allowing the tropical easterly flow to resume its influence over the region.

### **Temperature**

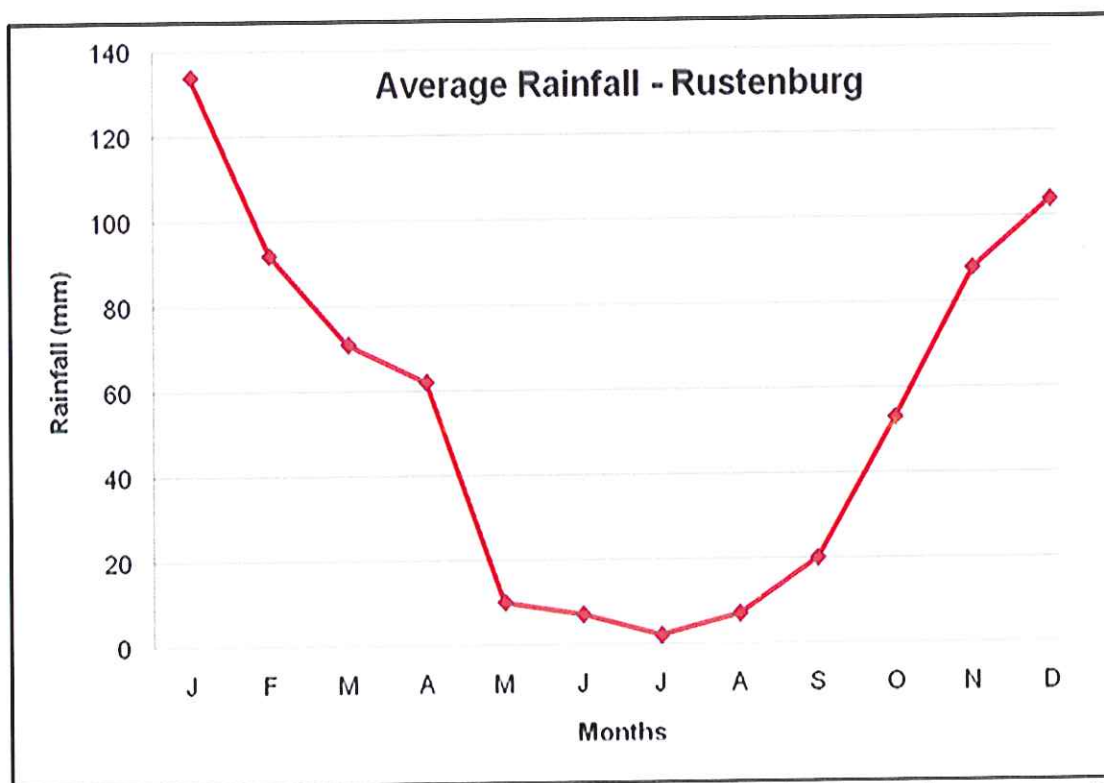
Temperatures typically range between 16°C and 31°C during the summer months, with daily averages in the order of 26.5°C. During the winter months, the temperature typically ranges between 3°C and 24°C, with an average temperature of 10.9°C. The average annual temperature for Rustenburg is 18.7°C (refer to Table 4-1). Extreme upper and lower ends of the temperature scale have been recorded at 39.1°C and 2.8°C, respectively (Rustenburg SEA, 2003).

**Table 4-1: Average monthly temperatures recorded over a 29 year period (Rustenburg weather station no. 05115234)**

Month	Average of Daily Temperature (°C)		
	Maximum	Minimum	Mean
January	30.3	17.2	23.8
February	29.4	16.8	23.1
March	28.3	15.0	21.7
April	25.5	11.2	18.3
May	23.3	6.5	14.9
June	20.4	3.2	11.8
July	20.9	2.8	11.8
August	23.7	5.1	14.4
September	27.3	9.6	18.5
October	28.7	12.9	20.8
November	29.4	14.9	22.1
December	30.1	16.1	23.1
Year	26.5	10.9	18.7

**Precipitation and Evaporation**

The mean annual precipitation (MAP) for Rustenburg (as recorded at Weather Station No. 05115234 at a height of 1 157 metres above mean sea level (mamsl) is given as 650mm. January commonly has the highest precipitation (mean of 134 mm) whereas the month of July has the lowest precipitation (mean of 2 mm). The distribution of rainfall through the remainder of the year is illustrated in Figure 4-5. More than 70% of the annual rainfall occurs between the months of October to February.



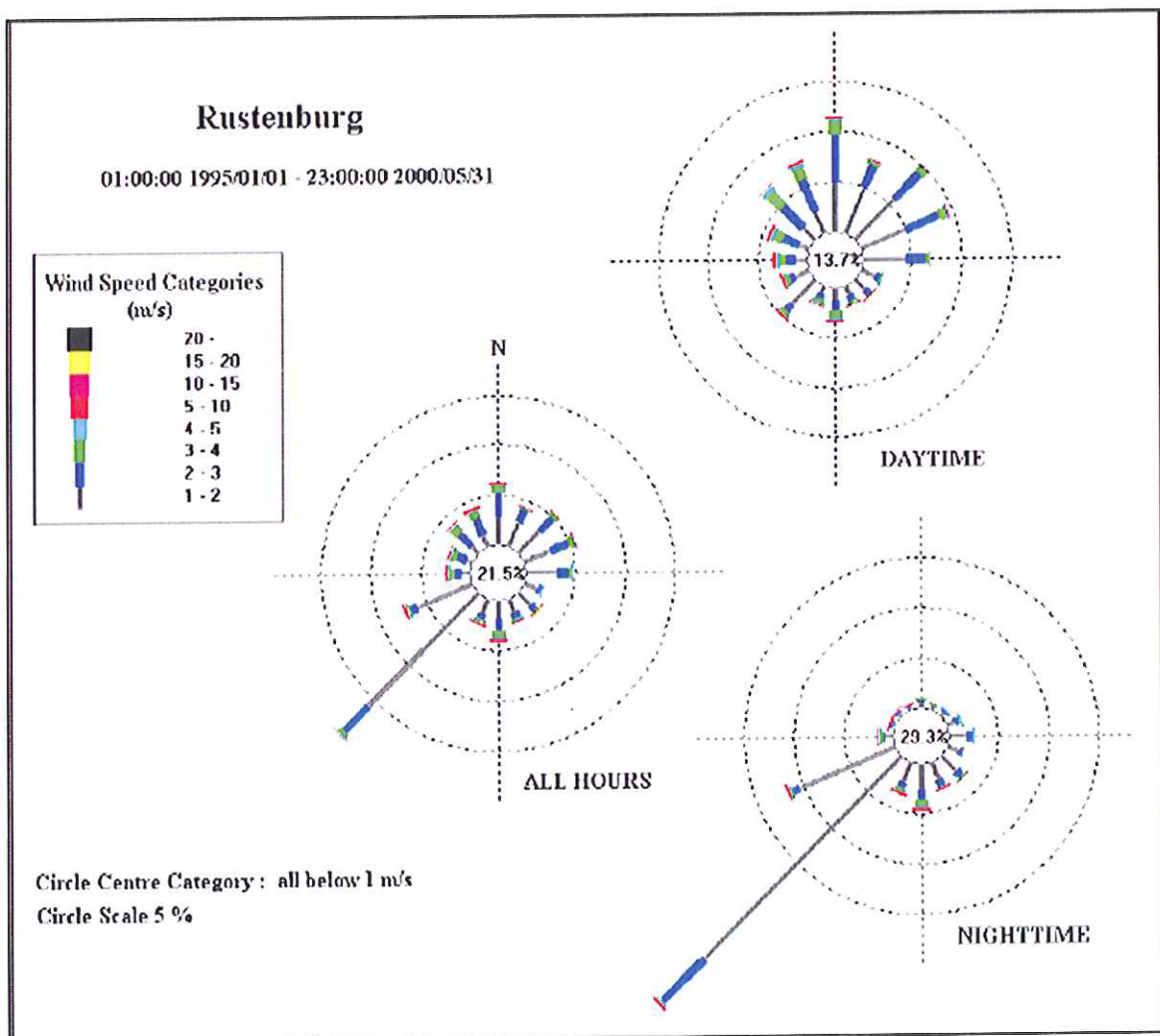
**Figure 4-5: Graph indicating the mean monthly rainfall for Rustenburg over a 29 year period**



**Wind**

Winds are heavily influenced by the underlying topography of the region. Rustenburg town is to the south of the Pilanesberg and experiences moderate northerly winds; another station in Rustenburg experiences frequent south-westerly winds, and strong north-easterly winds. This station is influenced by the Magaliesberg mountain range. A spatial and temporal variability exists in the wind field of the Rustenburg region between day and night.

A clear distinction can be made between the day and night-time wind conditions. Night-times are characterised by an increase in the number of calms as is typical of the night-time flow regime in most regions, and by the predominance of low velocity wind (generally below 3 m/s) from the south-westerly, southern and south-easterly sectors. Calm wind conditions occur nearly twice as much during the night than daytime hours. Furthermore, the winds during the day are mainly from the north-western, northern and north-eastern sectors.



**Figure 4-6: Wind patterns recorded at the Rustenburg weather station**

**4.2.2 Air Quality**

The prominent economic activities within the BPDM are mining and tourism. Large Platinum mines are located in the District, predominantly in the Rustenburg area. The mines are located in a band along the Merensky Reef which stretches west from the Pilansberg towards Marikana and Brits in the east. Although the area is currently not regarded as an air

pollution 'hot spot,' it has been declared a priority area anticipating the future developments in the area, which could result in the area experiencing severe air pollution problems as are seen in the Vaal and Highveld priority areas.

In the BPDM, the area around Rustenburg has the largest potential for future mining activities due to the position of the Merensky Reef (BPDM AQMP, 2010). The National Framework for Air Quality Management in South Africa has identified the Bojanala Platinum District as having poor air quality due to emissions from mining (National Framework for AQM, 2007). Mining, particularly opencast mining, generates dust emissions as a result of quarrying, mining, materials handling, vehicle entrainment from haul roads, wind erosion from open areas, drilling and blasting.

Domestic fuel burning is also a concern in BPDM, with many households not electrified. Domestic fuel burning is of particular significance during winter when more fuel is burnt for warmth and the high pressure system over the region prevents the dissipation of pollution. Transportation is also a source of emissions in the BPDM, with private and commercial vehicle emissions as an overall contributor. Agriculture, biomass burning and waste management are all lesser contributors to overall atmospheric emissions.

An emissions inventory for BPDM was compiled as part of the Air Quality Management Plan for the District. The main sources of air pollution were identified as:

- Industrial operations,
- Mining activities,
- Agricultural activities,
- Biomass burning (veld fires),
- Domestic fuel burning (particularly, coal),
- Vehicle tailpipe emissions,
- Waste treatment and disposal (landfills and incineration),
- Vehicle entrainment of dust from paved and unpaved roads,
- Other fugitive dust sources such as wind erosion of exposed areas.

Pollutants that are of particular concern for BPDM are SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub>. Rustenburg and Madibeng Local Municipalities also have the highest contribution of industrial emissions.

#### **4.2.3 Topography**

The Rustenburg area is typically a combination of slightly undulating plains where more than 80% of the area has slopes of less than 5%, and lowlands, hills and mountains with moderate to high relief (i.e. 50 – 80% of the area has a slope less than 5%).

The site for the proposed residential development is located on a relatively flat piece of land that imperceptibly slopes downwards to the south from 1 183 to 1 181 mamsl (2m vertical drop over 1.1 km horizontal distance). This is expected as the Waterkloofspruit runs further south from the site.

#### **4.2.4 Geology and Geohydrology**

It is evident that the site is underlain by norite and gabbro of the Main zone of the Rustenburg Layered Suite, Bushveld Igneous Complex. Typically these rocks decompose in-situ forming a surface horizon of black, highly expansive clay known colloquially as "black turf", while this residual material may often be covered in a horizon of transported fine colluvial sand.

As a result of deep and extensive chemical weathering, the rock mass has been reduced to residual silty sand and gravels at depth and active clayey soils close to the surface. The depth of this material varies considerably and is usually underlain by residual gabbro, at depths that vary from approximately 1m to greater than 5m.

The 1:250 000 Geological Series 2526 Rustenburg indicate that the proposed project area is situated on Pyroxenite, Dunite and Harzburgite. Norite, Diabase and Quartzite are to be found to the west of the development area. Peroxenite, Norite and Anorthosite are to be found to the north east of the project area. The Pyroxenite and Harzburgite do have early Transmissivity values ranging from 28 to 152m<sup>2</sup>/d and late Transmissivity values of 12.7 to 36.7m<sup>2</sup>/day, indicative of a medium to high yielding aquifer. The depth to static water level measures between 7.00 and 10.15 metres. The static water level depth outside the development area, range between 3.63 and 21.73 metres below ground level. The groundwater rest level was calculated from depth to the water and surface level altitude. The groundwater level altitude mimics the surface topography. The potentiometric contours shows no signs of groundwater over-abstraction in the area (Geo-Logic, 2007).

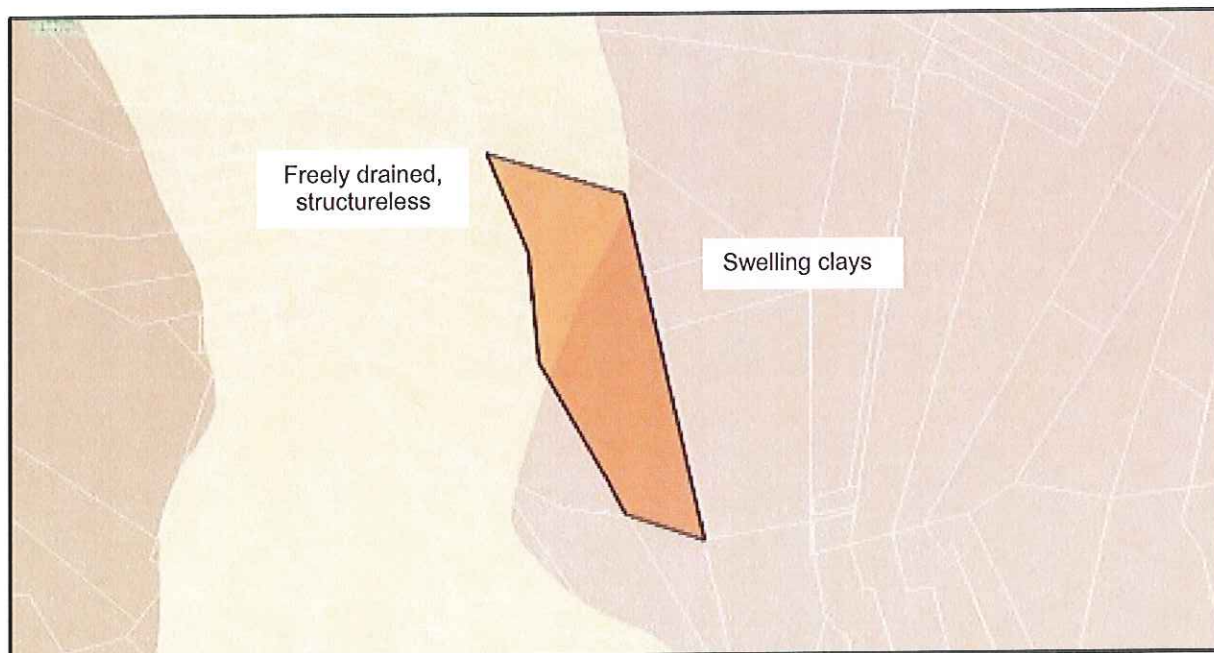
The catchment area feeding the project area aquifer cannot be theoretically defined by the normal topography, due to the physical catchment size being too large and therefore a liberal figure will be calculated. In this case, boreholes with Transmissivity values of in the order of 28 to 152m<sup>2</sup>/d, can gather water from at least 2km away. It will therefore be theoretically correct to establish a groundwater catchment area based on a no flow boundary of 2km from the production boreholes. A catchment area with an estimated 28km<sup>2</sup> surface area can be calculated, from which a groundwater storage figure of approximately 840 000m<sup>3</sup> is established. The groundwater recharge volume is calculated between 2838m<sup>3</sup>/d and 3836m<sup>3</sup>/d and the Harvest potential figure range between 767m<sup>3</sup>/d and 1150m<sup>3</sup>/d (Geo-Logic, 2007).

#### 4.2.5 Soil

Two general soil types are identified to occur within the project area (Figure 4-7).

The north-western section of the site as can be seen in Figure 4-7 is identified to have red, yellow or greyish soils with a high base status. The soil class associated and identified within this region include freely drained, structureless soils. These soils, which are favourable for physical development such as this project, may have a restricted soil depth, excessive drainage, high erodibility and low natural fertility. The south-eastern section of the site has strongly structured cracking soils, mainly dark coloured and dominated by swelling clays (vertic soils). They may occur associated with one or more of melanic and red structured soils. The soil class associated with this area and general soil description is swelling clays which are high in natural fertility, a high swell shrink potential and are very plastic and sticky.





**Figure 4-7: Soil classes identified for the project area**

From the geotechnical specialist study (Johann van der Merwe Pty Ltd, 2007); it was found that the site is underlain by colluvial and alluvial clayey soils, which are underlain by residual soils developed over norite bedrock belonging to the Kroondal Norite Unit, Rustenburg layered Suite, Bushveld Complex. Isolated outcrops and sub-outcrops of very hard rock norite bedrock were encountered within the region and on site where the home of the landowner is situated. Seven prominent geotechnical material zones have been identified across the region, five (5) of which occur on site. They include:

**Soil Zone A:** Occur where outcrop and sub-outcrop of very hard norite rock and shallow, highly weathered bedrock are present below a shallow soil cover of dark grey and dark red, sandy clay.

**Soil Zone B:** A very generalised description of the typical soil profile that maybe encountered here, is as follows:

- 0,0 – 0,3: Slightly moist, dark grey, very stiff, shattered, sandy clay containing scattered gravels and fine roots; colluvium. Upper 300mm generally disturbed by past agricultural activities.
- 0,3 – 1,0: Moist, dark grey to black, stiff, shattered and slicken-sided, silty clay; colluvium.
- 1,0 – 1,2: Abundant coarse norite gravels, clast supported in a matrix of moist, dark grey, silty clay, pebble marker. Overall consistency is medium dense.
- 1,2 – 1,8: Dry, pale-green, olive and yellowish white stained orange on joints, very dense, relict jointed, slightly silty coarse sand containing occasional bands of soft rock and occasional pockets of clay, residual norite.
- 1,8+: White speckled olive and black, moderate weathered to un-weathered, medium to widely jointed, soft rock becoming hard rock norite.

**Soil Zone C:** A very generalised description of the typical soil profile that maybe encountered here, is as follows:

- 0,0 – 0,3: Slightly moist, dark grey, very stiff, shattered, sandy clay containing scattered gravels and fine roots; colluvium. Upper 300mm generally disturbed by past agricultural activities.

- 0,3 – 1,5: Moist, dark grey to black, stiff, shattered and slicken-sided, silty clay; colluvium.
- 1,5 – 1,7: Abundant coarse norite gravels, clast supported in a matrix of moist, dark grey, silty clay; pebble marker. Overall consistency is medium dense.
- 1,7 – 2,0: Dry, pale green, olive and yellowish white stained orange on joints, very dense, relict jointed, slightly silty coarse sand containing occasional bands of soft rock and occasional pockets of clay; residual norite.
- 2,0+: Greenish white speckled olive and black, moderate weathered to un-weathered, medium to widely jointed, soft rock becoming hard rock norite.

**Soil Zone E:** A very generalised description of the typical soil profile that maybe encountered here, is as follows:

- 0,0 – 0,6: Dry, dark brown becoming reddish dark brown, dense, shattered, clayey sand; colluvium. Occasionally extends down to 1,0m below surface.
- 0,6 – 1,1: Slightly moist, dark olive-speckled green, very stiff, shattered and fissured, sandy clay containing scattered ferricrete nodules; residual norite.
- 1,1 – 2,6: Dry, yellowish white speckled green, medium dense becoming dense, relict jointed, slightly silty coarse sand; residual norite.

**Soil Zone G:** Represents disturbed ground conditions occupied by a number of medium and large earth dams as well as a subtle drainage feature.

#### 4.2.6 Surface Water

The study area falls within the Crocodile (West) Marico Water Management Area (WMA) and within the A22H quaternary catchment. The surface water information available is as follows:

Water Management Area (WMA):	Crocodile (West) Marico
Catchment Area:	4.26028 km <sup>2</sup>
Mean Annual Runoff (MAR):	23.7 mm
Mean Annual Precipitation (MAP):	657.65 mm
Quaternary Catchment:	A22H
Closest water course:	Waterkloofspruit 300m south of the project area
Water authority:	DWA Hartbeespoort Regional Office
DWA monitoring:	A2H038 Lower Waterkloofspruit at Rietvallei

#### 4.3 Biotic Environment

The Bojanala District falls within a high biodiversity area of the Province and some significant faunal and floral species may be present in and around the project area.

Although the site predominantly consists of agricultural land, the occurrence of Red Data or protected species is not eliminated. Furthermore, small mammal species, reptiles, birds and arthropods of concern also have a possibility of occurrence. It must be noted however, that a majority of the site has been disturbed by agricultural activities and very little natural/bushveld species remain.

##### 4.3.1 Fauna

Fauna species of concern identified to occur within the Rustenburg area can be seen in Table 4-2 to 4-5. The probability of occurrence was estimated based on findings of the fauna and flora survey (Galago Environmental, 2007) and update by HydroScience to current species lists.



Table 4-2: Red Data mammals that are likely to occur within the Rustenburg region

Scientific Name	Common Name	Status	Probability
<i>Atelerix frontalis</i>	Hedgehog	Rare	Moderate
<i>Civettictis civetta</i>	African Civet	Rare	Low
<i>Cleotis percivali</i>	Short-eared Trident Bat	Indeterminate	Low
<i>Crocidura maquassiensis</i>	Maquassi Musk Shrew	Indeterminate	Low
<i>Graphiurus ocellatus</i>	Spectacled Dormouse	Rare	Low
<i>Manis temminckii</i>	Pangolin	Vulnerable	Low
<i>Mellivora capensis</i>	Honey Badger	Vulnerable	Low
<i>Mystromys albicaudatus</i>	White-tailed Mouse	Vulnerable	Moderate
<i>Orycteropus afer</i>	Aardvark	Vulnerable	Low
<i>Pipistrellus kuhlii</i>	Kuhl's Bat	Indeterminate	Moderate
<i>Poecilogale a. albinucha</i>	African Striped Weasel	Rare	Low
<i>Proteles cristatus</i>	Aardwolf	Rare	Low
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat	Indeterminate	Low
<i>Suncus infinitesimus</i>	Lesser Dwarf Shrew	Indeterminate	Moderate
<i>Suncus lixus</i>	Greater Dwarf Shrew	Indeterminate	Low
<i>Zelotomys woosnami</i>	Woosnam's Desert Rat	Rare	Low

Table 4-3: Red Data bird species that are likely to occur within the Rustenburg region

Scientific Name	Common Name	Status	Probability
<i>Anthus brachyurus</i>	Short-tailed Pipit	Rare	Low
<i>Apus bradfieldi</i>	Bradfield's Swift	Indeterminate	Low
<i>Ardeotis kori</i>	Kori Bustard	Vulnerable	Low
<i>Botaurus stellaris</i>	Bittern	Vulnerable	Low
<i>Falco peregrinus</i>	Peregrine Falcon	Rare	Low
<i>Glareola pratincola</i>	Red-winged Pratincole	Rare	Low
<i>Gypaetus barbatus</i>	Bearded Vulture	Rare	Low
<i>Gypohierax angolensis</i>	Palmnut Vulture	Rare	Low
<i>Gyps coprotheres</i>	Cape Vulture	Vulnerable	Low
<i>Ixobrychus sturmii</i>	Dwarf Bittern	Indeterminate	Low
<i>Mirafra chuana</i>	Short-clawed Lark	Indeterminate	Moderate
<i>Neophron percnopterus</i>	Egyptian Vulture	Endangered	Low
<i>Neotis ludwigii</i>	Ludwig's Bustard	Vulnerable	Low
<i>Polemaetus bellicosus</i>	Martial Eagle	Vulnerable	Low
<i>Porzana pusilla</i>	Baillon's Crake	Indeterminate	Low
<i>Pterocles gutturalis</i>	Yellow-throated Sandgrouse	Indeterminate	Moderate
<i>Terathopius ecaudatus</i>	Bateleur	Vulnerable	Low
<i>Torgos tracheliotus</i>	Lappet-faced Vulture	Vulnerable	Low
<i>Tyto capensis</i>	Grass Owl	Vulnerable	Moderate

**Table 4-4: Red Data herpetofauna species likely to occur within the Rustenburg region**

Scientific Name	Common Name	Status	Probability
<i>Dalophia pistillum</i>	Blunt-tailed Worm-lizard	Peripheral	Moderate
<i>Homoroselaps dorsalis</i>	Striped Harlequin Snake	Rare	Low
<i>Python sebae natalensis</i>	African Rock Python	Vulnerable	Low

**Table 4-5: Red Data arthropod species likely to occur within the Rustenburg region**

Scientific Name	Habitat	Status	Probability
<i>Acraea macheuena</i>	Bushveld	Red Data	Low
<i>Andronymus neander neander</i>	Wetlands/forests	Red Data	Low
<i>Metisella meninx</i>	Wet areas/wetlands	Red Data	Low
<i>Neita neita</i>	Bushveld/Hillsides	Red Data	Low
<i>Spiadia paula</i>	Bushveld	Red Data	Low

#### 4.3.2 Flora

Two vegetation types are identified to occur on the proposed project area, Marikana Thornveld and Moot Plains Bushveld (Mucina and Rutherford, 2006). Although large sections of the natural vegetation around the proposed site have been altered by agricultural activities, some Red Data floral species may still occur in the area however from field investigations (Galago Environmental, 2007), none were found. Red Data species that were considered for the project grid square 2527CB as listed by the South African National Biodiversity Institute (SANBI) can be seen in Table 4-6. Natural vegetation was limited to the farm house garden; the rest of the site has no natural vegetation due to agricultural activities.

**Table 4-6: Red data plant species that might occur within the project area (SANBI, 2012)**

Family	Scientific Name	Common Name	Status
ASPHODELACEAE	<i>Aloe peglerae</i>	Vuurpylaalwyn	Endangered
MESEMBRYANTHEMACEAE	<i>Frithia pulchra</i>	Fairy Elephant's Feet	Rare

Endemic species, meaning species that only occur within South Africa or specific regions of South Africa were also taken into account. Endemic species listed by SANBI to possibly occur within the project area but were not found to be present can be seen in Table 4-7. Exotic/invasive species that were also listed within the grid square of the project area can be seen in Table 4-8.

**Table 4-7: Endemic plant species that might occur within the project area (SANBI, 2012)**

Family	Species Name
ANACARDIACEAE	<i>Searsia rigida</i>
APOCYNACEAE	<i>Aspidoglossum glabrescens</i>
APOCYNACEAE	<i>Huernia transvaalensis</i>
ARALIACEAE	<i>Cussonia transvaalensis</i>
ASTERACEAE	<i>Vernonia staehelinoides</i>

Family	Species Name
ASTERACEAE	<i>Berkheya carlinopsis subsp. magalismontana</i>
ASTERACEAE	<i>Berkheya seminivea</i>
ASTERACEAE	<i>Vernonia staehelinoides</i>
CAMPANULACEAE	<i>Wahlenbergia magaliesbergensis</i>
CELASTRACEAE	<i>Gymnosporia polyacanthus subsp. vacciniifolia</i>
CELASTRACEAE	<i>Gymnosporia polyacanthus subsp. vacciniifolia</i>
CRASSULACEAE	<i>Adromischus umbraticola</i>
EUPHORBIACEAE	<i>Euphorbia clavarioides var. truncata</i>
FABACEAE	<i>Indigastrum burkeanum</i>
MALPIGHIACEAE	<i>Triaspis glaucophylla</i>
MALVACEAE	<i>Hermannia grisea</i>
MALVACEAE	<i>Hibiscus marlothianus</i>
MALVACEAE	<i>Hermannia lancifolia</i>
MALVACEAE	<i>Triumfetta sonderi</i>
POACEAE	<i>Sporobolus pectinatus</i>
PORTULACACEAE	<i>Portulaca grandiflora</i>
RHAMNACEAE	<i>Phyllica paniculata</i>
SCROPHULARIACEAE	<i>Craterostigma wilmsii</i>
VITACEAE	<i>Cyphostemma sulcatum</i>

**Table 4-8: Exotic/invasive plant species that might occur within the project area (SANBI, 2012)**

Family	Species Name
ASTERACEAE	<i>Sonchus maritimus</i>
ASTERACEAE	<i>Tagetes minuta</i>
MOLLUGINACEAE	<i>Mollugo nudicaulis</i>
PORTULACACEAE	<i>Portulaca oleracea</i>
FABACEAE	<i>Senna occidentalis</i>

#### 4.4 Heritage/Archaeology

Sites of heritage/archaeological value were investigated, but no sites in this regard were identified during the specialist survey (J. van Schalkwyk, 2007). Therefore no impacts, positive or negative, are foreseen to be exerted on heritage sites.

#### 4.5 Sensitive areas

As per findings of the specialist studies, no cultural or heritage areas were identified nor any fauna or flora species of concern. An old farm dam, however, exists on site which over time developed ecological attributes unique to this aquatic system, such as the presence of aquatic species. Therefore, loss of this feature/habitat would mean the loss of the species present. This dam will continue to exist throughout the development of the proposed project and during the operational phase as an open area, it will not be removed. Further investigations on other sensitive features were done by HydroScience, such as the project area location in comparison to the MPE buffer and CBA areas (Figure 4-8).



Figure 4-8: CBA map for Portion 73 of Waterkloof 305 JQ

The project area is not regarded as sensitive as it is located outside of the MPE core, on the boundary of the MPE buffer zone and a small section of it in CBA 2 which is also not regarded as sensitive, which is confirmed by the presence of agricultural land and the absence of natural vegetation.

#### 4.6 Socio-Economic Environment

The total population have increased from 395 000 in 2001 to nearly 450 000 in 2007. This represents an increase of 13.6% over this period and thus implies an annual growth rate of approximately 2.3%. A notable feature is that the growth in the number of households (25.6%) was nearly double that of the population figures, translating into a household growth rate of 4.3% per annum. This figure may imply that many extended households who have possibly lived in single dwellings have established themselves as separate households over this period, hence the large growth in households. Approximately 84% of the Rustenburg Municipal Area population can be classified as urbanized, residing in either urban or rural settlements. Only 10% of the total population lives on farms.

The age structure of the population indicates that the population profile is dominated by people in the young economically active age category from 21 to 35. Nearly 33% of the total population falls within this age category, a figure substantially higher than the comparative District figures. This pattern may be the result of the high concentration of economic activities and hence employment opportunities in the Rustenburg area, thus attracting a significant proportion of the population in the economically active age categories. The comparative figures for 2001 and 2007 also indicate that the section of the population in the age category between 21 and 35 has further increased. The proportion of the population between 41 and 55 years of age have also increased notably over the same period.

The gender structure is male dominated with approximately 57% of the total population represented by males. This is probably associated with the economic characteristics of the area which is dominated by the mining sector.

It is generally recognized that the skills profile of a particular area has a significant influence on the economic performance and growth of that region. This information indicates that, although significant progress has been made with the eradication of adult illiteracy (decreasing from proximately 12% to 6.7%), the majority of the adult population have only completed some form of secondary education as highest qualification (representing just over 40% of the total adult population). Although some progress has been made with the percentage of adults who have completed a certificate or diploma (6% by 2007) and those with degrees (2.2% of the 2007 population) this still represents a very low percentage of the adult municipal population. There are no significant differences between the education profiles, although a slightly higher percentage of the male population has only completed primary education compared to the female population. In both categories, the percentage of the adult population with some form of tertiary qualification remains very low.

The estimated unemployment rates in the RLM have decreased from 31.8% in 2001 to 28.2% in 2007. These figures are substantially lower than the comparative district unemployment rate which decreased from 40.8% to 33.7% over the same period. A further notable feature is the significant differences between the levels of unemployment between the male and female population. The unemployment rate of the male population in 2007 was 18.1%, compared to the 46.3% of the female population.

More than 50% of the employed economically active population were involved in the mining sector by 2007. The total number of people employed in this sector has also increased from 57212 in 2001 to 64861 by 2007 and again decreased in 2012 - 2013. The most notable

other sectors is the wholesale and retail trade sector which by 2007 accounted for 10.8% of the employed population (13962 people) and the community, social and personal services sector representing 12% of the employed population (15490 people). This information also indicates that the proportional contribution of the various economic sectors to employment have not dramatically changed between 2001 and 2007. A further important aspect to note is that, despite the large rural areas in the RLM, the agricultural sector only accounted for 3.4% of the employed population by 2007. It also slightly decreased from 4.1% in 2001.

#### 4.6.1 Housing Demand

According to the official census statistics, the proportion of households living in formal houses on separate stands in proportional terms declined somewhat from 47.4% in 2001 to 42% in 2007. This does not imply that the actual number of households residing in formal structures on separate stands have declined (actual number increased from 55146 in 2001 to 61477 in 2007). It does, however, mean that other categories have increased at a faster rate than formal housing in formal settlements, hence the resulting proportional decrease. A further notable feature is the large proportional increase in the number of households residing in informal structures in backyards that increased from 13.4% in 2001 to 21% in 2007. According to the Statistics SA data, the total number of households residing in informal structures in backyards has doubled between 2001 and 2007 (15540 to 30685). A positive feature is the decrease in number of households residing in informal structures in informal settlements that have declined from 30094 in 2001 to 23922 by 2007. This also represents a proportional decrease from 25.9% in 2001 to 16.3% in 2007.

The Rustenburg Housing Sector Plan analysed the total overall municipal housing need, as well as the spatial disaggregation housing need per settlement cluster. The data used for this purpose is based on the information contained in the Rustenburg Housing Strategy and was updated with the results of the backlog study for Local Municipalities completed by the BPD. In some clusters, the estimated housing backlogs in the district backlog study were higher than the estimates contained in the Rustenburg Housing Strategy. The approach adopted in the Housing Sector Plan was to use the higher of the two estimates (aggregated to cluster level) to provide the most realistic backlog figure. According to these figures, the total backlog (which comprises informal structures in informal settlements, informal structures in backyards, traditional houses constructed of traditional materials and other informal categories) is estimated to be approximately 58 600 units. This backlog is mostly concentrated in the Boitekong/Kanana Cluster ( $\pm 14\ 000$ ), the Thekwane-Mfidikoe-Photsaneng Cluster ( $\pm 12\ 000$ ) and the Rustenburg/Thlabane cluster ( $\pm 6\ 000$ ). The potential future growth of the municipality, resulting from both natural growth, as well as immigration to the area due to its high economic growth rate will result in an additional demand for housing over the period up to 2015. The total additional demand over this period is estimated to be approximately 57 000 units. This figure includes both affordable housing units to be provided through the public sector, as well as bonded houses to be provided through the private sector. Based on the socio-economic and affordability characteristics of the Rustenburg population, the Housing Sector Plan estimates that approximately 18% of this future demand will be provided through the private sector in the form of bonded housing and the remainder through the public sector (in the Rustenburg/Thlabane Cluster it was assumed that approximately 80% of the additional demand would be in the form of medium to high income bonded housing). It was further also assumed that approximately 75% of this potential future affordable housing demand would potentially qualify for government assistance in the form of subsidies.

#### 4.6.2 Need for Services

The project area has no direct access to municipal water and is not linked to the municipal sewage management system (also refer to letter dated 14 November 2013, ref 14/1 from

RLM, Directorate Infrastructure Development and Management). Groundwater is currently used, via boreholes, as water supply source. The project area is however within the urban edge.

The design of the water reticulation, sewerage reticulation, roads and storm water system will be in accordance with the “Guidelines for Human Settlement Planning and Design”, (Red Book), compiled under the patronage of the Department of Housing by the CSIR, 2000. Also refer to the Services Report (EPS, 2013) attached.

**Water:** An existing 300mm bulk water pipeline is situated parallel to and on the northern side of Provincial Road D1641, on the southern boundary of the proposed development. A proposed new bulk water pipeline will be installed as part of the upgrading of the water supply and reticulation in the area and connected directly to the existing 300mm bulk water pipeline.

The water demand for the development will be a total of 809.1 kl/day which is based on 3.6 kl/day (1.2 kl/day X 3 stands) for the access control and 805.5 kl/day for the residential area (0.9 kl/day as an average daily demand X 895 stands).

**Electricity:** Municipal electricity is currently supplied to the site under an electrical licence for the distribution area as stipulated by the Department of Energy (rural overhead medium voltage infrastructure). Based on the prescriptions of the NRS 034 and generally accepted norms from the Electrical Engineering Unit of RLM, the increase in demand as a result of the development is 3.2MVA. RLM has completed the construction of the Waterkloof 88/33/11kV substation on the south eastern outskirts of Rustenburg and it is currently fed via an overhead 33kV transmission line until the connection to the 88kV Eskom grid is established. The developer will either install the link service between the Waterkloof Substation and the development or upgrade existing services on behalf of RLM.

**Sewage:** Currently, there is no existing sewerage reticulation system in the vicinity of the proposed development (as confirmed by RLM, 14 November 2013, ref 14/1). All internal sewers will gravitate via a conventional sewer system to an approved new sewerage treatment plant (NWP/EIA/145/2006) to be installed for this and other developments.

For the interim there is an existing sewer pumping station and rising main pipeline situated in the south eastern corner of the development, installed exclusively for the Savanna Falls development. For the Waterkloof Hill X4 development it is propose that this existing sewerage pumping station be upgraded to accommodate both the Waterkloof Hill X4 development and the Savanna Falls development.

The sewer flow for the proposed development has been estimated at 80% of the average daily water demand, i.e. 647.28 kl/day as provision is made for full-flush sanitation.

**Storm water:** The natural drainage pattern of the terrain is from west to north-east and west to the south-east with the two lowest points in the north-eastern and south eastern corners of the terrain. The storm water design will be done in accordance with the “Guidelines for Human Settlement Planning and Design” compiled under the patronage of the Department of Housing by the CSIR, DWAF and design specifications of the Local Authority. Refer to storm water management plan (EPS, 2013).

## 5 PROJECT ALTERNATIVES

### 5.1 Site Alternatives

The applicant, Christo Weyer Familie Trust, has not considered an alternative site as the proposed site is owned by the applicant (Title deed: T15010/1997 in Appendix B). Therefore, it is the only available option for the applicant to develop on.

### 5.2 Activity Alternatives

#### 5.2.1 Alternatives in terms of water supply:

- **RLM:** The RLM provides the infrastructure necessary to unlock the potential for development of the area in terms of the SDF and the water master plan. The developers in the area will contribute pro-rata towards the provision of the bulk service and a service agreement will be entered into with RLM during the Township Establishment. An existing 300mm bulk water pipeline is situated parallel to and on the northern side of the D1641 road, on the southern boundary of the proposed development. A proposed new bulk water pipeline will be installed as part of the upgrading of the water supply and reticulation in the area and connected directly to the existing 300mm bulk water pipeline. *This is the preferred option.*
- **Rand Water:** Another water services providing authority (Magalies Water or Rand Water) provides the bulk service on behalf of RLM. No contribution towards bulk service will be payable to the RLM and these water services providing authorities will only provide services if RLM cannot do so, due to the fact that the site is located in the urban edge, this is unlikely.
- **Groundwater:** A large development such as this will place tremendous strain on limited groundwater resources if boreholes are used as a water supply source. This water supply source is therefore not recommended.

#### 5.2.2 Alternatives in terms of sewage management:

- **RLM:** *This is the preferred option.*
  - Interim: All internal sewers will gravitate via a conventional sewer system to the existing pump station situated at the lowest of both the proposed Waterkloof Hill X4 and the Savanna Falls developments. The upgraded pump station, at full development, will be equipped with two electric pumps. Pump control will be by means of pressure switches and flow meters. The sump volume will be determined to minimise motor starts to 10-15 starts per hour. Screens and a grid chamber will be used on the pump station to limit blockages in the pumps. The sewer will be pumped to the existing bulk sewer system installed by the Rustenburg Local Municipality to the north-west of the development via the existing sewerage rising main pipeline.
  - Final: All internal sewers will gravitate via a conventional sewer system to an approved new sewerage treatment plant (NWP/EIA/145/2006) to be installed for this and other developments.

A typical and logical sequence of the wastewater treatment processes is as follows:

**Preliminary treatment:** Materials such as rags, plastics, sand, metal particles, etc. are transported through the system with the wastewater. Although only a small proportion of the total wastewater flow, it can have adverse effects on further treatment processes and can cause damage to plant equipment and must be removed. Preliminary treatment of wastewater occurs at the head of the works and generally includes screening, grit removal and flow measurement. This is planned at the pump station.



**Primary treatment:** Organic and inorganic solids are removed by sedimentation, and floatable material is removed by skimming. Typically, a Biological Oxygen Demand (BOD) reduction of 25% to 50% is achieved and 50% to 70% of the suspended solids (SS), and 65% of the oil and grease are removed. "A primary sedimentation tank is defined as a tank in which wastewater is retained long enough to bring about sedimentation of suspended matter but short enough to prevent anaerobic decomposition of the sludge.

**Secondary treatment:** "Secondary treatment is the second step in most wastewater treatment systems during which bacteria consume the organic parts of the wastes. This is accomplished by bringing the sewage, bacteria and oxygen together in trickling filters or within an activated sludge process." Micro-organisms and oxygen are utilized during secondary treatment to stabilize the sewage after primary treatment and 85% to 95% of the SS and the BOD load can typically be removed. Secondary treatment processes include percolating filters (trickling filters or rotating biological filters), rotating biological contractors, and activated sludge processes, which normally consist of aeration tanks (where air (oxygen) is injected into the primary treated wastewater), sedimentation tanks (where the activated sludge is separated from the liquid) and final clarifiers.

**Tertiary treatment:** "Tertiary treatment is the advanced treatment process, following secondary treatment of wastewater that produces high quality water. Tertiary treatment includes removal of nutrients such as phosphorus and nitrogen and practically all suspended and organic matter from wastewater." During tertiary treatment (which includes filtration, phosphorus removal, ammonia stripping and other special treatments), specific constituents are removed. Further treatment may include sand filtration, wetlands or other advanced treatment processes.

**Disinfection**

Methods for disinfection are:

- Chemical, e.g. chlorination and ozonation
- Physical, e.g. ultraviolet radiation and microfiltration
- Biological, e.g. detention ponds

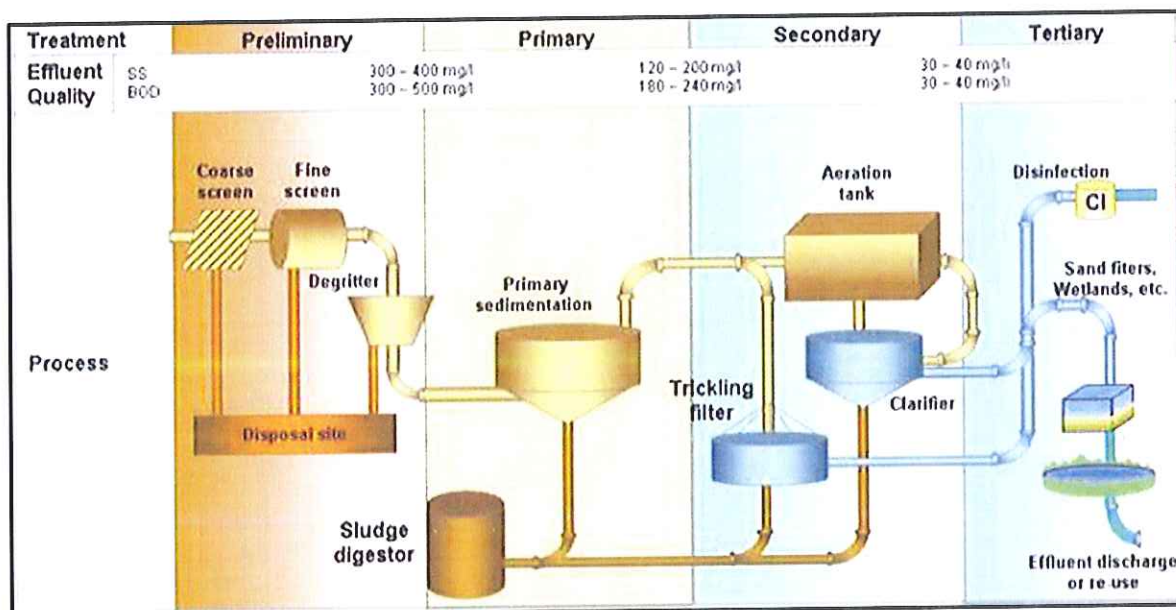


Figure 5-1: A basic schematic of a sewage treatment facility

- **On-site system:** SPUD (Solar-powered dehydration) system considers the scarcity of water resources (aerobic dry system, 100% waterless), the lack of bulk infrastructure in most municipal areas (municipal backlogs), the cost of establishing wastewater treatment

works and environmental impact (solar powered, ventilation powered through a wind driven extractor, no need for off-site removal and disposal – self-contained, 100% chemical free). However, this option is better suited for low cost housing.

### 5.2.3 No-go Alternative

If the proposed project and township establishment is not approved, the following may result:

- Since the site falls within the urban edge, it is taken that the project area is planned for urban developments such as this (SDF, 2010) to address the need created by population growth as well as the need for infrastructure and services. If the project should not continue, the land can perhaps be used for agricultural activities for a short period after which the land will remain vacant in-between other residential developments that have started or are in the process of being approved.
- Vacant land poses security risks to surrounding neighbours/residential developments within vicinity of the project area. Risks can be linked to vagrants that may inhabit the open land; fire hazards etc.
- The already high demand for housing in the Rustenburg area will remain and not be addressed to any extent, resulting in unchanged social-economic conditions.

## 6 PUBLIC PARTICIPATION

### 6.1 Introduction

The Public Participation Process (PPP) forms an integral part of the EIA process and it is one of the important aspects of the process to obtain environmental authorisation. Its aim is to provide all interested and affected parties (I&APs) with clear, accurate and comprehensible information about the proposed project, its alternatives, the possible environmental impacts and the management thereof. In addition, the process seeks to provide I&APs with the opportunity to indicate their viewpoints on issues and concerns regarding the proposed project, alternatives and / or decisions.

This process therefore enhances transparency and accountability in decision making as it allows all I&APs to suggest ways of avoiding, reducing or mitigating potential negative impacts of the proposed project and enhance positive impacts. All inputs from the I&APs are considered in the planning of the project and consequently clear recording of all issues and concerns raised was maintained in a comments and response register. This register is updated when new issues or concerns are raised.

This section of the report provides a methodical description of the PPP followed. It also contains a complete record of any public notices, details of all registered I&APs and all communications to and from I&APs pertaining to the application.

### 6.2 Approach

The aim of the PPP is not only to adhere to the required legislation, but also to give as many stakeholders and I&APs as possible an opportunity to be actively involved in this process.

The PPP has been carried out in accordance with Chapter 6 of the NEMA as amended and in support of the EIA Regulations, 2010. Based on these Regulations published in terms of Sections 54 to 57 of GNR 543 of NEMA, the following steps were undertaken:

- Potential I&APs were identified through conducting a site visit, previous work in the area and having discussions with the local community, through Windæd searches conducted on neighbouring properties and their owners, through notices placed on site (Figure 6-1 and Plate 6-1) and through placing a notice in the local newspaper, the Rustenburg Herald (8/9 August 2013; see Appendix D);
- Further notice of the application was given to the identified I&APs (see Table 6-1) through the distribution of written notices, in the form of Background Information Documents (BIDs), via e-mail, post and hand delivery (Appendix D);
- A stakeholder register of I&APs was compiled in terms of Regulation 57 that includes national, provincial and local authorities, government departments, organisations and neighbours that may have an interest in the proposed project. BIDs were distributed to all these stakeholders (Table 6-1);
- I&APs were given at least 40 days (8 August to 20 September 2013) to comment on the proposed application or register as I&APs. Any concerns that have been raised by I&APs were acknowledged, noted and addressed (Table 6-2) by the EAP;
- Furthermore, all registered I&APs were given 40 days (20 September – 29 October 2013) to comment, in writing, on the Scoping Report prior to submission to the competent authority, the NW DEDECT in November 2013. No comments were received on the Scoping Report;
- Another 40 days have been allocated to I&APs to comment on the Draft Full EIA report (16 January – 25 February 2014); and



- A recorded summary of concerns raised by I&APs, as well as the responses from the EAP, was kept throughout the entire process.

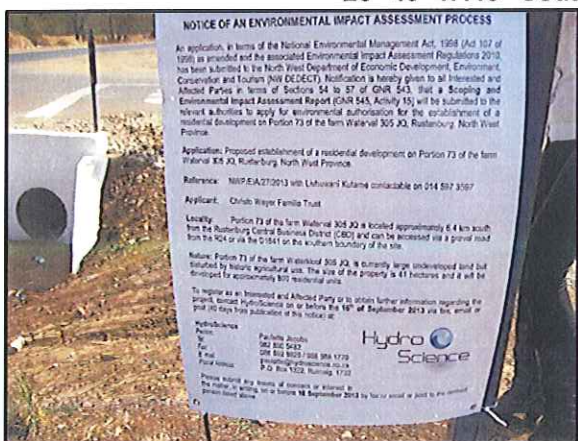
### 6.3 Public Awareness

#### 6.3.1 Site Notices

Two (2) notices (measuring 800mm x 600mm) were placed at the site on 8 August 2013 at locations where they would be most visible to the public concerned. This included, on the corner of D1641 and an entrance road on the southern boundary of the project area (Site Notice 2), as well as on a gravel road that can be accessed via the D1641 entrance road or via a gravel road from the R24 on the western boundary of the site (Site Notice 1). Each notice contained details regarding the applicant (Christo Weyer Familie Trust), the nature of the activity to take place (Residential development), the locality of the project (Portion 73 of the farm Waterkloof 305 JQ, Rustenburg) and the contact details of the EAP (see Plate 6-1). The placement of the site notices were recorded by taking photographs of the placed notices on site as well as by recording the GPS coordinates of these positions (Plate 6-1). These notices will remain on the site for the duration of the process. Figure 6-1 indicates the notices placed on site from an aerial view.

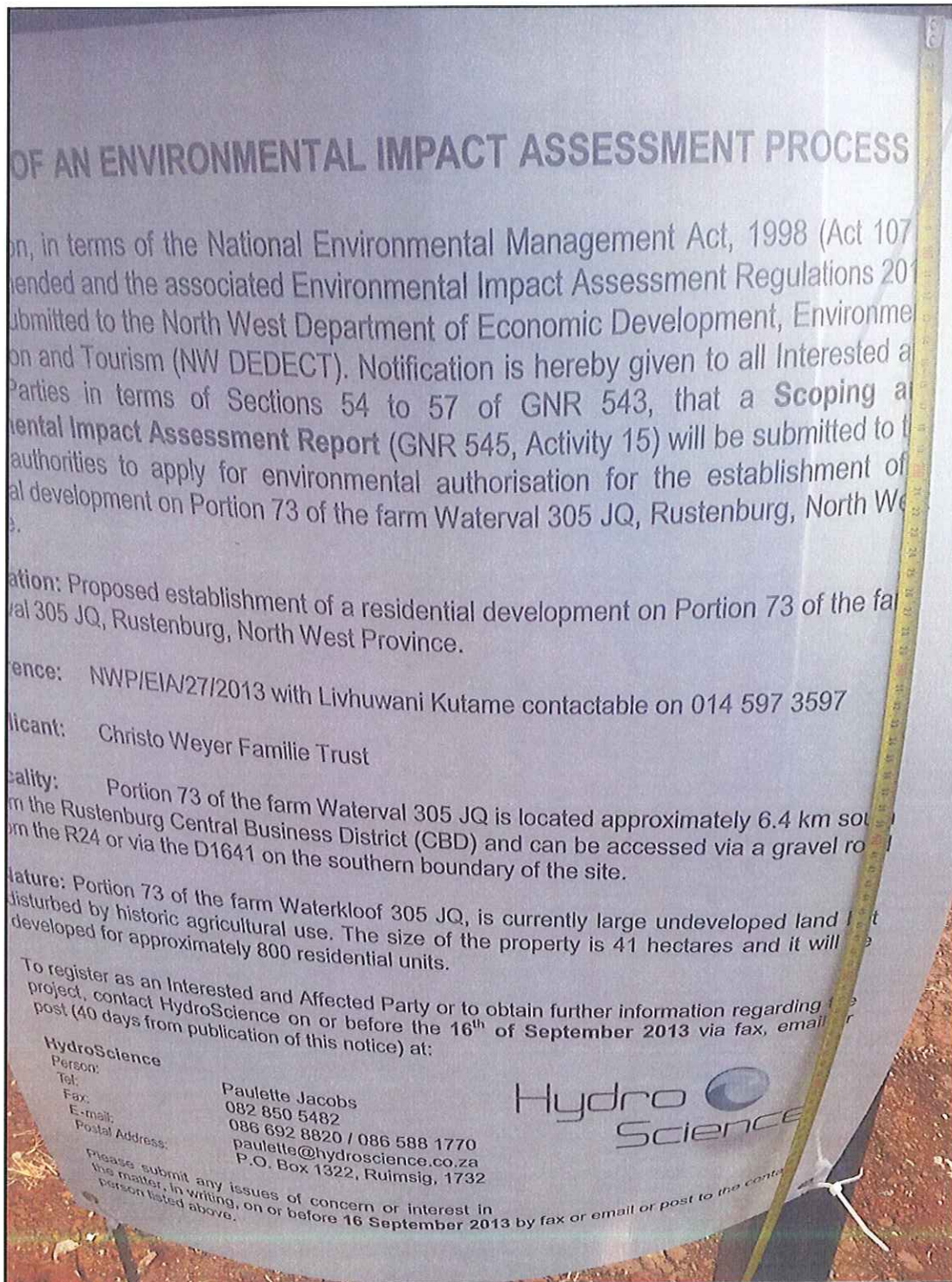


Site notice 1 on the gravel entrance road on the western boundary of the site  
 25° 43' 47.46" South, 27° 16' 14.84" East



Site notice 2 on the corner of the gravel entrance road and the D1641, southern boundary of the site  
 25° 43' 59.60" South, 27° 16' 22.71" East





**Size and wording of the site notices**  
**Plate 6-1: Notices placed on site as part of the Public Participation Process**





Figure 6-1: Location of site notices - Google™

### 6.3.2 Newspaper Advertisement

A newspaper advertisement regarding the project was placed in the Rustenburg Herald, page 18, published on the 9<sup>th</sup> of August 2013 (Appendix D). The aim of placing an advertisement in the local newspaper was to create a greater awareness of the project and to invite a broader spectrum of I&APs to register and be part of the process.

The Rustenburg Herald distributes newspapers throughout Rustenburg including Brits, Buffelspoort, Groot-Marico, Hartbeespoort, Koster, Kroondal, Lichtenburg, Marikana, Moinooi, Sun City, Swartruggens and Zeerust. Around 32 000 copies are distributed weekly.

### 6.3.3 Background Information Document

BIDs, containing information regarding the proposed project, were distributed to adjacent land owners as well as all other I&APs (Table 6-1) via e-mail, post, fax or hand-delivery as part of the notification process. Furthermore, BIDs were also distributed to local, provincial as well as national authorities, applicable government departments (such as the Department of Water Affairs, Department of Environmental Affairs and Department of Agriculture), and the Ward Councillor for the area. The BIDs were distributed between 8 and 9 August 2013 and it included a locality map, as well as the registration/response form. After distribution of the BIDs, I&APs were given at least 40 days (8 August – 20 September 2013) to register as an I&AP and to be included in future communication and the process for the project. The responses/comments received thus far can be seen in Table 6-2.

#### **6.4 Comments and Response Register**

Any concerns that were raised by I&APs during the process so far were recorded and addressed by the EAP where possible at this stage of the project (see Table 6.2). All proof of communication can be seen in Appendix D.

Furthermore, all registered I&APs were given an opportunity to comment, in writing, on the Scoping Report before its submission to the competent authority, NW DEDECT. No comments were received.

All I&APs were also provided with an opportunity to comment on this report (the EIA) report (16 January – 25 February 2014) before its submission to the NW DEDECT in March 2014.

Table 6-1: Registered I&APs for the proposed project

NEIGHBOURING LAND OWNERS, RESIDENTS AND BUSINESSES						
Name & surname	Company / Department / Organisation	Tel	Email	Cell	Address	Interaction
Fatima Dudhia	Portion 209	014 538 1766			P O BOX 50014 ZINNI/VILLE 0302	Send BID via Registered mail: RD654806745 2013-08-08
FANIE WISSEKERKE FAMILIE MPY PTY LTD	Portion 277		cashanehotel@telkomsa.net		P O BOX 1487 RUSTENBURG 0300	Send BID via Registered mail: RD654806737 2013-08-08
Pieter Wissekerke WISSEKERKE & SON PTY LTD	Portion 278, 279	014 592 8541			P O BOX 1487 RUSTENBURG 0300	Send BID via Registered mail RD654806737 2013-09-02
Maria Hendrina Reyneke	Portion 390	014 593 4599	danette.reyneke@gmail.com	082 961 8424	P O BOX 7581 RUSTENBURG 0300	Emailed BID: 2013-08-08 Registered: 2013-08-12
Johannes Jordaan (DONCARE PTY LTD)	Portion 391	014 537 2730			P O BOX 5000 RUSTENBURG 0300	Send BID via Registered mail: RD654806723 2013-08-08
William Sheehan Grant (SHALOM AFSLAERS CC) (ROCLA)	Portion 281	014 597 2543	shalom@mwweb.co.za	082 652 1890	P O BOX 1318 RUSTENBURG 0300	Emailed BID: 2013-08-08 Registered: 2013-08-09

## NEIGHBOURING LAND OWNERS, RESIDENTS AND BUSINESSES

Name & surname	Company / Department / Organisation	Tel	Email	Cell	Address	Interaction
Willem Wybrand Nezar LIMOSA INV 240 PTY LTD	Portion 282,345	014 594 0261	w@catax.co.za		P O BOX 6629 RUNSTENBURG 0300	Emailed BID: 2013-08-08 Registered: 2013-08-10
No information (complex built see Von Wielligh)	Portion 347					
Daniel Johannes Pretorius (FRANNESA PROP INV 202 CC)	Portion 348	014 594 1524 014 569 7314			POSTNET SUITE X57 PRIVATE BAG X82329 RUSTENBURG 0300 P O BOX 4168, RUSTENBURG, 0300	Send BID via Registered mail: RD654806710 2013-08-08
Carel Heyneke	Voltex Pty Ltd	014 597 1311	carl20@voltex.co.za	0832524099	98 PRES.THABO MBEKI DRIVE RUSTENBURG 0300	Registered through newspaper notice 2013-08-12
Frederick Wilhelm Christiaan Weyer (APPLICANT)	Portion 73, 295	014 537 2497	weyenplant@mweb.co.za	082 455 5911	P O BOX 149, KROONDAL, 0350	Emailed BID: 2013-08-08
George Paul Wenhold	Portion 300	014 537 2424	gpwen@absamail.co.za	082 773 0434	P O BOX 37, KROONDAL, 0350	Emailed BID: 2013-08-08
Hermann Rudolf Penzhorn	Portion 98, 236, 284	014 537 2437	apenzhorn@mweb.co.za	083 565 5845	1 VILLA HENDRICH, PIET HUGO STREET, ELDORAINGE, 0157 P O BOX 164,	Emailed BID: 2013-08-08
Von Wielligh Management	Complex management west of project area	014 592 5919	adriaan.spm@telkomsa.net			Emailed BID: 2013-08-08

**NEIGHBOURING LAND OWNERS, RESIDENTS AND BUSINESSES**

Name & surname	Company / Department / Organisation	Tel	Email	Cell	Address	Interaction
Jeffrey Hall	Concerned business		jhallsheq@gmail.com	084 538 6502		Registered through newspaper notice 2013-08-16
Nolte Ekkerd (TOWN PLANNER FOR PROJECT)	NE Town Planning & Development Consultants:	014 592 2777	nekkerd@mweb.co.za		P.O. Box 5717, Rustenburg, 0300	Emailed BID: 2013-08-08
Chris de Bruyn	North West Environmental Forum (NWEF)	014 537 3400	lti31424@mweb.co.za	082 823 3815		Emailed BID: 2013-08-08
Jemile Bolt	Rustenburg Olifantsnek Corridor Landowners Association (ROCLA)	014 537 2244	sylviab456@gmail.com	079 967 4248		Emailed BID: 2013-08-08



**AUTHORITIES**

**Local Municipality: Rustenburg Local Municipality (RLM)**

Name	Company / Department	Tel	Fax	Cell	E-mail	Interaction
Mr Thato Molwantwa	RLM: Town planning				tmolwantwa@rustenburg.gov.za	Emailed BID: 2013-08-08
Ms Tsibi Ruele	RLM: Town planning (assistant to Mr Molwantwa)				truele@rustenburg.gov.za	Emailed BID: 2013-08-08
Ms Ronette Barnard	RLM: Town planning				rbarnard@rustenburg.gov.za	Emailed BID: 2013-08-08
Ms Mpho Haoli	RLM: Town planning				mhaoli@rustenburg.gov.za	Emailed BID: 2013-08-08
Mr Walter Senne	RLM: Waste management	014 590 3101			wsenne@rustenburg.gov.za	Emailed BID: 2013-08-08
Ms Kelebogile Mekgoe	RLM: Environmental management	014 590 3075	014 590 3070	072 585 9460	kmekgoe@rustenburg.gov.za P.O. Box 16, Rustenburg, 0300	Emailed BID: 2013-08-08
Mr Tshepo Lenake		014 590 3085		083 961 0591	tlenake@rustenburg.gov.za	Emailed BID: 2013-08-08
Ms Ziyanda Mateta	RLM: Water & sanitation	014 590 3530		082 813 3358	zmateta@rustenburg.gov.za	Emailed BID: 2013-08-08
Office of the Speaker	RLM: Ward councillor				speaker@rustenburg.gov.za	Emailed BID: 2013-08-08
Ms Ala Malan	Ward Councillor		086 212 5022		alamalan@telkomsa.net	Emailed BID: 2013-08-08

**District Municipality: Bojanala Platinum District Municipality**

Name	Company / Department	Tel	Fax	Cell	E-mail	Interaction
Mrs Lynette Lekhafola (PA to the municipal manager: Mr Innocent Sirovha)	Bojanala Platinum District Municipality: Environmental	014 594 2332			lynnettel@bojanala.gov.za	Emailed BID: 2013-08-08

**Provincial Government: North West Department of Economic Development, Environment, Conservation and Tourism (NW DEDECT)**

Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Mr Livhuwani Kutame	NW DEDECT Rustenburg: Environmental Officer on project	014 597 3597	014 597 3553		lekutame@nwppg.gov.za	Emailed BID: 2013-08-08
Ms Motshabi Mohlasi	NW DEDECT Rustenburg: EIA Manager	014 597 3597	014 597 3553		mmohlalasi@nwppg.gov.za	Emailed BID: 2013-08-08
Mr Steven Mukhola	NW DEDECT Mahikeng Head Office	018 389 5959			smukhola@nwppg.gov.za	Emailed BID: 2013-08-08

**Department of Environmental Affairs (National)**

Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Mr Albi Modise	National Department of Environment	012 310 3132			amodise@environment.gov.za	Emailed BID: 2013-08-08

**Department of Agriculture, Forestry and Fisheries (DAFF)**

Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Mr. B. Msoni	DAFF				CDESRM@nda.agric.za CDESRM@daff.gov.za	Emailed BID: 2013-08-08
Mr Lufuno Nevhufumba	National Department of Agriculture	018 381 3423	086 580 1640	082 907 6118	NevhufumbaL@nda.agric.za Private Bag X05, Mmabatho, 2735	Emailed BID: 2013-08-08
Mr Piet Theron					PietT@daff.gov.za	Emailed BID: 2013-08-08
Mr David Kleyn		012 319 7484			davidkl@nda.agric.za	Emailed BID: 2013-08-08

Department of Water Affairs (DWA)						
Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Ms Letabo Ramashala	DWA: Hartbeespoort regional office	012 253 1026	086 548 3057	082 885 9581	Ramashala@dwa.gov.za P/Bag X357, Hartbeespoort, 0216	Emailed BID: 2013-08-08
Mr Justice Maluleka	DWA – Regional Office in Pretoria	012 392 1355			JusticeM@dwa.gov.za	Emailed BID: 2013-08-08
Ms C. Theunissen	DWA - Hartbeespoort Dam Office				TheunissenC@dwa.gov.za	Emailed BID: 2013-08-08
Department of Public Works, Roads and Transport (DPWRT)						
Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Mr Lobakeng	NW DPWRT				lobakengk@nwpg.gov.za	Emailed BID: 2013-08-08
Department of Housing (MEC Support; communication; development & planning)						
Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Mr Kelepile Thaganyane	NW Department of Housing	018 387 3689			kthaganyane@nwpg.gov.za	Emailed BID: 2013-08-08
Mr S.P. Ramagaga		018 387 5303			sramagaga@nwpg.gov.za	Emailed BID: 2013-08-08
Ms Kelebogile Tshenkeng		018 388 2391			ktshenkeng@nwpg.gov.za	Emailed BID: 2013-08-08
South African Heritage Resources Agency (SAHRA)						
Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Ms Colette Scheermeyer	SAHRA	021 462 4502			cscheermeyer@sahra.org.za	Emailed BID: 2013-08-08

**ESKOM**

Name	Company/ Department	Tel	Fax	Cell	E-mail	Interaction
Mr Kobus Vorster	Eskom	014 565 1122	014 565 1191	083 255 2341	VorsteK@eskom.co.za	Emailed BID: 2013-08-08 Registered 2013-08-13

**Table 6-2: Comments and Response Register**

Comment received from:	Date received and date responded:	Comment / concern:	Response:
Danette Reyneke (Neighbour Portion 390)	2013-08-12 2013-08-12	<ul style="list-style-type: none"> <li>In full support of the project</li> </ul>	<ul style="list-style-type: none"> <li>Noted</li> </ul>
Jeffrey Hall	2012-08-16 2012-08-16	<ul style="list-style-type: none"> <li>Rustenburg area has no sustainable development. As required by law local enterprises and companies must be used. This is not the case.</li> <li>Sustainable Development is not employing local labour, 80% of all funds go back to the cities where the contractors are. This has been the case with Supergroup, New Platinum Checkers and currently the development across the Square Spar.</li> <li>No issue with agricultural land, however 1800 houses is not required in Rustenburg due to all the mines retrenching.</li> <li>Agricultural land is not disturbed land as it is agricultural land. The application of excavation, foundations, planning for water runoff is an illustration of what disturbed land is and what Agricultural void in that area or in Rustenburg?</li> <li>How will it be ensured that local companies benefit?</li> <li>How will it be ensured to be sustainability?</li> <li>With all the retrenchments how would the EAP as non-local company pull those skills into the construction.</li> <li>What is the construction Rehabilitation plan?</li> <li>Can the services take so many apartments or accommodate for them?</li> </ul>	<ul style="list-style-type: none"> <li>Contracting of construction and other services consider many aspects such as cost and service levels when appointments are made. This aspect also does not form part of the EAP process (it happens at a much later stage) and therefore it cannot be determined what contract services will be employed as business is business, where completion of the best service for the best price remains a mandate. Furthermore in some cases such as in this one, the applicant is a local construction company in its own right, therefore they will use their own services to save costs. As with most construction projects, the opportunity will go out on tender for all interested local companies to participate in.</li> <li>Even if the construction company and contractors are not located in Rustenburg, it still has a positive socio-economic impact as the construction crew will support the commercial/retail and tourism sectors by supporting local accommodation facilities and shops for food.</li> <li>Agricultural land is scientifically regarded as disturbed land, as it is no longer in its natural bushveld state. In</li> </ul>

Comment received from:	Date received and date responded:	Comment / concern:	Response:
		<ul style="list-style-type: none"> <li>• What is the Environmental action plan before clearing? During and construction and after completion?</li> <li>• What studies have been done on both EMP's regarding heritage sites graves...?</li> <li>• Accommodation for all employees? This is to ensure no employees that live far have to walk or it might create an informal settlement.</li> <li>• What is the estimated yearly impact on the waste sites?</li> <li>• Impact on water usage?</li> <li>• Fauna and flora impact?</li> </ul>	<p>many cases agricultural activities will require the use of chemicals (pesticides, herbicides) that are toxic and further impact the natural environment. Although retrenchment of mining employees have occurred, the application of new mines opening or expanding continues, which again will create job opportunities. Throughout time this will remain a fluctuating market, however as confirmed by the Rustenburg Spatial Development Framework (2010), there is a backlog in available accommodation which this project aims to mitigate.</p> <ul style="list-style-type: none"> <li>• As mentioned above, local companies will benefit as a result of the development, the socio-economic structure of Rustenburg as a whole will benefit.</li> <li>• The whole environmental process (conducted by HydroScience) is to ensure sustainability. A Environment Management Programme (EMP) will be compiled as part of the second phase (EIA phase) of the project to ensure all phases of the project are sustainable by adhering to the mitigation as set out in the programme. This EMP is legally binding to the applicant if the project should be approved.</li> <li>• HydroScience is only the environmental consultant and can therefore not "pull those skills into the construction." The EMP will however recommend that where possible local labour should be used but appointments would probably still be made through a tender process. HydroScience is not involved in the construction, it is only handling the environmental studies and authorisations.</li> <li>• Rehabilitation plan usually refers to the restoration of the natural environment during the decommissioning/closure phase of the project. Due to the fact that the complete site will be developed there will be no rehabilitation plan during the construction phase, furthermore the project is permanent and will not have a decommissioning phase. There will be</li> </ul>



Comment received from:	Date received and date responded:	Comment / concern:	Response:
			<p>mitigation as part of the EMP for the construction phase and this will include the re-vegetation of the areas between residential units – this can be seen as rehabilitation as alien/invasive species will be removed and the planting of indigenous vegetation will be encouraged/recommended.</p> <ul style="list-style-type: none"> <li>The proposed project is located within the urban edge, therefore RLM service are available/planned. The pressure on services should then be accommodated. RLM has applied for municipal infrastructure grants to extend and improve service delivery.</li> <li>Remainder of comments will be included in the EIA phase that will be made available for public review.</li> </ul>
<b>Comments on the Scoping Report</b>			
<p>Rustenburg Local Municipality Unit: Integrated Environmental Management (Kele Mekgoe)</p>	<p>2013-10-25 2013-10-25</p>	<p>The department has no objections against the proposal, further suggestions include:</p> <ul style="list-style-type: none"> <li>All mitigation measures as suggested by the specialist in the Scoping Report and EMP must be complied with.</li> <li>The proposed activity should be managed with utmost care and responsibility, and that habitat disturbance should not be allowed to occur due to development activities.</li> <li>Water quality should be monitored at six months intervals from the boreholes in the area, to determine the potential impact on the groundwater.</li> <li>There should be a strategy for the handling and disposal of excess spoil resulting from excavation/trenching. It should be noted that no excess spoil must be left strewn along the working areas of the site.</li> <li>Proper measures must be implemented to ensure the management of surface runoff during the construction phase of the development. Embankments must be established around excavation areas and stockpiles to divert surface runoff away from these areas to avoid water pollution.</li> <li>Appropriate and visible signalling for safety purposes must be posted at reasonable distances (those that allow sufficient time</li> </ul>	<ul style="list-style-type: none"> <li>Noted and will be included in the EMP.</li> </ul>

Comment received from:	Date received and date responded:	Comment / concern:	Response:
<p>NW DEDECT: Environmental Services (Livhuwane Kutame) – Project official</p>	<p>2013-12-12 2013-12-13</p>	<p>for reaction by motorists) at every section of the road affected by the construction and operational activities.</p> <ul style="list-style-type: none"> <li>• Dust generated by construction activities must be minimised by dust suppression techniques such as the use of a water sprinkler.</li> <li>• The storm water management plan, must address any potential pollution from oil and diesel leaks or spills during construction and operation. The plan must ensure that sufficient berms are constructed to contain accidental spills.</li> </ul> <p>The Scoping Report was found to be acceptable, however the following information should be addressed in detail in the EIA phase of the project:</p> <ul style="list-style-type: none"> <li>• <b>Bulk water supply:</b> It is imperative that for a project of this magnitude, sufficient effort and accompanying information regarding the availability of water supply for the proposed stands must be investigated to determine the feasibility and sustainability of the development itself. The matter regarding bulk water supply for the proposed development must be thoroughly investigated to establish the source and the availability in terms of capacity for supply.</li> <li>• <b>Agricultural feasibility study:</b> The proposed development site is zoned agricultural. During the site inspection conducted by Mr. Livhuwane Kutame of this department and Louise van Wyk of HydroScience cc on 3 December 2013, it was established that the area was ploughed in the previous seasons and therefore this Department requests that an Agricultural feasibility be conducted to identify if the area is longer suitable for agricultural purposes.</li> <li>• <b>Method of Sewerage Disposal:</b> Sewage disposal method for the proposed development must be investigated and quantified in relation to its suitability and compatibility to the site dynamics. If municipal water be the best practical option, the capacity of the sewage treatment plant must be investigated to establish its capacity in handling the additional sewage resulting from the proposed new development.</li> <li>• <b>Waste management:</b> Detailed information regarding the management of solid waste during construction and operational</li> </ul>	<ul style="list-style-type: none"> <li>• Noted. Will be incorporated into the EIA report as requested.</li> </ul>

Comment received from:	Date received and date responded:	Comment / concern:	Response:
		<p>phases of the project must be provided. If it's going to be municipal services, a signed agreement by both the applicant and the municipality must be included in the final EIA report; a waste management plan for the proposed development must be established in consultation with the Local Municipality and be incorporated in the EIA report.</p> <ul style="list-style-type: none"> <li>• <b>Geotechnical study:</b> A geotechnical survey must be commissioned on site to determine the suitability of the soil for the proposed development in relation to the geology, soil structures and groundwater implications that might limit or specify particular caution during the construction activities on site.</li> <li>• <b>Final layout plan:</b> All engineering and design layout plans for the proposed development must be included in the EIA report and also be submitted to the identified interested and affected parties. The layout plan must also show all the sensitive environmental features to be affected by the development, if any.</li> <li>• <b>Authority consultation:</b> The comments from the National department of Agriculture must be attached in the final EIR as there will be a permanent transformation from agricultural to residential.</li> <li>• <b>Environmental Management Programme (EMPr):</b> An EMPr for the construction and operational phases of the project must be developed to identify and mitigate potential environmental and social impacts associated with the proposed activities on the receiving environment. The contents of the EMPr must comply with the guidelines as stipulated in Regulation 33 of Government Notice R.543.</li> </ul>	

## 7 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS

One of the main purposes of the EIA process is to assess the significance of potential impacts and to determine to what extent the negative impacts can be mitigated and minimized, while the positive impacts are enhanced.

The EIA process for this project has been designed to comply with the requirements of the EIA Regulations promulgated on 18 June 2010 in terms of section 24 of the NEMA which is South Africa's framework environmental legislation. Key principles embodied in the NEMA include:

- Sustainability – development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs;
- Mitigation hierarchy – avoidance of environmental impact, or where this is not possible, minimising the impact and remediating the impact; and
- The duty of care towards the environment.

The assessment of impacts has been conducted in accordance with these principles. Based on the findings of the EIA, a draft Environmental Management Programme (EMP) has been developed. The EMP will be implemented to control and minimise adverse impacts during the construction, operational and decommissioning phases of the proposed project.

### 7.1 Specialist studies

Specialist studies incorporated into the EIA include:

- a geotechnical report (Johann van der Merwe Pty Ltd);
- a geohydrological report (Geo-Logic Trading Trust);
- a fauna and flora (terrestrial ecology) specialist study (Galago Environmental);
- a heritage/cultural/archaeological specialist study (J van Schalkwyk);
- services report (EPS Consulting Engineering Pty Ltd); and
- traffic impact study (Route 2 Transport Strategies)

### 7.2 Impact assessment methodology

The significance of the environmental impacts identified will be assessed in terms of their:

- Duration;
- Extent;
- Probability; and
- Severity.

The above will be used to determine the significance of an impact without any mitigation, as well as with mitigation.

**Nature of an impact:** An impact's nature can be positive (+) or negative (-).

**Consequence:** Considers duration, extent and severity.

**Table 7-1: Environmental risk and impact assessment criteria**

<b>DURATION (D)</b>		
Immediate	Less than 1 month	1
Short term	6 months	2
Construction	36 months	3
Life of project	Operational phase	4
Post closure	Time of rehabilitation and for re-establishment of natural systems	5
Residual	A permanent impact (100 years or more)	6
<b>EXTENT (E)</b>		
Site specific	Site of the proposed development	1
Local	Farm/site and surrounding farms/site	2
District	Rustenburg Local Municipality	3
Regional	Bojanala District Municipality	4
Provincial	North West Province	5
National	Republic of South Africa	6
<b>PROBABILITY (P)</b>		
Rare	<5% probability of occurrence – may occur in exceptional circumstances	1
Unlikely	15% - 6% probability of occurrence – could occur at some time	2
Possible	45% - 16% chance of occurrence – might occur at some time	3
Likely	65% - 46% probability of occurrence – will probably occur in most circumstances	4
Almost Certain	90% - 66% probability of occurrence – is expected to occur	5
Definite	100%- will occur	6
<b>SEVERITY (S)</b>		
Catastrophic (critical)	Total change in area of direct impact, relocation not an option, death, toxic release off-site with detrimental effects, irreversible loss, huge financial loss	6
Significant (High)	> 70% change in area of direct impact due to loss of significant aspect, extensive injuries, long term loss in capabilities, off-site release to high extent, major financial implications	5
Serious	50 – 70% long term loss, extensive rehabilitation / restoration / treatment required, high financial impact, still restricted in extent	4
Moderate (medium)	20 – 49% change, medium term loss in capabilities, rehabilitation / restoration / treatment required, on-site release with outside assistance, medium financial impact	3
Minor	10 – 19% change, short term impact that can be absorbed, on-site release, immediate containment, low financial implications	2
Insignificant (low)	< 10 % change in the area of impact, no financial implications, localised impact, a small percentage of population	1

**[Duration (D) + Extent (E) + Severity (S)] x Probability (P) = Impact Significance (IS)**

<b>IMPACT SIGNIFICANCE (IS)</b>		
<b>Impact Significance</b>	<b>IS score range</b>	<b>Description</b>
Low (L)	<15	The impact is minor or insubstantial; it is of little importance to any stakeholder and can easily be rectified.
Moderate Low	16 - 45	The impact is limited in extent, even if the intensity is major;



(ML)		the probability will only be likely, the impact will not have a significant impact considered in relation to the bigger picture; no major material effect on decisions and will require only small scale management intervention bearing moderate costs.
Moderate high (MH)	46 - 70	The impact is significant to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.
High (H)	71 <	The impact could render development options controversial or the entire project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in project decision-making.

### 7.3 Draft environmental management plan / programme

A draft EMP is encompassed into the EIA report and covers all the phases of the project as well as their durations. These phases include:

- Planning and design phase;
- Construction phase;
- Operational phase; and
- Decommissioning phase.

The EMP also includes responsibilities for management measures to be implemented during each phase and also deals with aspects such as:

- Monitoring;
- Recording;
- Reporting;
- Auditing; and
- Compliance.

EMPs are important tools for ensuring that the management actions/measures arising from the EIA process are clearly defined and implemented through all phases of the project.

## 8 POTENTIAL ENVIRONMENTAL IMPACTS

Potential environmental and socio-economic impacts that may occur as a result of the proposed residential development have been identified in this section. The criterion defined in Table 7.1 will be used to assess the significance of the impacts identified (Section 9) and remedial or mitigation or management measures thereof will be suggested (Section 10) to reduce the significance.

### 8.1 Land Use

Currently, the site is zoned as agricultural; however according to the SDF (2010) the proposed/planned project area zoning is "Single Residential". Single residential zones are designed to provide locations for predominantly single-family dwelling houses in low to medium density residential neighbourhoods, with a safe and pleasant living environment. However there are controlled opportunities for home employment, additional dwellings and low intensity mixed use development on a single residential property. Therefore, the proposed project is in-line with the SDF of RLM, although currently zoned for agricultural purposes. This is expected as the site is situated within the urban edge and therefore the anticipated impact on the land use is negligible.

### 8.2 Soil

As per findings of the geotechnical specialist study (Johann van der Merwe Pty Ltd, 2007), the following considerations need to be taken into account as it may impact (damage) on the structures built on the soil which has a secondary socio-economic impact.

#### Expansive Soils

The colluvial and residual clay that blankets the site are potentially "high" to "very high" in the degree of expansiveness, based on the results of the laboratory test and according to the Van der Merwe (1964) method. A total surface heave value of some 20mm to 40mm is predicted across Soil Zone "B" and a surface heave value in the range 30mm to 50mm is predicted across Soil Zone "C", depending on the locality and should the moisture condition of the soils change from a desiccated to a saturated condition. Heave values in the range 15mm to 25mm are predicted across Soil Zones "E" under similar moisture conditions as mentioned above.

#### Excavation Characteristics

Very hard excavation and blasting will be required to remove the hard rock norite bedrock and the weathered bedrock from below shallow depths across Soil Zone "A" and from below average depths of 1.5m, 1.8m and more than 2.0m respectively for Soil Zones "B" and "C". No problems should be experienced to remove the transported and residual soils down to a depth of at least 2.5m below surface across Soil Zone E, using conventional earth-moving equipment.

The clayey horizon will be difficult to work during the wet season when machines will tend to become bogged down in the upper clay horizons that tend to soften up when becoming saturated. Unstable sidewall conditions can be expected in deep excavations in the clay horizons, caused by the presence of slicken-sided joints. Shoring will be required in deep excavations in order to safeguard construction personnel.

#### Compressible and Collapsible Soils

A number of undisturbed soil samples representative of the residual norite as well as the sandy colluvium were tested to determine the collapse potential of the material according to the method advocated by Jennings (1974). The colluvial and residual norite soils which

blanket the site are potentially moderately collapsible and compressible with a collapse rating of “moderate trouble” to “trouble” in terms of collapse settlement, according to Jennings.

### 8.3 Visual Aspects

Currently, although predominantly zoned agricultural, the landscape in the area also consists of a fair amount of residential/farmsteads, guest houses and other business establishments. The landscape will be locally transformed into a residential development of approximately 41ha and will consist of residential 2 units. Other residential estates already border the proposed project area and for this reason the visual impact is regarded as minimal.

### 8.4 Flora and Fauna

Based on the flora and fauna specialist study (Galago Environmental, 2007), the proposed development will have the following impacts on the ecological environment:

- Loss of terrestrial biodiversity through the direct or indirect loss of fauna and flora species;
- Habitat loss;
- Encroachment of alien/invasive species and subsequent reduction in the ecological integrity;
- Contamination of soil/surface water run off/groundwater that can impact upon remainder/surrounding vegetation; and
- Disturbance and alteration of ecological systems through noise and loss of keystone species (aquatic system).

Mitigation of these impacts to reduce the significance is listed in the EMP.

### 8.5 Noise and Air

During the construction phase, construction vehicles and equipment will definitely disturb the ambient environment of the surrounding farmsteads, businesses and residential units. During the operational phase, a local increase in the number of residents, once the development is completed, will increase the noise levels in the area due to a concentrated influx of people. Aside from vehicular traffic increasing, ambient noise levels will also most probably increase due to people talking, shouting, children playing, dogs barking, music playing etc. However, this is expected for any residential area.

Currently, the sources of air pollution in and around the project site include vehicular exhaust emissions, emissions from fires used by the local community for heating and cooking purposes, dust from travel on gravel roads and more significantly, mining activities. During the construction phase, dust will probably increase with the removal of vegetation and movement of construction vehicles on the bare soil (clearance and earth works), as well as the environmental factors that can contribute, wind and limited precipitation during the dry season. A local increase in the number of residents during the operational phase will increase the levels of vehicular related emissions.

### 8.6 Traffic

Based on site observations, the existing and base traffic volumes, as well as the capacity analyses, it is concluded that the proposed development traffic will not have a significant impact on the weekday AM and PM peak hour capacity although the access intersections will have to be upgraded as well as the intersections of the D1641 with P16-1 (R24) and R104 (Route 2 Transport Strategies, 2013).

## 8.7 Surface water

There are no natural surface water resources such as streams/rivers/wetlands on the proposed project area. There is an old farm dam, constructed for recreational/irrigation purposes only (see Appendix C). The dam will be maintained for recreational purposes and aesthetic value in a park area for the residential development. Therefore there will be no impact on this man-made surface water feature.

During the construction phase, concern can arise from:

- Contamination of surface water runoff through improper waste handling; and
- Improper storm water and sewage management, which is also applicable during the operational phase.

Mitigation and management measures to prevent such occurrences can be found in the EMP.

## 8.8 Groundwater

There is no intended use of groundwater for the residential development because water from the municipal supply or Rand Water pipeline will be utilised. Therefore, the impacts on the groundwater are related to that of the surface water impacts.

During the project phases, contamination of groundwater through improper waste disposal including sewage disposal and treatment can result in groundwater pollution.

## 8.9 Socio-Economic

The provision of formal housing for the local people in the area will be a positive impact. Schools, churches and shops are located within vicinity of the proposed development. Other facilities and amenities (police, hospitals etc.) are located around the CBD. The establishment of a residential development in this area could promote the establishment of these facilities closer to the community and may provide opportunities for entrepreneurs to establish small businesses. The development of this property may lead to further developments in this area which will increase the property value locally. Because the property is within the urban edge, the development is not considered urban sprawl.

Construction of the development will result in direct job creation. Jobs are also created indirectly in industries that provide goods, material and services. For example, an additional amount of goods used during construction will be required from local businesses and industries related to the construction sector. This could lead to an increased number of jobs being created in these businesses, i.e. in order to increase output.

The following sectors would benefit the most in terms of employment creation:

- Manufacturing
- Retail
- Transport
- Services
- Households

It is expected that these sectors, together with the construction sector will be responsible for the majority of the employment creation in the economy as a result of the direct capital investment.



The construction phase will lead to the increase of business sales for existing businesses located within the Rustenburg area. For example, materials used in construction such as bricks, pipes, concrete etc., will be purchased locally, as well as particular services such as engineers, plumbers, electricians, etc. will be sourced locally. These changes are measured in terms of new business sales, i.e. new sales that will be generated in the city economy as a direct result of the capital investment in the proposed project.

One of the most important economic indicators used to indicate economic growth and value is Gross Geographical Product (GGP). GGP measures the value of all final goods and services produced/provided within one year of the region's economy, which this project will improve upon.

Lastly, risk to security of surrounding land owners and the health and safety of construction workers will need to be considered during the construction phase. During the operational phase, a positive impact will be the increase in security due to the removal of possible crossings / open land / hide-away for vagrants.

### **8.10 Heritage**

No heritage impacts are anticipated, due to the fact that no sites of heritage/archaeological value were found on the site.

### **8.11 Cumulative Impacts**

Holistically, the establishment of a residential development in the project area will uplift not only the local area, but the Province as a whole. The development of this property may lead to further developments in this area which has a high probability as the project area is located within the urban edge and other residential establishments already exist adjacent to the proposed project area. This could place pressure on service provision (water supply, sewage management, waste removal and storm water management). However, RLM will be required to expand services within the urban edge. Any environmental impacts identified during the Scoping or EIA phases must be sufficiently and effectively mitigated in order to reduce the probability of cumulative impacts that may occur as a result of the proposed development.

## 9 IMPACT ASSESSMENT

The impact assessment indicates significance ratings both before and after mitigation for the impacts anticipated and listed in Section 8 above. They are also listed separately for the construction and operational phase. The decommissioning phase is not applicable as the housing development is intended to serve the community indefinitely. It must be noted that positive impacts indicated in Table 9.1 do not require mitigation, therefore significance ratings remain the same.

### 9.1 No-go option significance

The following impacts are identified if the No-go option is considered.

- **Contribution to existing housing issues:** As Rustenburg is experiencing housing shortages, not moving forward with the project will result in amplifying this issue.
  - **Duration:** Long term
  - **Likelihood:** High
  - **Significance:** High
- **Safety and security:** Vagrants may occupy the site bringing a safety and security risk to the area.
  - **Duration:** Long term
  - **Likelihood:** Moderate
  - **Significance:** Moderate
- **Loss of Gross Domestic Product (GDP) and GGP:** An opportunity to contribute to the local GDP and GGP of Rustenburg and that of the Province as a whole will be lost if the development is not to move forward as no new jobs will be created that was previously part of the project outcomes.
  - **Duration:** Medium term
  - **Likelihood:** High
  - **Significance:** Moderate
- **Loss of economic income of support industries:** Support industries that provide goods, materials and services will not benefit from the construction and operation of the residential development, resulting in further loss of income in the local economy of Rustenburg.
  - **Duration:** Medium term
  - **Likelihood:** High
  - **Significance:** Moderate

Table 9-1: Impact Assessment of activities during the construction phase

Aspect and description		Construction Phase													
		Impact rating (before mitigation)					Impact Rating (after mitigation)								
Aspect	Description.	(Positive / Negative)	Spatial Scale (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)	(Positive / Negative)	Spatial Scale (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)
Landuse	Loss of agricultural land	N	3	4	2	9	6	54	N	3	4	3	10	4	40
	Expansive soils	N	1	4	3	8	4	32	N	1	3	2	6	2	12
Soil	Hard excavation and blasting	N	2	3	3	8	4	32	N	2	3	2	7	2	14
	Compressible and Collapsible soils	N	1	4	3	8	4	32	N	1	3	2	6	2	12
Visual	Loss of aesthetic value	N	2	4	2	8	4	32	N	2	3	2	7	3	21
	Loss of species and biodiversity	N	2	5	3	10	5	50	N	2	5	2	9	3	27
Flora and fauna	Habitat loss	N	2	5	3	10	4	40	N	2	5	2	9	2	18
	Encroachment of exotics	N	2	5	3	10	4	40	N	2	5	2	9	2	18
	Contamination through pollution	N	2	5	4	11	3	33	N	2	5	2	9	2	18
Noise and Air	Loss/alteration of ecological systems	N	2	4	4	10	4	40	N	2	4	2	8	3	24
	Noise of construction activities	N	2	1	2	5	6	30	N	1	1	2	4	3	12

	Dust due to the removal of vegetation	N	2	1	2	5	5	25											
	Pollution of surface water run off	N	2	3	4	9	4	36											
Surface water	Improper storm water and sewage management	N	2	2	3	7	5	35											
Groundwater	Improper waste disposal	N	2	2	3	7	5	35											
Socio-economic	Creation of jobs	P	4	4	3	11	6	66											
	Creation of business sales	P	4	4	3	11	6	66											
	Provision of formal housing	P	4	4	3	11	6	66											
	Health and safety	N	3	1	5	9	3	27											

Table 9-2: Impact Assessment of activities during the operational phase

Aspect and description		Operational Phase													
		Impact rating (before mitigation)					Impact Rating (after mitigation)								
Aspect	Description.	(Positive / Negative)	Spatial Scale (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)	(Positive / Negative)	Spatial Scale (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)
Fauna and Flora	Encroachment of exotics	N	3	5	3	11	3	33	N	3	5	2	10	2	20
Noise and Air	Noise of operational/human activities	N	2	1	2	5	6	30	N	1	1	2	4	3	12
	Vehicular related emissions	N	2	1	2	5	5	25	N	1	1	2	4	3	12
Traffic	Increase in traffic	N	3	4	2	9	4	36	N	2	4	2	8	3	24
Surface water	Spillage of sewage or storm water management	N	2	2	3	7	5	35	N	2	2	3	7	3	21
Groundwater	Spillage of sewage or storm water management	N	2	2	3	7	5	35	N	2	2	3	7	3	21
Socio-economic	Creation of jobs	P	4	4	3	11	6	66	P	4	4	3	11	6	66
	Safety and security	P	2	4	3	9	4	36	P	2	4	3	9	4	36
Need of services	Rand water supply	N	3	4	2	9	4	36	N	3	4	2	9	4	36
	Municipal water supply	N	3	4	2	9	4	36	N	3	4	2	9	4	36



Groundwater	N	3	4	3	10	4	40	N	3	4	3	10	4	40
	N	3	4	3	11	4	40	N	4	4	3	11	4	44
	N	3	4	2	9	4	36	N	3	4	2	9	4	36
	N	4	4	3	11	4	44	N	4	4	3	11	4	44

## 10 ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP)

The purpose of the EMP is to ensure that undue or reasonably avoidable adverse impacts of the project are prevented, that impacts which cannot be prevented are managed to reduce their significance and that the positive benefits of the project are enhanced.

The EMP will therefore:

- Define the various measures to be taken during the life of the project [pre-construction (design and planning), construction and operation] in order to enhance positive and minimise/reduce adverse environmental impacts and meet the performance specifications;
- Define the actions needed to implement these measures;
- Describe how this will be achieved; and
- Allocate responsibilities.

EMPs are important tools for ensuring that the management actions/measures arising from the EIA process are clearly defined and implemented through all phases of the project.

### 10.1 Potential Impacts and Management Measures

As part of the EMP, the identified environmental impacts that may result from the various phases of the project, their risks or potential impacts, the proposed management measures thereof and associated time frames are indicated in Table 10-1.

### 10.2 Responsibility

The applicant will be responsible for the implementation of all mitigation and management measures as well as the compliance with this EMP (especially during the construction phase) by delegating his/her responsibilities to the construction Contractor. Each Contractor involved in the project will comply with the EMP and will therefore appoint a Contractor's Representative (the title may vary), who is responsible for the on-site implementation of the EMP (or relevant sections of the EMP) and conditions of authorisations/licences.

The Contractor's representative can be:

- The site agent;
- Site engineer;
- A dedicated environmental officer; or
- An independent consultant.

The Contractor will ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that he/she can interact effectively with other site contractors, labourers, the Environmental Control Officer (ECO) and the public. The Contractor's Representative ensures that all sub-contractors working under the Contractor abide by the requirements of the EMP as well as any authorisations/licences that may be issued.

In the event of the Contractor appointing an Environmental Officer (EO), or officers, their primary role will be to coordinate the environmental management activities of the Contractor on site. The EO may also be required to perform the following roles:

- Support the ECO in the monitoring and execution of the EMP by maintaining a permanent presence on site;

- Inspect the site as required to ensure adherence to the management actions of the EMP and authorisations/licences;
- Complete Site Inspection Forms on a regular basis (e.g. daily or weekly);
- Provide inputs to the regular (e.g. monthly) environment report to be prepared by the ECO;
- Liaise with the construction team on issues relating to implementation of, and compliance with, the EMP and authorisations/licences;
- Maintain a record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken; and
- Maintain a public complaints register in which all complaints are recorded.

The conditions of the authorisation/licences and EMP must be brought to the attention of all persons (employees, workers, consultants, contractors etc.) associated with the undertaking of these activities and the applicant must take such measures that are necessary to bind such persons to the conditions thereof (contracts with penalties for non-compliances).

The applicant can further enforce this by running workshops with all employees in order to raise environmental awareness. These workshops should cover aspects such as fire prevention, strict use of ablution facilities and general duty of care. A pamphlet can be handed out on socially acceptable and environmentally responsible conduct such as water conservation, waste management etc.

### **10.3 Compliance, Monitoring and Reporting**

Accurate and up-to-date records will be kept (by the EO or other appointed contractor's representative) of all system malfunctions resulting in non-compliance with the EMP or authorisations/licences. The applicant will also, within 24 hours, ensure that the relevant authorities are notified of the occurrence or detection of any incident which has the potential to cause, or has caused pollution of the environment, health risks or which is a contravention of any EMP or environmental authorisation/licence condition. The applicant is then to submit an action plan indicating measures which will be taken to:

- Correct the impacts resulting from the incident;
- Prevent the incident from causing any further impact; and
- Prevent a recurrence of a similar incident.

A complaints register will be kept on site and all complaints from the public will be noted therein as well as measures taken to rectify the situation as described above.

### **10.4 Alterations to the EMP**

As EMPs should remain dynamic and flexible, certain conditions may require the EMP to be revised. These conditions may include the following:

- Changes in legislation;
- Occurrence of unanticipated impacts or impacts of greater significance, intensity and extent than predicted;
- Inadequate mitigation, i.e. where the level of an environmental parameter is not conforming to the required level despite the implementation of measures; and
- Secondary impacts which occur as a result of the mitigation.

## 10.5 Pre-construction phase (planning and design)

The following management measures were incorporated during the pre-construction phase:

- Conduct specialist studies to quantify potential impacts and identify mitigation measures to reduce impacts:
  - Fauna and flora study due to large surface area that will be cleared of vegetation and whether any species require protection.
  - Heritage study to establish whether any items of cultural or heritage significance require protection.
  - Traffic study to determine whether road infrastructure will be sufficient with the increase in traffic or the modifications required accommodating the volume increase.
  - Single storey units planned based on outcome of geotechnical study.
  - A geohydrological specialist study to determine current groundwater yield and quality as a water resource alternative.
- Design layout around existing dam to be incorporated in park/open space area for recreational use and aesthetic value.
- Determine water supply requirements and volume of sewage to be managed and whether there is capacity within the existing municipal infrastructure to handle this, as well as storm water management.
- Change in land use and whether the proposed project is in line with the municipal SDF.

Table 10.1: Identified potential impacts, risks and proposed management measures.

<b>Construction phase</b>	
<b>Land Use</b>	
<b>Potential impact:</b>	<p><b><u>Loss of agricultural land</u></b></p> <p>The property is currently zoned for agricultural use. Previously cultivated land exists on site which will be permanently removed for the proposed residential development.</p>
<b>Impact Significance: (Prior to mitigation)</b>	<b>Moderately High</b>
<b>Management Measures:</b>	<p>When the following is considered the significance rating is reduced:</p> <ul style="list-style-type: none"> <li>• The site is within the urban edge</li> <li>• DAFF has issued a letter of excision (20 February 2007, 7254-1) that agricultural use is no longer required from this farm portion.</li> </ul> <p>Further mitigation will include:</p> <ul style="list-style-type: none"> <li>• An application will be submitted to RLM for a change of land use from agricultural use to residential use for the purpose of a township establishment in terms of the Township Ordinance.</li> <li>• Foundation solutions as stipulated in the geotechnical report due to collapsible soils.</li> </ul>
<b>Impact Significance : (Post mitigation)</b>	<b>Moderately Low</b>
<b>Soil</b>	
<b>Potential impact:</b>	<p><b><u>Expansive Soils</u></b></p> <p>The colluvial and residual clay that blankets the site are potentially “high” to “very high” in the degree of expansiveness.</p> <p><b><u>Excavation Characteristics</u></b></p> <p>Very hard excavation and blasting will be required to remove the hard rock norite bedrock and the weathered bedrock from below shallow depths across Soil Zone “A” and from below average depths of 1.5m, 1.8m and more than 2.0m respectively for Soil Zones “B” and “C”. The clayey horizon will be difficult to work during the wet season</p>



	<p>when machines will tend to become bogged down in the upper clay horizons that tend to soften up when becoming saturated. Unstable sidewall conditions can be expected in deep excavations in the clay horizons, caused by the presence of slicken-sided joints.</p> <p><b><u>Compressible and Collapsible Soils</u></b></p> <p>The colluvial and residual norite soils which blanket the site are potentially moderately collapsible and compressible with a collapse rating of “moderate trouble” to “trouble” in terms of collapse settlement.</p>
<p><b>Impact Significance:</b> (Prior to mitigation)</p> <p><b>Management Measures:</b></p>	<p style="text-align: center;"><b>Moderately Low</b></p> <ul style="list-style-type: none"> <li>• Foundations of residential types will need to be adapted to the soil zones on which they occur (as per geotechnical study). Methods that can be applied include: <ul style="list-style-type: none"> <li>○ Steel reinforced foundations</li> <li>○ Piled construction</li> <li>○ Soil Raft</li> <li>○ Split construction</li> <li>○ Stiffened or Cellular Raft</li> <li>○ Deep Strip Foundations</li> <li>○ Compaction of in situ soils below individual footings</li> <li>○ Modified Normal Construction</li> <li>○ Piled or Pier Foundation</li> </ul> </li> <li>• Earthworks can be assisted through chemical stabilization or mechanical modification of dark clay soils to improve the compacted strength thereof. Upper selected, sub-base and base-course quality materials will have to be imported for construction purposes. Cognisance should be taken of the potentially compressible, collapsible and expansive nature of the upper soil horizons in the design of roads and paved areas.</li> <li>• There should be a strategy for the handling and disposal of excess spoil resulting from excavation/trenching. It should be noted that no excess spoil must be left strewn along the working areas of the site which could result in erosion and surface water contamination. Excess spoil could be used as backfill or disposed of offsite. A detailed waste management sub-plan, including spoil management measures, will need to be developed and must address all relevant legislation and set out the requirements and procedures for the management of spoil and other wastes.</li> </ul>
<p><b>Impact Significance :</b></p>	<p style="text-align: center;"><b>Low</b></p>

(Post mitigation)	
<b>Visual</b>	
<b>Potential impact:</b>	<b><u>Loss of aesthetic value</u></b> Although predominantly zoned agricultural, the landscape in the area also consists of a fair amount of residential/farmsteads and business establishments. Large transformation, however, such as the proposed residential establishment may have a visual impact specifically to the remaining farmsteads adjacent to the property.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
<b>Management Measures:</b>	To reduce the impact the following mitigation needs to be incorporated: <ul style="list-style-type: none"> <li>• Avoid removal of large indigenous trees where they do not intersect with planned infrastructure.</li> <li>• Where removal is unavoidable, to re-establish large indigenous trees as part of landscaping, specifically on the project boundaries.</li> </ul>
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>
<b>Fauna and Flora</b>	
<b>Potential impact:</b>	<b><u>Loss of biodiversity and habitat for animals</u></b> Vegetation will be removed during the construction period. The majority of the vegetation that will be removed comprises of disturbed bushveld, very little natural vegetation currently remains on site due to a larger percentage of the site (85%) that has been used for agricultural activities. Vegetation removed relates directly to the loss of habitat for fauna species. <b><u>Encroachment of alien/invasive species and resulting reduction in the ecological integrity</u></b> Exotics/invasive species already occur on site, however disturbance of the site can further result in encroachment of exotic species and result in the edge effect where surrounding properties are impacted upon.



	<p><b><u>Contamination of soil/surface water run off/groundwater that can impact upon remainder/surrounding vegetation</u></b></p> <p>During the construction phase, spillages/pollution of construction material can take place which can impact the remaining ecology on site as well as the surrounding ecology.</p> <p><b><u>Disturbance and alteration of ecological systems through noise and loss of keystone species (aquatic system).</u></b></p> <p>The site has a unique aquatic system formed in the historical man-made farm dam area over time, which can be incorporated into the landscape design of the project area. Furthermore, construction activities (movement, load noises, lighting) can disturb ecological activities/cycles.</p>
<p><b>Impact Significance:</b> (Prior to mitigation)</p> <p><b>Management Measures:</b></p>	<p style="text-align: center;"><b>Moderately Low</b></p> <p>Recommendations that form part of the mitigation of ecological impacts include:</p> <ul style="list-style-type: none"> <li>• To remain within demarcated areas during construction to limit disturbances to surrounding areas;</li> <li>• To remove all exotic/invasive species as CARA requires;</li> <li>• To limit the removal of large indigenous Bushveld trees where possible and incorporate it into the landscape features of the development;</li> <li>• To only use indigenous trees as part of landscaping;</li> <li>• To include the historic man-made farm dam area in the landscape design and layout of the residential development to maintain the aquatic system as a feature and to protect species associated with this feature;</li> <li>• To limit construction activities to the day time and working hours for the purpose of not disturbing activities and ecological processes of nocturnal birds, small mammal etc. and there must be no lighting position next to large trees;</li> <li>• To have a Waste Management Plan in place so as not to pollute the site or surrounding ecology thereby further reducing the ecological integrity, this also includes removal of existing waste sites;</li> <li>• No fauna species encountered may be harmed or captured and no poaching may occur; and</li> <li>• To limit dust on site and the spreading thereof to surrounding vegetation.</li> </ul>
<p><b>Impact Significance :</b> (Post mitigation)</p>	<p style="text-align: center;"><b>Moderately Low</b></p>

## Noise and Air

<p><b>Potential impact:</b></p>	<p><b><u>Disturbance to the ambient environment:</u></b></p> <p>During the construction phase, construction vehicles and equipment will definitely disturb the ambient environment. Dust on site will probably increase with the removal of vegetation and movement of construction vehicles on the bare soil (clearance and earth works), as well as the environmental factors that can contribute, wind and limited precipitation during the dry season.</p>
<p><b>Impact Significance:</b> (Prior to mitigation)</p>	<p style="text-align: center;"><b>Moderately Low</b></p> <p>All vehicles and machinery/equipment used on, or entering the site, must be maintained and serviced regularly to ensure that they do not emit smoke or fumes. The contractor's representative or environmental officer must ensure that all on-site vehicles comply with the old SABS 0181 standards (now SANS 10181:2003 in conjunction with SANS 10281:2003).</p> <p>Dust must be suppressed, during dry periods, by the regular application of water or a biodegradable soil stabilisation agent. Water used for this purpose must be used in quantities that will not result in the generation of runoff.</p> <p>Any solvent based finishes such as paints, varnishes, sealants and polishes will contain minimal levels of volatile organic compounds (VOC) and no chloro fluoro carbons (CFC) which may harm the atmosphere. Water-based paints are to be used where possible (interior) and plant based stains and sealants must be considered as these are more environmentally-friendly. All main paint suppliers now have paints that are solvent and VOC free and therefore environmentally friendly, such as Plascon's Professional Evolution, Dulux Ecosure, Earthcote and Envirolite (Midas).</p> <p>No ad hoc cooking fires are to be allowed on site except in designated cooking areas.</p> <p>Waste must be disposed, as soon as possible, to a municipal transfer station, skip or on a permitted landfill site. Waste must not be allowed to stand on site to decay, resulting in malodours and attracting vermin. Waste may not be burnt on site.</p> <p>Construction contractor will ensure vehicles are road worthy. Construction will take place only during regular working hours (7:00 – 17:00) and not on weekends or public holidays to minimize disturbance to neighbours. In the event that it becomes necessary to work on weekends or outside these hours, then this will first be discussed and</p>



	<p>negotiated with neighbours.</p> <p>A complaints register must be kept throughout the construction and operational phase.</p>
<b>Impact Significance :</b> (Post mitigation)	<b>Low</b>
<b>Surface and Groundwater contamination</b>	
<b>Potential impact:</b>	<b><u>Incorrect handling and spillage of building materials and hydrocarbons</u></b>
	Spillage of building aggregate (concrete, bitumen) and other construction related materials can cause soil, runoff and groundwater contamination.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
	<p>Construction contractor will ensure that all building materials / chemicals are effectively stored and managed. In the unlikely event of a spillage, an incident will be registered and sufficient clean-up procedures will be carried out immediately.</p> <p>All reagents, reagent storage tanks and mixing units will be supplied with a concrete bunded area built to contain 110% of the capacity of the facility in order to return any spilled material back into the system. The system will be maintained in a state of good repair and standby pumps must be provided.</p> <p>Any hazardous substances will be handled according to the relevant legislation relating to transport, storage and use of the substance (Material Safety Handling Datasheets).</p> <p>All construction vehicles will be parked/stored off site (when not working) and will be maintained/serviced off the site to prevent any leakages or spillages of hydrocarbons. If emergency maintenance is required on site, drip trays and/or absorbent mats will be placed underneath the vehicles/equipment where maintenance work is conducted.</p> <p>If hydrocarbons are leaked or spilled, immediate rehabilitation with a product such as that produced by Drizit or Ecodynamics will be used and contaminated soils will be removed for disposal off-site or be rehabilitated in-situ. Waste manifests for safe disposal will be kept. Rehabilitation kits produced by Ecodynamics are environmentally friendly in that hydrocarbons can be recovered (recycling) and the remains biodegrade (no waste to be disposed).</p>
<b>Management Measures:</b>	



<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>
<b>Potential impact:</b>	<b>Poor sanitary practises</b> Improper sanitary practises or facilities could lead to soil and/or groundwater contamination.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
<b>Management Measures:</b>	Portable dry chemical toilets will be provided by the construction contractor for workers. Chemical toilets will be serviced as required to prevent overflows. Construction contractor will ensure that there are an appropriate number of mobile dry chemical toilets on site (typically 1 toilet for 20 people). Contractor to provide suitable ablution facilities (washing and changing area) for construction workers. No builders/workers will be housed on the site. Ablutions outside the provided facilities are not to occur under any circumstances.
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>
<b>Potential impact:</b>	<b>Stormwater management during construction</b> Due to exposed surfaces and unnatural constituents that surface runoff will encounter during the construction phase, stormwater quality and quantity may prove a concern.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
<b>Management Measures:</b>	<ul style="list-style-type: none"> <li>• Embankments and/or diversion drains must be established around excavation areas and stockpiles to divert surface runoff away from these areas to avoid water pollution.</li> <li>• The stormwater management plan, must address any potential pollution from oil and diesel leaks or spills during construction. The plan must ensure that sufficient berms are constructed to contain accidental spills.</li> </ul>
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>
<b>Potential impact:</b>	<b>Poor solid waste management practises</b> Poor solid waste management practises can lead to contamination and unsightly construction zones as well as pests/vermin and associated health issues. Waste streams include: <ul style="list-style-type: none"> <li>• Solid construction waste generated through construction activities and/or demolition of buildings.</li> </ul>

	<ul style="list-style-type: none"> <li>• Biodegradable waste generated through the removal of vegetation.</li> <li>• General waste produced by builders (biodegradable and non-biodegradable).</li> </ul>
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
<b>Management Measures:</b>	Construction waste (building rubble) and general waste will be collected in suitable containers (drums/skips/bins on site) and be removed from site for disposal at the RLM landfill/waste management facility by the construction contractor on a regular basis (at least weekly or when skip is full). The construction contractor will ensure sufficient containers are available for storage of waste prior to removal off site to prevent overflow and littering on the site and surroundings. Storage containers will be clearly marked (and/or colour coded) in terms of what waste can be stored in it. Though no special disposal methods are required (non-hazardous waste), non-biodegradable refuse such as glass bottles, plastic bags, etc. must be stored in suitable containers to allow for recycling and emptied on an as-required basis for recycling purposes during the construction and clean-up phase. Furthermore, the contractor will ensure that no litter, refuse, waste, rubble and construction waste generated on the premises is placed, dumped or deposited on this, adjacent or surrounding properties during or after construction. Litter patrols will be organised by the contractor. The contractor will keep copies of all waste manifests showing responsible handling and disposal by a reputable waste transporter.
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>
<b>Socio-economic</b>	
<b>Potential impact:</b>	<b>Health and Safety</b>
	An increase in workers in the area may pose security or safety risks. The health and safety of construction workers also need to be considered as construction activities can lead to injuries and even death.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
<b>Management Measures:</b>	<ul style="list-style-type: none"> <li>• Transport of workers to and from the construction site will be that of the Contractor, unless otherwise arranged between the Contractor and worker/ employee.</li> <li>• Contractor will discourage loitering of workers / job-seekers and hawkers at entrances to the construction site.</li> <li>• No ad-hoc employment in construction area as this will encourage job-seekers to loiter in the area.</li> <li>• A security guard will keep watch during non-working hours to prevent illegal access and security problems on</li> </ul>



	<p>the site or in the surrounds.</p> <ul style="list-style-type: none"> <li>• The site is to be fenced for the purposes of access control.</li> <li>• Inform staff about environmental and safety risks associated with their work. Have documented work procedures. Make sure employees are competent for the work they perform.</li> <li>• Train staff to operate in an environmentally responsible manner (closing of taps for water conservation, reporting spills etc).</li> <li>• Train staff on incident reporting.</li> <li>• Train staff on procedures and responsibilities for emergency response. Have emergency drill exercises on a regular basis. Clearly mark emergency assembly points (signage) and place an escape route plan on the notice board.</li> <li>• Staff must regularly be informed of the necessary emergency and safety procedures and be competent in the work they are employed to do.</li> <li>• Ensure that staff is familiar with the Occupational Health and Safety Act (OHSA), 1983 (Act 85 of 1983) and Policy. All the necessary safety regulations must be abided by including building codes and fire practice requirements.</li> <li>• Signage to caution employees and visitors – restrict entry in work areas; no open fires (smoking in certain areas), personal protective equipment (PPE) required in work areas, traffic of heavy vehicles etc.</li> <li>• Ensure a vehicle is always available to transport an injured worker to the emergency facilities at the nearby hospital in Rustenburg. Provide first aid facilities on site. Netcare (082 911) and hospital (014 568 4399).</li> <li>• Ensure that the contact details of the police (10111 &amp; 014 590 4115) and/or Security Company, ambulance service and fire brigade (10177 &amp; 014 590 3444) are available on site.</li> <li>• Any hazardous substances will be handled according to the relevant legislation relating to transport, storage and use of the substance (Material Safety Handling Datasheets). The transportation, storage and handling of all substances considered hazardous, will conform to all statutory and regulatory requirements as set out by the Hazardous Substances Act, 1973 (Act 15 of 1973).</li> </ul>
<p><b>Impact Significance :</b> (Post mitigation)</p>	<p style="text-align: center;"><b>Moderately Low</b></p>
<p><b>Potential impact:</b></p>	<p><b><u>Provision of homes</u></b></p> <p>The provision of formal housing for the local people in the area will be a positive impact. The development of this property may lead to further developments in this area which will increase property value locally.</p> <p><b><u>Job creation</u></b></p> <p>Construction will result in direct job creation. Jobs are also created indirectly in industries that provide goods,</p>

	<p>material and services. Where skills are available locally and local people are competent, local labourers should preferably be used to further enhance the socio-economic benefit of the project.</p> <p><u>Increase in business sales</u></p> <p>The construction phase will lead to an increase in business sales for existing businesses located within the Rustenburg area. For example materials used in construction such as bricks, pipes, concrete etc., will be purchased locally, as well as particular services such as engineers, plumbers, electricians, etc. will be sourced locally. These changes are measured in terms of new business sales, i.e. new sales that will be generated in the city economy as a direct result of the capital investment in the proposed project.</p>
<p><b>Impact Significance:</b> (Prior to mitigation)</p>	<p><b>Moderately High</b></p>
<p><b>Management Measures:</b></p>	<p>No mitigation required.</p>
<p><b>Impact Significance :</b> (Post mitigation)</p>	<p><b>Moderately High</b></p>



<b>Operational phase (Indefinite)</b>	
<b>Fauna and Flora</b>	
<b>Potential impact:</b>	<b><u>Encroachment of alien/invasive species and resulting reduction in the ecological integrity</u></b>  Encroachment of exotics and invasive species is still possible during the operational phase and would require continual monitoring and removal of these.
<b>Impact Significance: (Prior to mitigation)</b>	<b>Moderately Low</b>
<b>Management Measures:</b>	Mitigation of ecological impacts include: <ul style="list-style-type: none"> <li>• To remain within demarcated areas during the operational phase to limit disturbances to surrounding areas;</li> <li>• To remove all exotic/invasive species as CARA, 1983 (Act 43 of 1983) requires; and</li> <li>• Signage indicating conduct in open areas (private park areas), dams - such as no littering etc.</li> </ul>
<b>Impact Significance : (Post mitigation)</b>	<b>Moderately Low</b>
<b>Noise and Air</b>	
<b>Potential impact:</b>	<b><u>Disturbance to the ambient environment</u></b>  During the operational phase, a local increase in the number of residents in the area due to a concentrated influx of people. Aside from vehicular traffic increasing, ambient noise levels will also most probably increase due to people talking, shouting, children playing, dogs barking, music playing etc. However, this is expected for any residential area. A local increase in the number of residents during the operational phase will increase the levels of vehicular related emissions.
<b>Impact Significance: (Prior to mitigation)</b>	<b>Moderately Low</b>
<b>Management Measures:</b>	SABS 0103:1994 code with rating levels of ambient noise allowed for this type of district will be adhered to. The body corporate/home owners association appointed can lay down rules on noise after 10pm etc that must be complied with by residents to reduce the nuisance of noise.



<b>Impact Significance :</b> (Post mitigation)	<b>Low</b>
<b>Traffic</b>	
<b>Potential impact:</b>	<b>Traffic increase</b> Increase in traffic due to additional residential units and consequent increase in local residents and travelling.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
<b>Management Measures:</b>	The capacity analysis indicates that the intersections of the D1641 with the P16-1 (R24) and R104 should soon be upgraded and that the access roads to the estate from the D1641 should have turning lanes as proposed in the traffic impact report (Route 2 Transport Strategies, 2013) and RLM road master plan. It is proposed, if access control is used, the access gate control should at least allow for two lanes in and two lanes out with a minimum stacking of 20m.
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>
<b>Surface and Groundwater</b>	
<b>Potential impact:</b>	<b>Increased storm water runoff and surface or groundwater pollution</b> The proposed development will lead to an increase in impermeable surfaces, i.e. buildings, roofs, paved walkways, drive ways, roads etc. An increase in such impermeable surfaces minimises the surface area available for infiltration and prevents the effective infiltration of precipitation into the soils and therefore leads to an increase in surface water flow volumes to be managed as well as the velocity at which it flows. The contribution of the proposed development to increased surface runoff is likely to be relatively small (small contribution given the size of property in comparison to the sub catchment as a whole).
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>
<b>Management Measures:</b>	A storm water management plan (Figure 10-2) will be put in place for the development, by a qualified civil engineer that will consider the contribution of the entire catchment. The engineer will ensure that proper storm water management and erosion control practices are enforced during site clearance and construction but also for the operational phase. The storm water design will be done in accordance with the "Guidelines for Human Settlement Planning and Design" compiled under the patronage of the Department of Housing by the Council for Scientific

	and Industrial Research (CSIR).  Spillages must be reported and cleaned immediately. If municipal services are used, the municipality will be responsible which is the preferred option. If other contractors are used, they will remain responsible along with the home owners association for clean-up and the associated costs.
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>
<b>Socio-economic</b>	
<b>Potential impact:</b>	<b><u>Socio-economic upliftment</u></b>  The project will benefit the local community by providing housing and employment opportunities in the area. This includes contracting jobs of vendors for waste removal, gardening etc. Furthermore security has been improved due to the removal of possible open land / hide-away for vagrants.  Part of the adjudication process for the successful contractor to undertake the civil works will be the use of casual and unskilled labour to stimulate local job creation through the use of labour intensive construction methods where possible. Specific tasks have been identified as being suited to labour intensive construction (e.g. excavation of sewer trenches, laying and back filling of pipes, steel fixing, construction of storm water trenches, re-instate vegetation programs etc.). Approved training will be provided to the contractor's staff where needed.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately High</b>
<b>Management Measures:</b>	No mitigation required.
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately High</b>
<b>Need of Services</b>	
<b>Potential impact:</b>	<b><u>More pressure on services from the RLM</u></b>  Need for municipal services due to the new development and the residents that occupy it.
<b>Impact Significance:</b> (Prior to mitigation)	<b>Moderately Low</b>

<b>Management Measures:</b>	Due to the small area with limited residential units, usage of municipal services will be of a small magnitude in comparison to large, public or industrial developments. However, no services (water supply, sewage and storm water management) exist within the area, therefore the services will need to be extended by the municipality. The development is within the urban edge and therefore municipal services are the preferred option.
<b>Impact Significance :</b> (Post mitigation)	<b>Moderately Low</b>



## 10.6 Mitigation for the Need for Services

The design of the water reticulation, sewerage reticulation, roads and storm water system will be in accordance with the “Guidelines for Human Settlement Planning and Design”, (Red Book), compiled under the patronage of the Department of Housing by the CSIR, 2000. Also refer to the Services Report (EPS, 2013) attached.

**Responsibility:** The construction/establishment of external bulk civil services is the responsibility of the RLM unless otherwise agreed upon in the services agreement. The external bulk services will be handed over to the RLM after construction, who will then be responsible for the maintenance of the external services. The internal services will not be taken over by the RLM and a Non Profit Company or the Developer will be responsible for the maintenance of the services.

**Water:** An existing 300mm bulk water pipeline is situated parallel to and on the northern side of Provincial Road D1641, on the southern boundary of the proposed development. A proposed new bulk water pipeline will be installed as part of the upgrading of the water supply and reticulation in the area and connected directly to the existing 300mm bulk water pipeline. The internal reticulation of the proposed development will be connected directly to this new bulk water pipeline to supply the development with water. A new bulk water meter will be installed for the proposed development. The internal layout of the water reticulation system will be designed to accommodate peak demands in terms of the “Guidelines for Human Settlement Planning and Design”.

The water demand for the development will be a total of 809.1 kl/day which is based on 3.6 kl/day (1.2 kl/day X 3 stands) for the access control and 805.5 kl/day for the residential area (0.9 kl/day as an average daily demand X 895 stands).

**Electricity:** Municipal electricity is currently supplied to the site under an electrical licence for the distribution area as stipulated by the Department of Energy (rural overhead medium voltage infrastructure). Based on the prescriptions of the NRS 034 and generally accepted norms from the Electrical Engineering Unit of RLM, the increase in demand as a result of the development is 6.44MVA. RLM has completed the construction of the Waterkloof 88/33/11kV substation on the south eastern outskirts of Rustenburg and it is currently fed via an overhead 33kV transmission line until the connection to the 88kV Eskom grid is established. The area in which this development is located was earmarked to be supplied by this substation. The developer will either install the link service between the Waterkloof Substation and the development or upgrade existing services on behalf of RLM. The internal electricity infrastructure will be designed and specified in accordance with the requirements of the NRS 048 as accepted by the Electrical Engineering Unit of RLM. Low voltage reticulation will be by means of underground cable. Individual connections will be metered and fed from metering kiosks by means of underground connection cable. All cables located within Residential 2 stands will be installed in a 2m servitude registered in favour of RLM. Street lighting system will be designed and installed in accordance with SANS 098.

**Sewage:** Currently, there is no existing sewerage reticulation system in the vicinity of the proposed development (as confirmed by RLM, 14 November 2013, ref 14/1). All internal sewers will gravitate via a conventional sewer system to an approved new sewerage treatment plant (NWP/EIA/145/2006) to be installed for this and other developments. The new treatment plant together with the maintenance, operation and monitoring thereof will be handed over to the RLM who will be responsible for the maintenance of the new sewerage treatment plant. Effluent quality will comply with the General Authorization standard (Section 39 of the NWA) and will be discharged into the existing water course. A water use registration will be submitted in terms of the NWA.

For the interim there is an existing sewer pumping station and rising main pipeline situated in the south eastern corner of the development, installed exclusively for the Savanna Falls development. For the Waterkloof Hill X4 development, it is proposed that this existing sewerage pumping station be upgraded to accommodate both the Waterkloof Hill X4 development and the Savanna Falls development. All internal sewers will gravitate via a conventional sewer system to the existing pump station situated at the lowest of both the proposed Waterkloof Hill X4 and the Savanna Falls developments. The upgraded pump station together with the maintenance, operation and monitoring thereof will be handed over to the RLM who will be responsible for the maintenance of the upgraded pump sewerage station.

The sewer flow for the proposed development has been estimated at 80% of the average daily water demand, i.e. 647.28 kl/day as provision is made for full-flush sanitation.

**Storm water:** The natural drainage pattern of the terrain is from west to north-east and west to the south-east with the two lowest points in the north-eastern and south eastern corners of the terrain. The storm water design will be done in accordance with the "Guidelines for Human Settlement Planning and Design" compiled under the patronage of the Department of Housing by the CSIR, DWAF and design specifications of the Local Authority. Run-off and peak flow rates will be calculated according to selected return periods and outflow points. The 1:50 recurrence intervals will be used for the major system design and the 1:5 year recurrence will be used for storm water design of the subsurface system. A formal drainage system of pipes or canals will be provided to convey storm water and to discharge this water into natural water courses or similar systems connecting to natural water courses in the vicinity of the proposed development. Erosion protection will be in the form of open drains or shallow side drains, or they could consist of standard municipal type kerbs or mountable kerbs. Energy dissipaters will be provided at the lower end of each watercourse and at sites where the drainage is diverted away from roads. The drainage system will be designed to minimize the impact of the development on the storm water characteristics of the property and adjacent properties by utilizing:

- Surface drainage where possible.
- Sub-surface (underground) pipe systems to convey storm water from higher laying areas.
- Erosion protection, stabilisation of erodible materials, and sediment control.
- Retention where applicable.

Refer to storm water management plan (EPS, 2013).







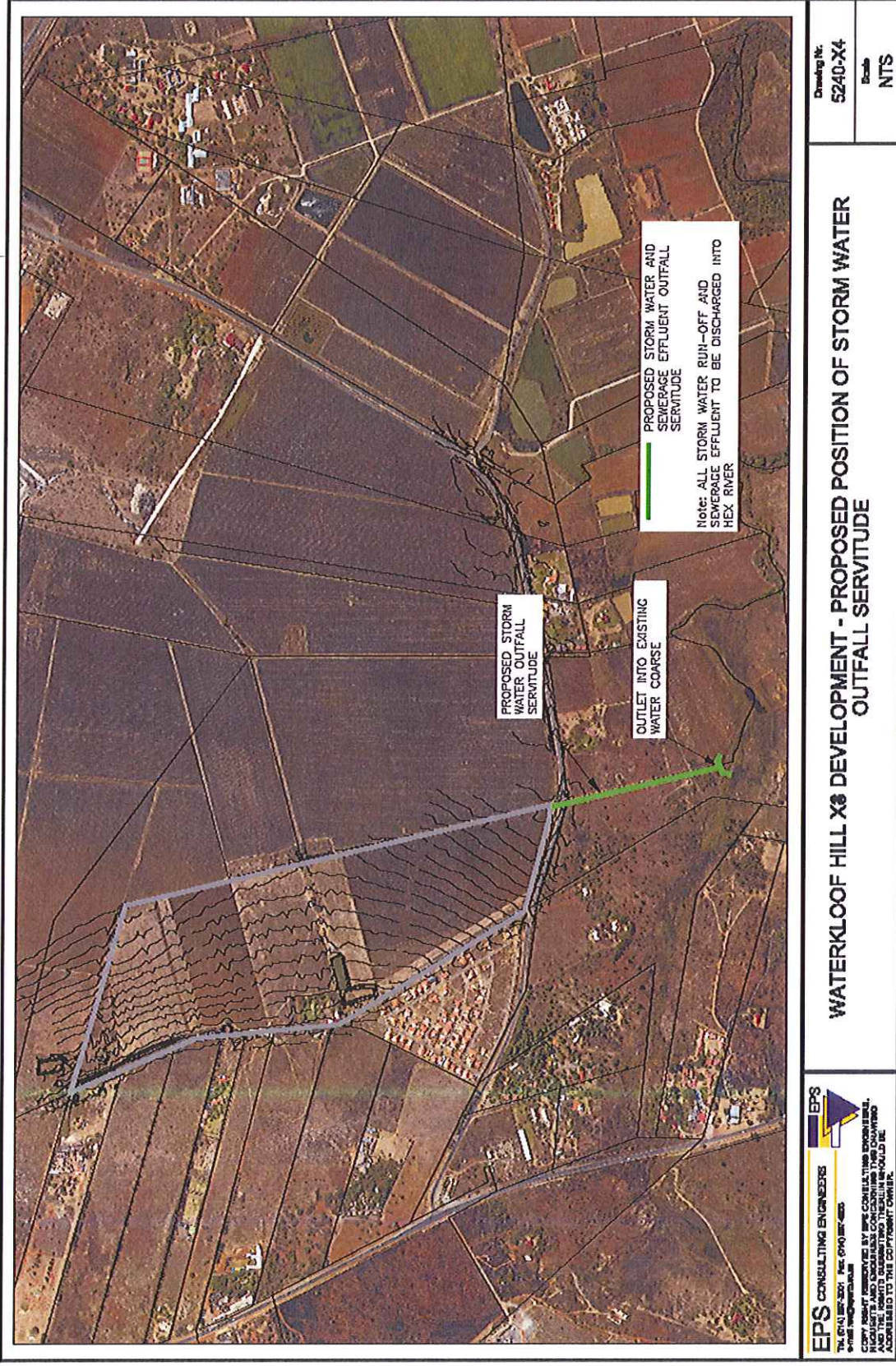


Figure 10-2: Proposed storm water management

## 11 EAP PROFESSIONAL OPINION

In accordance with the EIA Regulations GN R543 31 (2) (n), the EAP must provide an opinion as to whether the activity should or should not be authorised/licenced, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorization must be stated.

An impact assessment has been undertaken, which has incorporated consultation with and participation of the interested and affected parties. It is the EAP's opinion that due process has been followed. Where impacts have been found to be potentially significant, various mitigation measures to manage and monitor the impacts of the project have been proposed.

It was found that the construction and implementation of the project would:

- Not give rise to any adverse biophysical or socio-economic impacts that cannot be adequately mitigated; and
- The proposed development will in actual fact have a positive Socio-Economic impact and in line with the RLM SDF.

It is the opinion of the EAP that, subject to compliance with the recommended mitigation measures, which are detailed in the EMP, the project has significant positive aspects and acceptably low negative impacts and should be approved. The authorization/licence should be subject to the following conditions:

- The project should remain in full compliance with the requirements of the EMP and with all regulatory and legal requirements as well as conditions of authorisations/licences;
- The EMP should be implemented by senior qualified environmental personnel that have competence and credibility to interpret the requirements of the EIA and the EMP, and must be issued with a written mandate by a senior management member to provide guidance and instructions to the contractors;
- Stakeholder engagement must be maintained during the construction and operational phase of the project, with the emphasis on on-going provision of information pertaining to the project, and with the goal of maintaining constructive and mutually respectful stakeholder relations;
- A detailed record of all activities related to environmental and social management, as well as stakeholder engagement, should be retained for review and audit by independent parties for all phases of the project. The audit findings should be made available to the relevant environmental and local authorities; and
- Any substantive changes to the project configuration should be the subject of environmental assessments and should result in amendments to the EMP. Information related to any such changes should be made available to the authorities as well as for public review in the spirit of full disclosure

## 12 ENVIRONMENTAL IMPACT STATEMENT

This Section is presented in accordance with Regulation 31 (2) (o) of the EIA Process Regulations (GNR 543 of 2010). It summarizes the findings of the EIA and provides a comparative assessment of the positive and negative implications of the project.

### 12.1 Need and Desirability

The need for and desirability of the project are discussed in Section 2.2. In summary, there is already a backlog in the need for housing for the Rustenburg community. The potential future growth of the municipality will result in an additional demand for housing up to 2015. The total additional demand over this period is estimated to be approximately 57 000 units. This figure includes both affordable housing units to be provided through the public sector, as well as bonded houses to be provided through the private sector.

### 12.2 Summary of Findings

The EIA process did not indicate any fatal flaws or negative impacts of high significance that could make the project non-feasible from a legal, biophysical or socio-economic perspective. The proposed project will result in some minor negative impacts and positive socio-economic impacts of which the negative impacts can be minimised by the implementation of the recommended mitigation measures. These measures have been formalised in the EMP.

#### 12.2.1 Positive impacts

The positive impacts include:

- Employment creation during construction and operational phase;
- Providing residential units for the growing community which will reduce the backlog of residential units required in the RLM;
- Contribution to the GDP and GGP;
- Removing a security risk by removing open land that can be utilised by vagrants; and
- Removal of existing exotic and invasive species.

#### 12.2.2 Negative impacts

The negative impacts include:

- The possible contamination of the surrounding environment (air, groundwater & surface water) with construction material during construction activities;
- Loss of a small section of agricultural land;
- Loss of aesthetic value;
- Ecological impacts;
- An increase in traffic flow within the region; and
- Pressure on the RLM service capacity (however development is within the urban edge)