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FINAL EIA Report (Final EIAR) **12/1/9/2-C44**

FINAL EIA REPORT FOR THE PROPOSED DEVELOPMENT OF A RESIDENTIAL AREA WITH A GOLF COURSE ON REMAINDER OF PORTION 4 OF THE FARM ROODEPOORT 744 LS AND REMAINDER OF PORTION 1 OF THE FARM LANGGENOEG 754 LS, POLOKWANE MUNICIPALITY, CAPRICORN DISTRICT, LIMPOPO PROVINCE
SHORT NAME: LANGDALE GOLF ESTATE

7 October 2016

Commissioned by: Northern Spark Trading (Pty) Ltd
Document version 1.0 – FINAL
Compiled by: HP Jannasch & EA Grobler

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Final EIA Report:

Prepared by

FINAL EIA REPORT FOR THE PROPOSED DEVELOPMENT OF A RESIDENTIAL AREA WITH A GOLF COURSE ON REMAINDER OF PORTION 4 OF THE FARM ROODEPOORT 744 LS AND REMAINDER OF PORTION 1 OF THE FARM LANGGENOEG 754 LS, POLOKWANE MUNICIPALITY, CAPRICORN DISTRICT, LIMPOPO PROVINCE

Short names: Langdale Golf Estate

7 October 2016

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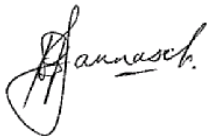

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Final EIA Report:

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Municipal Manager	Polokwane Local Municipality
Municipal Manager	Capricorn District Municipality
Department of Water and Sanitation	Mr. Donald Mabada
	Registered Interested and Affected Parties

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12/1/9/2-C44	5 September 2016	1.0	Consultation EIA report
12/1/9/2-C44	7 October 2016	2.0	Final EIA report

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LIST OF APPENDICES

1 OBJECTIVE OF THE EIA PROCESS

According to Regulation No R 982 of 4 December 2014, the objective of the EIA process is to, through a process of consultation:

a. Identify the policies and legislation relevant to the study and how the study complies with the policies and legislation.
b. Motivate the need and desirability of the proposed activity including the need and desirability of the activity in the context of the preferred location
c. Identify the location of the development footprint within the preferred site basd on an impact assessment and risk ranking process which includes cumulative impacts and a ranking process of all the identified alternatives focussing on the geographical, physical, biological, social, economic and cultural aspects of the environment.
d. Determine the
    a. Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform preferred alternatives; and
    b. Degree to which these impacts
        i. Can be reversed;
        ii. May cause irreplaceable loss of resources, and
        iii. can be avoided, managed or mitigated.
e. Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment
f. Identify, assess and rank the impacts the activity will impose on th preferred location through the life of the activity
g. Identify suitable measures to avoid, manage or mitigate identified impacts and
h. Identify risks that need to be managed and monitored.

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Name of EAP: AGES – Engela Grobler and Hein Jannasch
Contact details of EAP:

Physical Address:	120 Marshall Street, Polokwane, 0699
Telephone number:	015 291 1577
Fax number:	015 291 1577

Expertise of EAP: A Master's Degree in Environmental Management and 7 years of experience with the management and conducting of EIA's. A number of renewable energy projects which participated in the IPP Programme, issued 3rd August 2011 by the Department of Energy have been awarded Preferred Bidder Status. Curriculum Vitae of EAP is included in Appendix N.

4 LOCATION OF ACTIVITY

4.1 SURVEYOR GENERAL 21 DIGIT CODES OF DEVELOPMENT AREAS

Remaining extent of portion 4 (a portion of portion 1) of the farm Roodepoort 744 LS
T0LS00000000074400004
257.6085 ha

Remaining extent of portion 1 of the farm Langgenoeg 745 LS
T0LS00000000074500000
35.910 ha

4.2 PHYSICAL ADDRESS AND FARM NAME

The Remaining extent of portion 4 (a portion of portion 1) of the farm Roodepoort 744 LS, and the Remaining extent of portion 1 of the farm Langgenoeg 745 LS, Polokwane Local Municipality, Capricorn District Municipality, Limpopo Province.

4.3 COORDINATES OF PROPERTY BOUNDARIES

The site is located between the following co-ordinates:
23°59'24.87" and 23°58'02.39" South
29°27'04.87" and 29°25'48.95" East

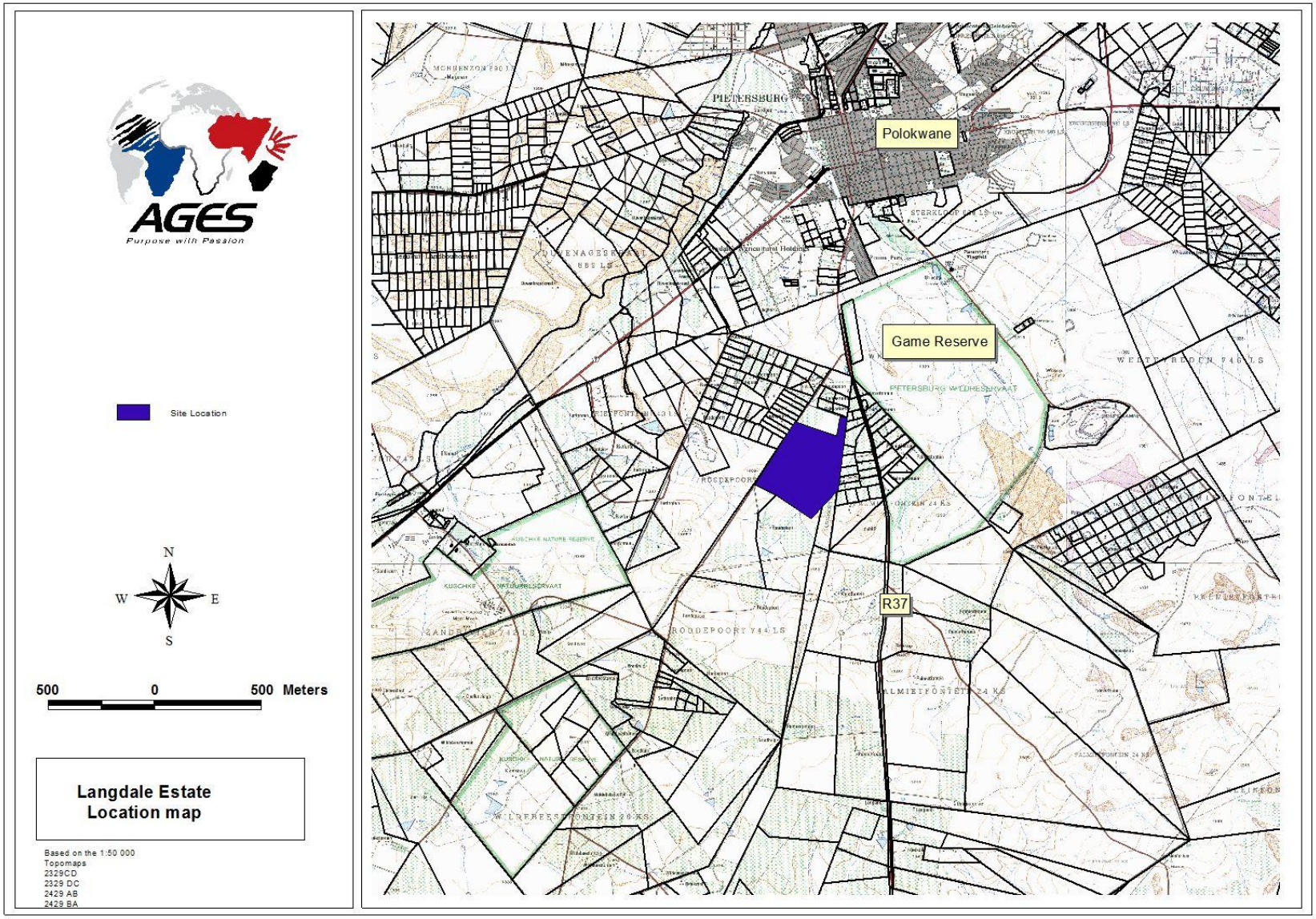
The proposed development is located approximately 6 km south-south-west of Polokwane, 10 km from the CBD.

From Polokwane the site can be reached via the R37 (Lebowakgomo Road). After crossing the Tzaneen-Mokopane bypass road, turn right on the Roodepoort road, and continue with this road until just before the tar ends. The entrance to the land is on the left. The land can also be reached by continuing with the R37; turn right in a westerly direction at Van der Linde Poles (see attached locality map) and continue to the smallholdings of E. Ives. Access is through this plot.

The property is located within the jurisdiction area of the Polokwane Local Municipality as well as within the Polokwane/Perskebult Town Planning Scheme, 2007 area.
The location is indicated on the location map included in Appendix A.

5 PLAN OF THE PROPOSED ACTIVITY

Figure 1 Location of the proposed Langdale Golf Estate



6 SCOPE OF THE PROPOSED ACTIVITY

6.1 LISTED ACTIVITIES TRIGGERED IN TERMS OF NEMA

Relevant notice	Description
GN R.983 Item 28 (ii) ***Residential development on land formerly used for agriculture after 01 April 1998 and which will occur outside an urban area, where the total land to be developed is bigger than 1 ha.***	Langdale Estate (292.49 ha)will be developed on land that was used for agriculture after 1 April 1998
GN R.984 Item 15 ***The clearance of an area of 20 ha or more of indigenous vegetation***	More than 20 ha of indigenous vegetation will be removed as the estate is 292.49 ha in extent.
GN R.985 Item 2 ***The development of reservoirs for bulk water supply with a capacity of more than 250 m³, outside urban areas, in critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans, areas within 10 km from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.***	A reservoir of 1500 cubic metres will be built at the estate which is located in a CBA 1 area and less than 1 km from a protected area (Polokwane Game Reserve)
GN R.985 Item 4 ***The development of a road wider than 4 m with a reserve less than 13,5 m; ii) outside urban areas, in ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Areas within 10 km from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas***	Roads of up to 6.5m wide will be constructed at the estate which is located in a CBA 1 area and less than 1 km from a protected area (Polokwane Game Reserve)
GN R.985 Item 5 ***The development of resorts, lodges, hotels and tourism or hospitality facilities that sleep less than 15 people. (b) Outside urban areas within 10 km from national parks or world heritage sites or 5 km from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (c) In Free State, Limpopo, Mpumalanga and Northern Cape provinces in critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans***	Hotels and tourism facilities will be constructed at the estate which is located in a CBA 1 area and less than 1 km from a protected area (Polokwane Game Reserve)
GN R.985 Item 12 ***The clearance of an area of 300 m² or more of indigenous vegetation except required for maintenance has been identified as critically endangered in the accordance with a maintenance management plan. Within critical biodiversity areas identified in bioregional plans***	More than 20 ha of indigenous vegetation will be removed as the estate is 292.49 ha in extent and which is located in a CBA 1 area less than 1 km from a protected area (Polokwane Game Reserve

6.2 DESCRIPTION OF ASSOCIATED STRUCTURES AND INFRASTRUCTURE RELATED TO THE DEVELOPMENT

The proposed development will consist of the following:

- 18 hole golf course + clubhouse with associated infrastructure
- 593 Residential 1 stand erven
- 3 Residential 3 stand erven,
- 1 Business 3 erf
- 1 hotel erf
- 1 Clubhouse erf
- 1 Erf for Educational use
- 2 erven for engineering services and workshop
- 3 erven for private roads
- 14 erven for private open space for parks and golf course

Thus, a total of 614 erven is planned on a total area of 292.498 ha.

Associated infrastructure / facilities would be as follows (more detail provided in the motivational memorandum attached):

- Sewerage pipelines
- Sewerage processing plants
- Access roads and streets
- Private open spaces including gardens & parks
- Storm water infrastructure
- Electricity infrastructure
- Water provision infrastructure
- Refuse removal services
- Access control facilities
- Golf course, also including:
    - Club house
    - pro-shop
    - restaurant
    - bar
    - bathroom/change room facilities
    - overnight accommodation
    - workshop & engineering
- Two long term water sources are available for the irrigation of the golf course, namely groundwater sources and effluent from the wastewater treatment plant/s.

6.3 GOLF COURSE DESIGN PHILOSOPHY AND WATER REQUIREMENTS

DDV Design Group wrote a design philosophy and calculation of the water requirements of the proposed golf course. This document is attached as Appendix J. The following information is an extract from this design document.

The Langdale Golf Estate consists of an 18-hole golf course which is integrated with the proposed residential dwellings. The golf course is designed with two loops of nine holes meandering through the estate. A driving facility will accompany the golf course and provide a warm-up facility and coaching academy.

The fairways are carefully designed to be integrated with the surrounding indigenous trees, with widths varying between 20-50m, depending on the design integrity of each hole. The fairways will be surrounded by a semi-rough area which will range between 5 and 10m, as per the area that can be played on, followed by the natural existing veld grass. The lie of the land forms an important part of the routing of the golf course, which also provides pockets of undisturbed bush which will create habitats for the existing fauna.

Greens
In order to provide the best surface for the greens, it is suggested that they be seeded with *Agrostis stolonifera* – this is a Bentgrass variety 007 which is a fine creeping Bent which can tolerate higher as well as sub-zero temperatures.

Fairways
The fairways will be seeded with LaPrima Bermuda grass seed where fast germination, rapid establishment and excellent turf performance are required. It is the first certified blend of improved, turf-type seeded bermuda grass varieties. The high performance varieties in LaPrima were chosen for their individual benefits and characteristics: to provide an extremely high quality turfgrass surface in a shorter time, at less expense and with easier maintenance requirements. La Prima Bermuda grass, is a drought tolerant grass, which can tolerate seasonal temperature changes. This grass was selected specifically for the soil conditions on site, and is not invasive.

Semi-rough
The semi rough is to be seeded with Cynodon dactylon Bermuda – kweek or coach grass – which is indigenous and also drought tolerant. However, the colour variation is different to the La Prima variety. This will provide a good definition between fairway and semi-rough.

Tees
A set of four to five island tees per hole, surrounded with veldgrass, will also be seeded with La Prima Bermuda grass, which can be manicured to heights of 5 to 10mm with a very good recovery rate.

Rough
The rough and other areas will be disturbed during the construction period but will be seeded with a mixture of grasses, consisting of *Cynodon dactylon* - Bermuda (15%), *Eragrostis tef* (15%), *Eragrostis curvula* (20%), *Chloris gayana* - Rhodes grass (25%), and *Digitaria eriantha* – Smuts finger (25%).

All trees, shrubs and groundcovers on the golf course and in the residential areas and road servitudes are to be **indigenous and water-wise.**

Water Usage

The water usage on the golf course was calculated for the optimum growth and maintenance of the golf course playing surfaces with water conservation in mind. Water will be applied through an automatic irrigation system, which will minimize water wastage. The pop-up irrigation system will consist of adjustable sprinklers that will predominantly spray inwards to the fairway and only seasonally be allowed to overspray on the semi-rough and rough areas. This would save 30% of normal irrigation practices.

The irrigation water requirements based on maximum peaks will be 600m^3 per day which will be applied in an 8 hr window at night time. The first requirement of water will be100 m^3 per day and then increase monthly to the full quantity of 600m^3 per day. The water requirements vary from the construction stage of the golf course, the grow-in stage, and ongoing watering, depending on the seasonal changes and maintenance practices.

In order to conserve water, to reduce direct evaporation and to minimize the seepage of water through the root zone, a water retention polymer will be applied in the top 100 to 150 mm planting zone on the fairway, tees and semi-rough areas, which will reduce the water requirement and direct evaporation by 40 %. This will reduce the water usage to 400m^3 per day. The polymer has a life span of 5 years although it is anticipated that it will only be effective for up to 3 years. Thereafter sufficient organic matter build-up in the root zone will assist. Furthermore, Cynodon grass will be used on the fairway, which requires less water than Kikuyu grass

The ongoing maintenance water requirements will be a maximum volume per day in mid- summer to 50 % less during winter months. Once the golf course reaches maturity or is fully grown in, the average water requirements should be between 400 to 600m^3 per day depending on seasons and maintenance practices.

The golf course will be constructed in two phases e.g. the first phase – the driving range and ten holes, holes (1 to 9 and 18) and the second phase will include the development of the other 9 holes which will only be constructed once there is sufficient treated effluent (from the residential component of the development) available on site.

7 LEGAL AND POLICY REQUIREMENTS

The following is a broad overview of the relevant policy and legal requirements related to the environment, applicable to the proposed project: Legislation is not limited to this list.

Table 1: Review of relevant legislation

Constitution of the Republic of South Africa (Act no. 108 of 1996)
Fencing Act (Act no. 31 of 1963)
LEMA: Limpopo Environmental Management Act. (Act No 7 Of 2003)
Environment Conservation Act (Act no. 73 of 1989)
National Water Act (Act no. 36 of 1998)
National Environmental Management Act (Act no. 107 of 1998) NEMA EIA Regulations 2014 (GN R. 982, 983, 984, 985 of 4 December 2014)
National Heritage Resources Act (Act no. 25 of 1999)
National Environmental Management: Biodiversity Act (Act no. 10 of 2004) GN R150:Threatened and Protected Species GN R15: Lists of critically endangered, vulnerable and protected species GN R152: Threatened Protected Species Regulations

National Environmental Management: Air Quality Act (Act no. 39 of 2004)
National Environmental Management: Waste Act (Act no. 59 of 2008) GN921 of 29 November 2013-Listed activities
National Veld and Forest Fires Act, 1998 (Act 101 of 1998)
Limpopo Environmental Management Act (Act 7 of 2003)
Occupational Health and Safety Act (Act No. 85 of 1993)
Polokwane Municipality Integrated Development Plan (2012-2015
Polokwane/Perskebult Town Planning Scheme, 2007
Town Planning and Townships Ordinance, 1986
Town Planning and Townships Ordinance, 1986
BGIS Land Use Decision Support (LUDS)
Mineral and Petroleum Resources Development Act (MPRDA
National Building Regulations and Building Standards Act

Under the National Water Act (NWA; Act No. 36 of 1998) an application for a Water Use Licence is required and such application will be prepared and submitted by AGES (Africa Geo-Environmental Engineering and Science) on behalf of the applicant. This application will run concurrently with the EIA process, although it had not yet been submitted.

A Heritage Impact Assessment had been completed by R&R Heritage Resources Consultants, and they were instructed to submit the required documentation to the relevant authorities. No comments from the authorities were received so far.

As this project has been worked on for quite a number of years some changes occurred with regard to heritage resources in terms of the EIA process. Although the provincial authority (LIHRA) was informed about the proposed development, they are no longer the commenting authority in terms of heritage resources.

Comments should now be obtained from SAHRA via the SAHRIS website. However, this is only done at the EIA stage as they require the consultation EIA Report before they are willing to comment on the project. Thus, this consultation report will be uploaded to the SAHRIS website in order to get comments from SAHRA to be submitted with the Final EIA Report.

8 NEED/DESIRABILITY FOR THE PROPOSED LANGDALE ESTATE NEAR POLOKWANE

A comprehensive motivational memorandum is attached as Appendix N, which serves as a document outlining the benefits of a development of this kind, in Polokwane. It also illustrates the need and desirability of the proposed development. The following are motivational factors supporting the project:

- The Langdale Golf Estate will address the identified need for a prestige golf course in Polokwane which is important for the promotion of the area as a tourist destination
- The principle of Langdale Golf Estate is to combine the sport/recreation of golf with the natural beauty – or in other words to provide residents with the opportunity to live in a relaxed country style living surrounded by open space and natural bushveld and of course, an eighteen hole prestige golf course
- It will establish a secure living area for many people
- People will be afforded the opportunity to live in an area of natural beauty
- People will be afforded the opportunity to live an outdoor lifestyle in a safe environment
- Another golf course can be substantiated for a city such as Polokwane. However, the viability and sustainability to develop a prestige golf course depends on developing it as part of a golf estate;
- Polokwane as capital city of the province has no Golf Estate and Langdale Golf Estate will be the first for the city;
- The proposed Langdale Golf Estate and golf course can be developed without prejudice to the existing course. As a matter of fact, it will rather compliment the sport facilities of the city and attract additional “golf tourism”;
- The Golf Estate can attract additional tourism for the city as well as Limpopo Province by developing this area;
- This development can attract foreign investment into the city - international and national investment;
- Golf Estates are developed as part of a “global trend” and there is an increasing demand and popularity for this type of development;
- To provide Langdale Golf Estate as an alternative housing type for Polokwane city – where lifestyle living in the form of golf and natural beauty are currently limited or not present at all.
- The proposed Langdale Golf Estate can play a major role in the local economic development of the city as well as the Limpopo Province.
- Combining a prestige golf course with a lifestyle estate makes it more viable, while developing and maintaining a prestige golf course alone is very difficult
- The neighbourhood will be provided with a shopping centre and other community facilities
- Recreational opportunities are created by the development of the estate and the associated activities around the sport of golf.
- It will discourage illegal occupation of land
- It will promote orderly settlement of residents
- It will provide housing for the growing population, particularly the growing middle class
- Efficient and integrated land development: prevent urban sprawl
- Sustainable land development

Golf courses and golf estates can although it is a very popular type of development, especially with the more affluent people, create a lot of negative feelings under the general public. The reason why it is seen in a negative light is the issue of water use by the developments and the effect it can have both on the quantity of water in the area of the golf course but also influence on the quality of surface water and groundwater in the area as a result of fertiliser and chemicals which are used in the maintenance of the golf courses. The influence on the biodiversity of the area is also an important issue. It also uses considerable portions of land which will not be available for other development

There is internationally and especially also in South Africa a shift towards the development of sustainable golf courses and estates which is environmentally “green” and have a smaller environmental footprint. In the proposed development special attention was paid to the reuse of purified effluent to save on water use for the course, using of alternative/renewable energy sources, hardy less “water thirsty” grass types, removal of invasive aliens, promoting the use of indigenous vegetation, environmentally friendly chemicals and many more initiatives.

The development will strive towards being economically viable, environmentally sound and socially responsible-the “Triple Bottom Line”. This involves the integration of environmental principles into existing management systems to structure the way of working with the environment. It will require close cooperation and liaison between every residential and business owner in the estate and the golf course/estate management to decrease the environmental footprint and to increase the long-term sustainability of the development.

9 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE PREFERRED SITE

A number of factors were taken into account in the design of the lay out and was based mainly on the topography and lay out of the natural area in order to make the most of the natural surroundings to increase the aesthetic appeal of a development of this kind, which is a golf course combined with a residential development and associated amenities.

10 CONSIDERATION OF ALTERNATIVES

10.1 DETAILS OF ALTERNATIVES CONSIDERED

There are no feasible and/or reasonable location alternatives for the proposed activity because the activity cannot be relocated as a result of boundary constraints. In the case of environmental constraints, options available to the applicant are to reduce the number of units and/or to modify the site lay out plan. The initial site lay out plans as well as the preferred alternative site lay out plans are included in **Appendix A.**

The current site lay-out underwent a number of changes as a result of information that were given to the applicant during the course of the past and current EIA processes. One determining factor was the identification of the 1:50 and 1:100-year flood line. Some erven and roads were located in the 1:100-year flood line area and the site lay out plan were amended in order to exclude any development within the 1:100-year flood line.

Alternative 1 (Preferred Alternative)
The potential of the land for the conducting of the preferred activity, is very positive. It was specifically purchased for its suitability as a location for a residential estate with a golf course.

The potential success of the development is largely dependent on the inclusion of the golf course. Without the golf course, the residential development will be located too far outside of the perimeter / city limits of Polokwane for development of a township alone. This became evident during the application for a change in land use, which was submitted to the Polokwane Municipality. The Municipality already approved the township with a golf course and proof of this is included in Appendix O together with the Motivational Memorandum, which formed part of the application.

The site lay out plan evolved from initially having residential erven in the flood line area as well as having residential erven planned inside drainage lines. These alternative site lay out plans are discussed hereafter.

Alternative 2

Site lay out / Alternative 2 indicates developments traversing drainage lines on site and thereby completely changing the natural characteristics of the drainage lines on site. In order to compensate for the natural flow of water during flood events, a storm water plan was drafted, which indicated that storm water will be redirected around the lay-out of residential erven. A different flow regime was designed in order to protect the residential erven against flood events in future.

Alternative 3

Before any specialist studies were conducted on site, a concept site lay out plan was designed in order to determine the financial viability of the project. However, in the concept site lay out plan a number of residential erven were indicated to be in a flood line area. However, as soon as the flood line area has been identified and delineated, the residential erven were taken out and a new site lay out plan was drawn.

Other Alternatives - Service alternatives

WASTE WATER TREATMENT

The planned method and infrastructure for the processing of the estimated daily amount of 1032 000 litre (1032 m^3, once occupation of 100% of erven is reached) of sewerage changed from a single plant system, where the plant was to be located in the northern extreme of the farm Langgenoeg to six smaller modular or package plants, located strategically to be within easier reach of the different groups of erven they are to serve (Figure 2). This is to ensure that the treated water from these plants will be available to irrigate the golf course and/or gardens. Note that the daily amount of sewerage/effluent to be generated is not enough to trigger the relevant activity (activity 25 of listing notice 1 GNR 983 of 4 December 2014). The six modular plants will limit the risk of pollution in the event of a plant failure.

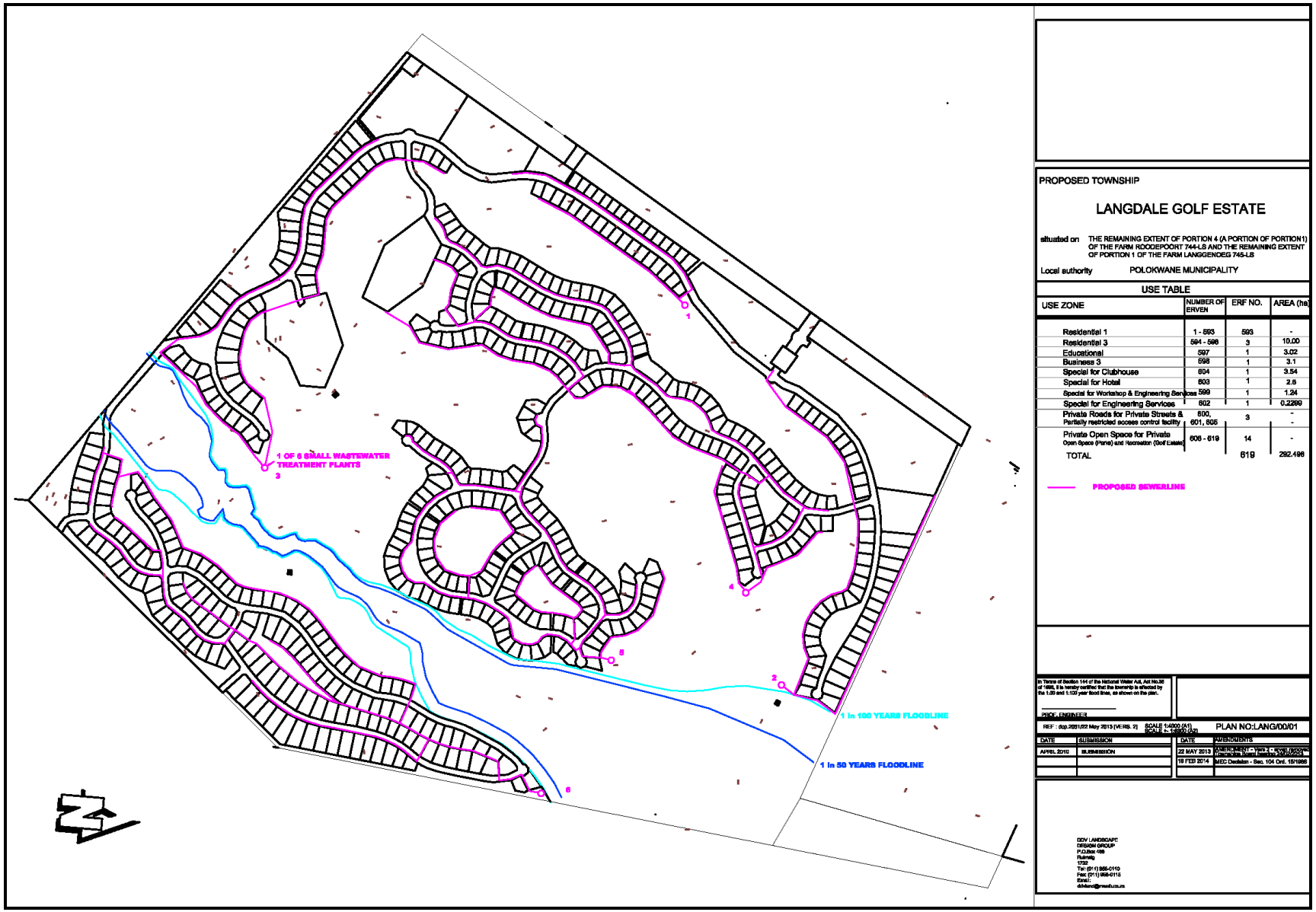


Figure 2 Locations of the proposed Langdale Golf Estate Sewage package plants.

Holding dams for the treated effluent from the water treatment plants will be lined in order to safeguard any possible pollution to ground water.

ELECTRICITY / ENERGY

For alternative energy sources for electrical energy, solar energy with photovoltaic solar panels on houses and batteries are planned. The light bulbs will also be low energy-using LED lights and not incandescent light bulbs.

Hot water will be supplied by solar water geysers with gas heater backup for times of not enough sun to heat the water.

Gas will be used for stoves and for heating and not electricity. The system planned is a **hybrid system** which combines solar energy, gas and electricity with the minimum reliance on Eskom power. The hybrid system will only be used for lighting and the operation of appliances such as TV's, fridges and other short term energy demands. The main energy demand of heating will not be connected to the system.

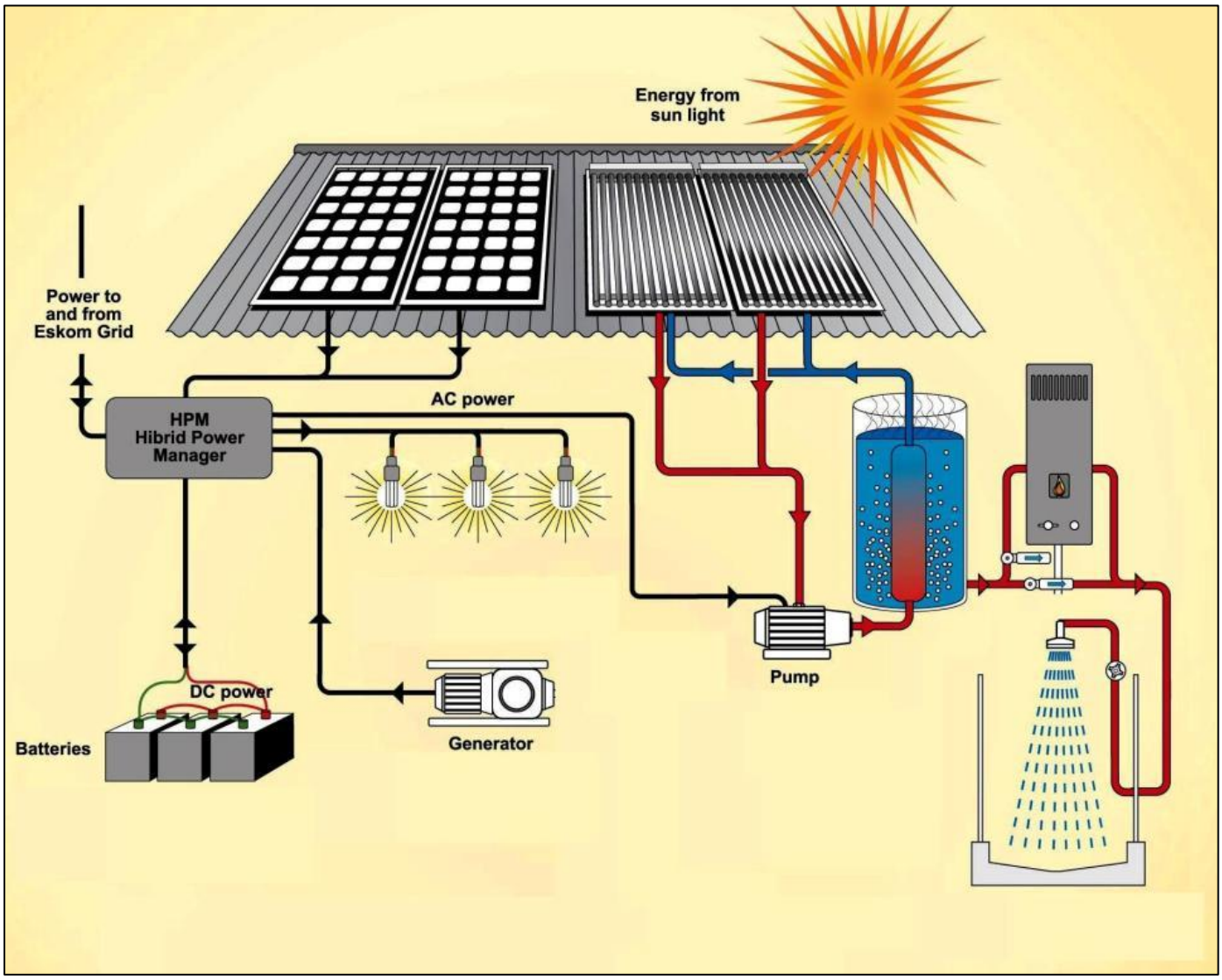


Figure 3 Illustration of a typical hybrid energy system that is planned at the development.

WATER USE

The irrigation of golf course will mainly be done with treated sewage effluent which could be supplemented by groundwater as opposed to the utilising of groundwater or scheme water from Lepelle Northern Water. The use of groundwater by the development will be reduced drastically by reusing treated effluent. The proposed golf course will only be constructed after occupation of more than 35% of the development. The golf course and its irrigation is dependent on the volume of water available from the water treatment plants. And this can only be done once a certain number residences are occupied and effluent is generated. Only then will there be enough water to contribute to the waste water source. When the development is 100% occupied a volume of over 1000 m^3 of treated effluent will be available for use on the golf course. However, the volume of water needed to irrigate the golf course will amount to 400 m^3 - 600 m^3 according to the DDV Design report in Appendix J. The design of the golf course was done in such detail insofar as that drought resistant grass species and variants have been chosen for the golf course in order to lower the volume of water required to maintain a high quality golf course. The golf course will be developed in phases, adding more holes and greens as more water becomes available, as the occupation rate increases.

10.2 DETAILS OF PUBLIC PARTICIPATION PROCESS UNDERTAKEN

The public participation process was followed according to Chapter 6 of the New EIA Regulations (2014). Notification posters were put up on site as well as in other areas of the development site on 09 November 2015. An advertisement was published the Observer, which is a popular local newspaper, in the 26 November – 2 December 2015 edition. Notifications were sent to the adjacent land owners and identified I&APs and relevant Government Departments.

A public meeting was held on 4 December 2015 and a number of issues were highlighted at this meeting, which include the following:

- Concerns were raised with regard to the use of the ground water. The EAP indicated that the use of water will be guided by a Geo-Hydrological study as well as inputs by the Department of Water and Sanitation (including a process for the application for a Water Use License).
- There is a concern that there will be an increase in criminal activities in the area as a result of the influx of people to the area as a result of the proposed development. The developer will commit to the installation of a high quality security fence as well as the deployment of security personnel inside as well as the perimeter of the development area.
- It was brought to the attention of the developer that activities from the Brick Works to the South of the development, generates noise and dust. The developer indicated that they are aware of this.
- The last major concern was regarding the increase in the risk of veldt fires occurring as a result of activities by workers in the area. It was requested that water be available at strategic points for the control of veldt fires.

The Draft Scoping Report was available for comments from 23 February 2016 until 22 March 2016. During the course of the previous application process as well as this application process, a number of letters were received, containing comments and include the following:

- Department of Mineral Resources
  The DMR acknowledged receipt of correspondence but no further correspondence was received.
- Land Claims Commission
  A notice was sent to the Land Claims Commissioner by Francis Baard Attorneys. However, no comments were received.
- Lepelle Northern Water
  A letter was received (dated 20 June 2014) in which it was indicated that Lepelle Northern Water will have water supply for bulk potable water to the proposed development. This is subject to a service agreement between Lepelle and the developer.
- Roads Agency Limpopo (RAL)
  RAL indicated that they have no objection against the proposed development but this is subject to a number of conditions, which were set out in a letter to the developer.

All correspondence and letters referred to here as well as all proof of public consultation is contained in Appendix C.

10.3 SUMMARY OF ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

After the issuing of the background information documents, no formal objections were received and no issues were raised by I&APs and no comments have been received from any I&APs. Some comments were received from governmental departments but there were no objections to the proposed development taking place.

At a public meeting, the issues mentioned include the following:

- Impact on ground water resources
- Increase in criminal activity as a result of increase of people in the area.
- Potential impact of brick works (noise and dust) on the proposed development.
- Increase in risk of veldt fires and the need for water to be available for fire-fighting purposes.

The Consultation EIA Report was made available to all registered I&APs and applicable governmental departments for a 30-day commenting period.

The Department of Water and Sanitation (DWS) submitted comments on the report and the development. The comments were about development in the flood line, identified water uses, storm water control, and waste management. A response on the comments was sent to the DWS on 5 October 2016. The comments and the response to the comments are attached in Appendix C.

10.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE FOOTPRINT ALTERNATIVES

10.4.1 BIODIVERSITY AND ECOLOGICAL ASPECTS

The**, terrestrial ecology** was assessed in 2007 by the Envirodel-Dubel Association (Appendix D). The **avifauna** of the area was assessed by J Grosel of Tembele Ecological services (Appendix E). Mr J Botha from AGES re-assessed the current vegetation condition in 2016 (Appendix D).

PREVIOUS & CURRENT LANDUSE

The study area was used for cattle grazing and croplands in the past, of which 75 ha have been transformed for croplands and the rest of the area has been used for cattle farming. Three dams have been constructed in drainage lines as well as storm water control berms in the most western portion of the site. There is a 40 m power line servitude within the property along the entire western border next to the road. The property is game fenced and game (impala, kudu, ostrich and blesbuck) are free ranging on the farm, whilst a small number of nyala are being kept in a camp. Cattle and goats are grazing and browsing in the areas closer to the farmhouse.

RIPARIAN AREA

A reasonably large drainage course enters the proposed development site (Langdale) at the southern boundary near the south-eastern corner and runs along the eastern boundary while two tributaries join it from the west, before it leaves through the eastern boundary just north of the middle of this border. Directly downstream from where the last tributary joins the main stream, the channel of the main drainage courses flattens out to such an extent that it becomes a broad flood plain with only a poorly developed main drainage channel. Due to the fact that it is an annual stream that only flows after significant showers, no true “delta” and/or vlei have formed in this flat area.

Drainage courses are protected from development by South African environmental legislation and as such should be protected. However, the drainage courses present on Langdale does not contain any important conservation features such as vlei’s, floodplains, catchments and / or rivers. Earth dams constructed in the drainage courses do however contain habitat for waterfowl and frogs, of which the African bullfrog is an important and protected species. Bullfrogs are definitely known to breed in earth dams in the area, for example in the Polokwane Game Reserve quite close to Langdale. Therefore, the water bodies on Langdale will most probably be important in this respect. The earth dams on Langdale, as well as their catchment areas, should be managed in such a manner that the breeding habitat of the bullfrogs will not be compromised.

TERRESTRIAL ECOLOGY

The proposed area falls in the Savannah biome and the vegetation type is classified by Low and Rebelo as Mixed Bushveld (veld type 18). According to the Acocks classification the veld is of veld type 67, Pietersburg Plateau Grassveld. The most recent classification is of Mucina and Rutherford (2006), and the land is classified as being of veld type SVcb23, namely Polokwane Plateau Bushveld. This veld occurs on moderately undulating plains, and varies from a short open tree layer with a well-developed grass layer, to grass plains with sparsely scattered trees at higher altitudes. Migmatites and gneiss are the dominant mother material, with some volcanic rocks, quartzite and schist. Shallow, well drained soils including predominantly Glenrosa and Mispah soil forms characterise this veld type. The conservation status of the Polokwane Plateau Bushveld is between least threatened and susceptible. Only about 2,7% of the veld type is conserved, while around 17% had been transformed by man. High concentrations of human settlements occur in certain parts of the veld type.

The vegetation units on the site vary according to soil characteristics, topography and land-use. The plant communities identified are:

1. Drainage Courses
2. Eastern Old Lands
3. Hills veld
4. Acacia veld
5. Euphorbia veld
6. Sour veld
7. Mixed veld
8. Woodlands
9. North-western Old Lands

- **Drainage courses;**

The vegetation consists of an open, tall shrub layer and a medium-dense to dense, medium high to tall tree layer. There is a dense grass layer of medium height. Modification of the habitat is limited to a number of earth dam walls. The remainder of the drainage courses are more or less pristine.

Drainage courses are important conservation features due to its value for water conservation and habitat provision for species conservation, especially aquatic animals and birds. The earth dams are also important in this respect; although they are artificial.

No development may be done within the 1:100-year flood line area. Pollution of all waterways and dams must be prevented. Botha stated in the updated Ecological report (Appendix D) that the main drainage course has well developed riparian woodland with *Asparagus* densification and the thorn trees are fairly dense. There are some blue gum trees in the one dam area. The minor drainage courses do not have riparian woodland and on some places there is no clearly defined channel.

- **Eastern Old Lands**

The vegetation consists of a moderately dense, low to high shrub layer and moderately open, medium sized tree layer. There is a dense grass layer of medium height. Severe habitat modification was inflicted through past crop cultivation - the fields were deforested and thereafter repeated (seasonal) tillage of the soil took place for many years. No important habitat or species recorded and no special management of this unit is required. According to the updated vegetation report (Appendix D) the Old lands vary from open grassland to very dense stands of *Vachellia tortilis, Vachellia rehmanniana* and *Vachellia nilotica.*

- **Hills Veld**

The vegetation consists of low to medium sized shrubs and trees. The grass layer consists of medium sized grasses occurring between the rocks and stones. There is limited habitat modification.

The conservation value is moderate. A wide diversity of tree and shrub species occurs in the hills and koppies, including some succulents and trees rather uncommon for the area. Although no protected species were recorded, there is a probability that such might occur in this habitat. The hills veld might accommodate individuals or a population of *Euphorbia clivicola*, although none could be found even though this species was searched for specifically in these habitats. Preferably no development is to be done in these koppies and hills due to the unique species combinations and a likeliness of species of conservation concern occurring in it. According to the updated vegetation report (Appendix D), the hills are fairly natural but sisal and prickly pear (exotics) are present on one hill.

- **Acacia Veld**

The vegetation consists of a moderately open to moderately dense shrub layer of a low to medium height, with a tree layer that is moderately open and of a low height with sparsely scattered taller trees. There is a moderately dense grass layer of a medium height. The veld is only slightly modified where bush encroachment has taken place, as well the odd disturbance of old infrastructure such as an old road, old watering point etc. The habitat has a Low conservation value.

No development may be done within the boundaries of the 1:100 year flood line. Erosion will become a factor on denuded soils in these areas during high rainfall bouts.

It was found in the updated vegetation report (Appendix D) that because this vegetation unit is very palatable, it has been over grazed in the past resulting in bush densification by *Vachellia tortilis, Vachellia rehmanniana* and *Vachellia nilotica*.

- **Euphorbia Veld**

The vegetation consists of a moderately dense shrub layer of a medium height, with a tree layer that varies from moderately open to moderately dense, a low to medium height with sparsely scattered taller trees. There is a moderately dense grass layer of a medium height.

The veld is only slightly modified where slight bush encroachment has taken place, as well the odd disturbance of old infrastructure such as an old road, old fence locations etc. The habitat has a Low conservation value and no special management for the unit is required.

According to the updated vegetation report by Botha (Appendix D) this area is heavily grazed by cattle and goats resulting in poor grass cover. Herbs, shrubs and trees are well browsed by the goats. Alien invader species occurring are prickly pear and queen of the night.

- **Sour Veld**

The vegetation consists of a moderately open to open shrub layer of a low height, with a tree layer that varies from an open to moderately open, low to medium high structure with sparsely scattered taller trees and some bush clumps. There is a moderately dense grass layer of a medium height.

The veld is only slightly modified where the odd disturbance of old infrastructure such as an old road, old fence locations or an old kraal occur. The habitat has a Low conservation value and no special management for the unit is required.

The updated vegetation report (Appendix D states that because of the low palatability of the grass, this area has a good grass cover with few herbs and encroacher bush. Tall khaki weed occur on places and berms have been constructed to retain storm water flow from the road.

- **Mixed Veld**

The vegetation consists of a moderately open shrub layer of a low to medium height, with an open tree layer of a low to medium height with sparsely scattered taller trees. There is a moderately dense grass layer of a medium height. The veld is only slightly modified where slight bush encroachment has taken place, as well the odd disturbance of old infrastructure such as an old road, old fence locations and water supply points etc. The habitat has a Low conservation value and no special management for the unit is required. In the updated ecological report (Appendix D), it is indicated that this area is more palatable and that resulted in more damage to the grass layer during previous years grazing practises. Because of the lower grass cover, bush encroachment by *Dichrostachys cinerea* (sickle bush) and *Lippia javanica* (Beukesbossie) has taken place. Prickly pear is also present, which is an exotic species.

Woodlands Veld

The vegetation consists of a moderately dense shrub layer of a medium height, with a tree layer of intermediate density and a medium height. There is a dense grass layer of a medium to tall height.

The veld is somewhat modified where some bush encroachment has taken place, as well as some disturbance of old infrastructure such as old roads, old fence locations, water supply points and ruins. The habitat has a Low conservation value. Erosion might occur of denuded soils during heavy showers.

According to the updated Ecological report (Appendix D), this vegetation unit is currently severely densified with umbrella thorn (*Vachellia tortilis*) and *Lippia javanica*.

- **North Western Old Lands Veld**

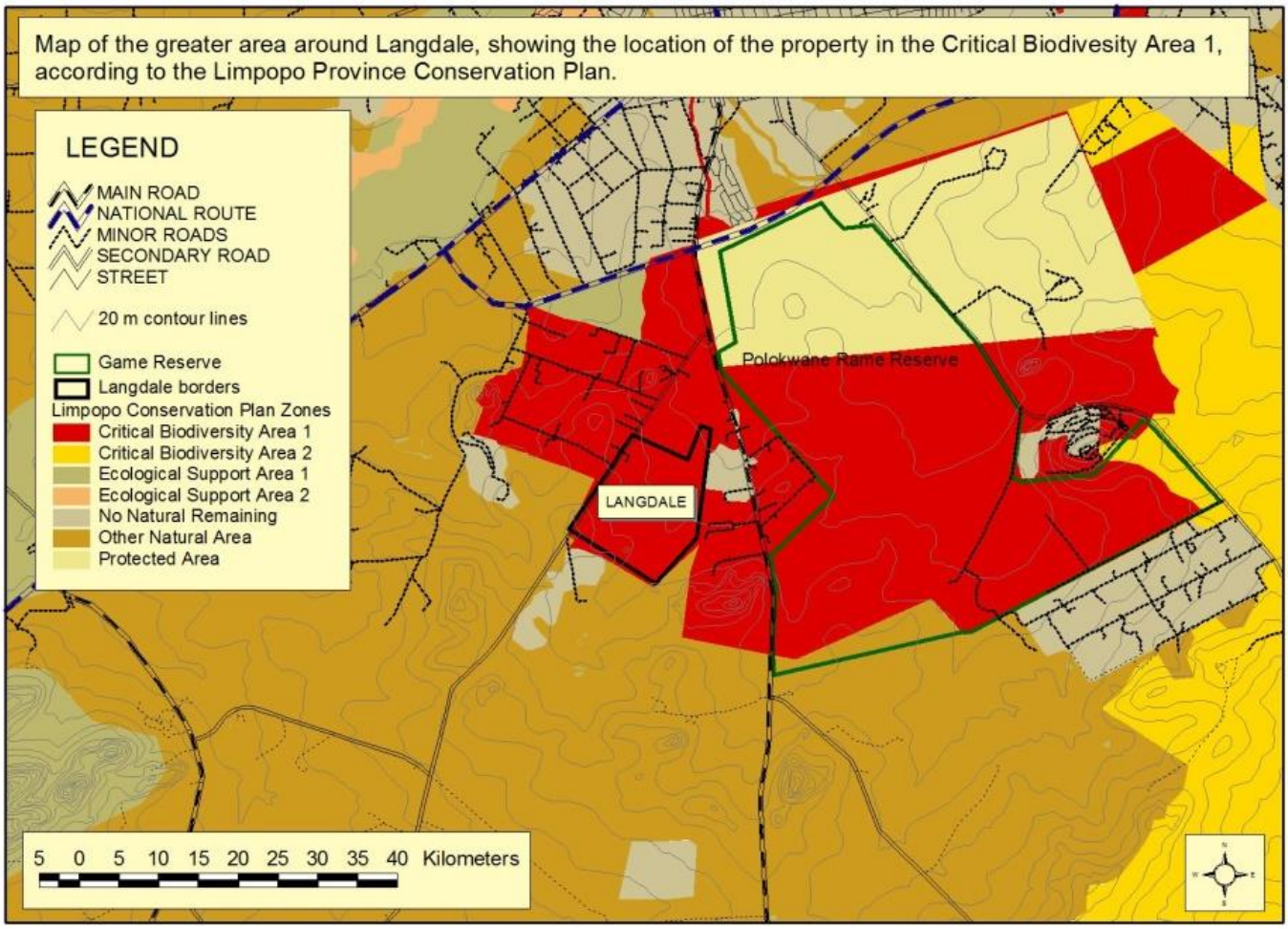
The vegetation consists of an open to moderately open, low shrub layer and open, small sized tree layer. There is a medium dense grass layer of a medium to tall height. The conservation value is Low and no important habitat or species recorded. No special management actions are required

Veld type conservation

De Klerk (2007) stated that the whole area of this vegetation type was farmed in the past and are therefore not in pristine condition anymore due to many disturbances such as the old cultivated fields, old roads, earth dams, old kraals and the like. It has little potential for veld type conservation. In addition, the area is small and as such not able to contribute substantially to the conservation of veld type 18, Mixed Bushveld or veld type SVcb23, namely Polokwane Plateau Bushveld (Mucina and Rutherford).

Mr Botha's evaluation of the veld in 2016 concluded that large areas are being encroached by natural species because of damage to the grass layer and the absence of fires. The whole site is included in and located on the edge of the **CBA 1** area (See Map in Figure 4) The study area has therefore changed to such an extent that only small portions still represent pristine Polokwane Plateau Bushveld. Intensive veld management will be needed to improve the veld condition and biodiversity and to create a habitat that is as close as possible to pristine Polokwane Plateau Bushveld.

Figure 4 Site in relation to the CBA 1 Area



Threatened or protected plant species

Although *Euphorbia clivicola* occur in the Polokwane area, in similar habitats as the Hills veld, none could be found although this species was specifically searched for. Should individuals or colonies be encountered at building or development sites during the development phase, the area should be marked, an ecologist brought in and a conservation plan be compiled. Possibilities as far as theirconservation includes changes of the development lay-out and/or relocation of the plants to other similar habitats.

A number of tree species are listed as protected plants under the forestry legislation. Of these, only the marula (*Sclerocarya birrea)*, occur according to resident workers, although none was recorded during the survey. Wherever one or more is located it should be protected from harm as far as possible, particularly those individuals larger than 8 m tall. Again, should these be encountered, an ecologist should be called in to assess the tree and to compile a plan of action.

RECOMMENDATIONS

A number of recommendations were outlined in the updated vegetation report (J. Botha, 2016) for the proposed development. This is to ensure that the area could be managed in a way that the current veld condition could be improved and to create a habitat that is as close as possible to pristine Polokwane Plateau Bushveld.

- Drainage lines and hills should be protected.
- Large trees must be retained wherever possible. Permits must be obtained before any protected trees can be removed.
- Alien invader species must be controlled.
- Bush encroachment must be controlled.
- An ecological management plan should be compiled for estate.
- *Aloe marlothii* (mountain aloe) plants must be transplanted in the gardens of the estate.

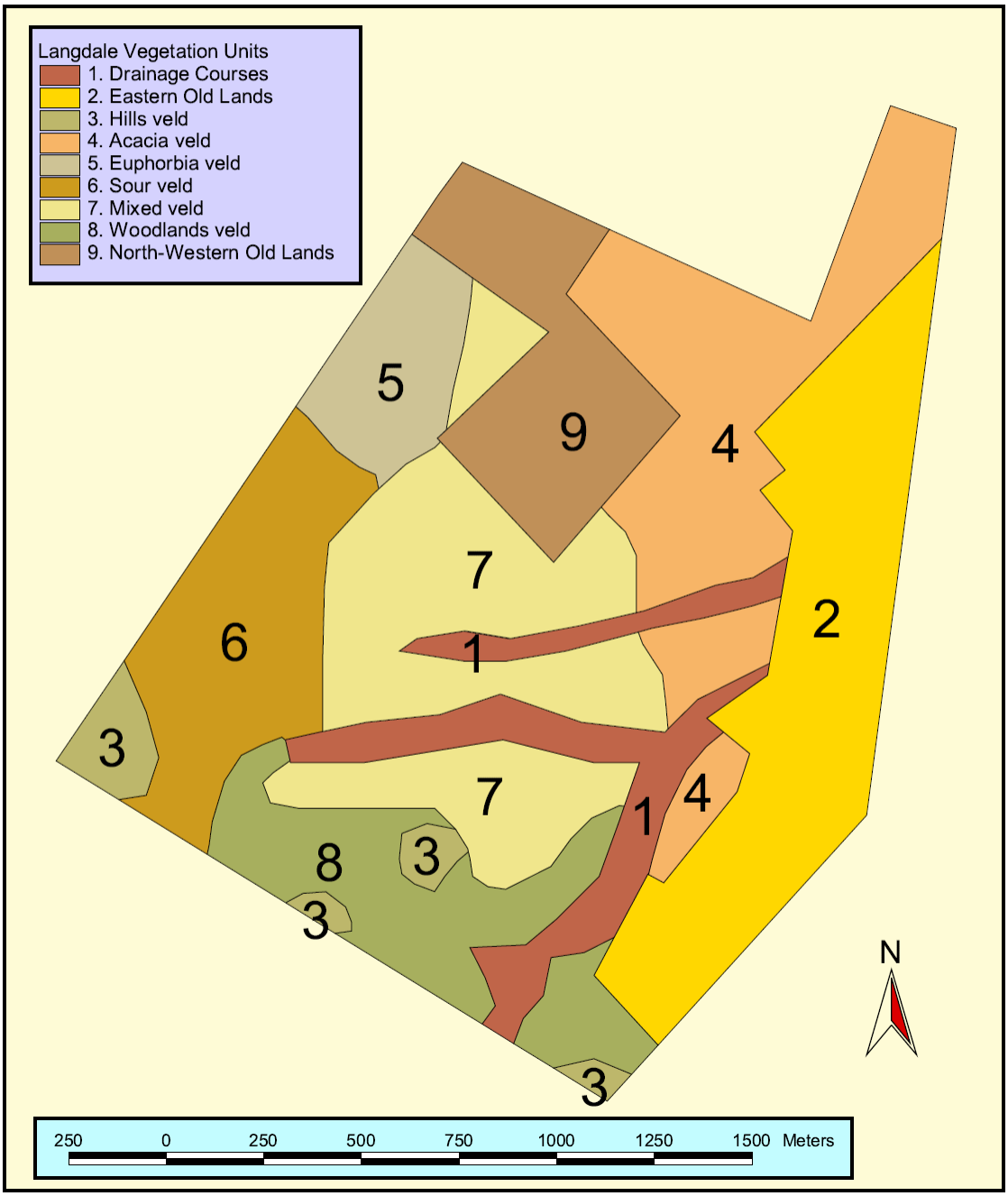
Fauna of the area

According to the ecology report, a diversity of small mammals and reptiles occur in the area, but no survey was deemed necessary as the area is not known for many rare species of these taxa. The **Polokwane Game Reserve**, located within a kilometre from Langdale, is renowned for its birdlife and avian species diversity. A list of birds, compiled by birdlife SA that were observed in the reserve is included in the ecological report. It can be assumed that there will be available habitat available at Langdale.

Threatened or Protected Animal Species and Their Habitat

As mentioned before, the African bullfrog most probably breed in the earth dams on Langdale, and if not established yet, will over time most probably establish in many of these earth dams. No other protected animal species was found or is considered to possibly be present.

Figure 5 Vegetation of the land earmarked for development of the Langdale Estate



AVIFAUNA

An avifaunal survey and assessment was carried out by Ornithologist Joe Grosel during November and December 2015.

According to the second South African Bird Atlas Project (SABAP 2) the study site in its entirety falls within one pentad grid square (2355_2925). Species lists of the area were thus compiled largely from the dataset for this pentad and from field surveys conducted on site. Overall, the avifauna within the study area comprises a rich bushveld assemblage which reflects the major habitat types of the area. Based on data from the abovementioned sources and the field surveys, 302 species occur within the general area of the study site. Of these, 244 are South African breeding residents while 26 are intra-African breeding migrants and 33 are non-breeding migrants.

As a result of breeding evidence such as nests and the observation of breeding behaviour detected during the field surveys as well as the presence of suitable breeding habitat, it is expected that at least 104 species breed within the study area.

Fifteen species of conservation importance (Provincially protected or Red Data listed species) occur within the immediate area of the proposed site. These „priority species" are White-backed Vulture *Gyps africanus,* Cape Vulture *Gyps coprotheres,* Secretarybird *Sagittarius serpentarius,* Verreaux"s Eagle *Aquila verreauxii,* Lanner Falcon *Falco biarmicus,* Lesser Kestrel *Falco naumanni,* Pallid Harrier *Circus macrourus,* Marabou Stork *Leptoptilos crumeniferus,* Black Stork *Ciconia nigra,* Abdim"s Stork *Ciconia abdimii,* Yellow-billed Stork *Mycteria ibis,* White-bellied Korhaan *Eupodotis senegalensis,* European Roller *Coracias garrulous,* Short-clawed Lark *Certhilauda chuana* and Red-billed Oxpecker *Buphagus erythrorhynchus.* Of these, only two species, the Red-billed Oxpecker and Short-clawed Lark are resident on the study site.

The assessment of the major threats revealed that the majority of the threats fall within the **medium** risk category while the threat of habitat loss is classed as **high**. However, should these threats be effectively mitigated e.g. the exclusion of development from the identified avian sensitive habitats then all the threat risks fall to the lower threat classes of **medium** or **low**. Golf courses and golf estates inevitably will not substitute for the natural habitats they have replaced, but careful design with ecological considerations can reduce the adverse effects of fragmentation.

The protection of the avian **sensitive** zones will ensure the well-being of both the resident and migratory species that utilise these habitats while the creation of additional habitats such as permanent surface water should increase the avian diversity of the area. The preservation of the two red data species along with their preferred habitats on the property is imperative. This will be an additional, positive conservation feature of the proposed development and a biodiversity offset to compensate for the associated impacts.

The most notable avian sensitive areas within the study site in terms of priority species, habitat-specific species and species richness are the: (figure 4)

- Thickets along the drainage lines
- Seasonal streams and impoundments
- Rocky outcrops and ridges
- Open arid Acacia shrubland on Hutton soil
- Tall Acacia thickets

The greatest impact on the avifauna of the study site will be as a result of permanent loss of habitat due to the envisaged **township establishment** and **construction** (Construction Phase) of a golf course. This impact will lead to fragmentation of habitat and limitation of free movement of the smaller bird species. This may not lead to the loss of species but will affect current numbers through displacement and loss of foraging and breeding habitat (fewer territories).

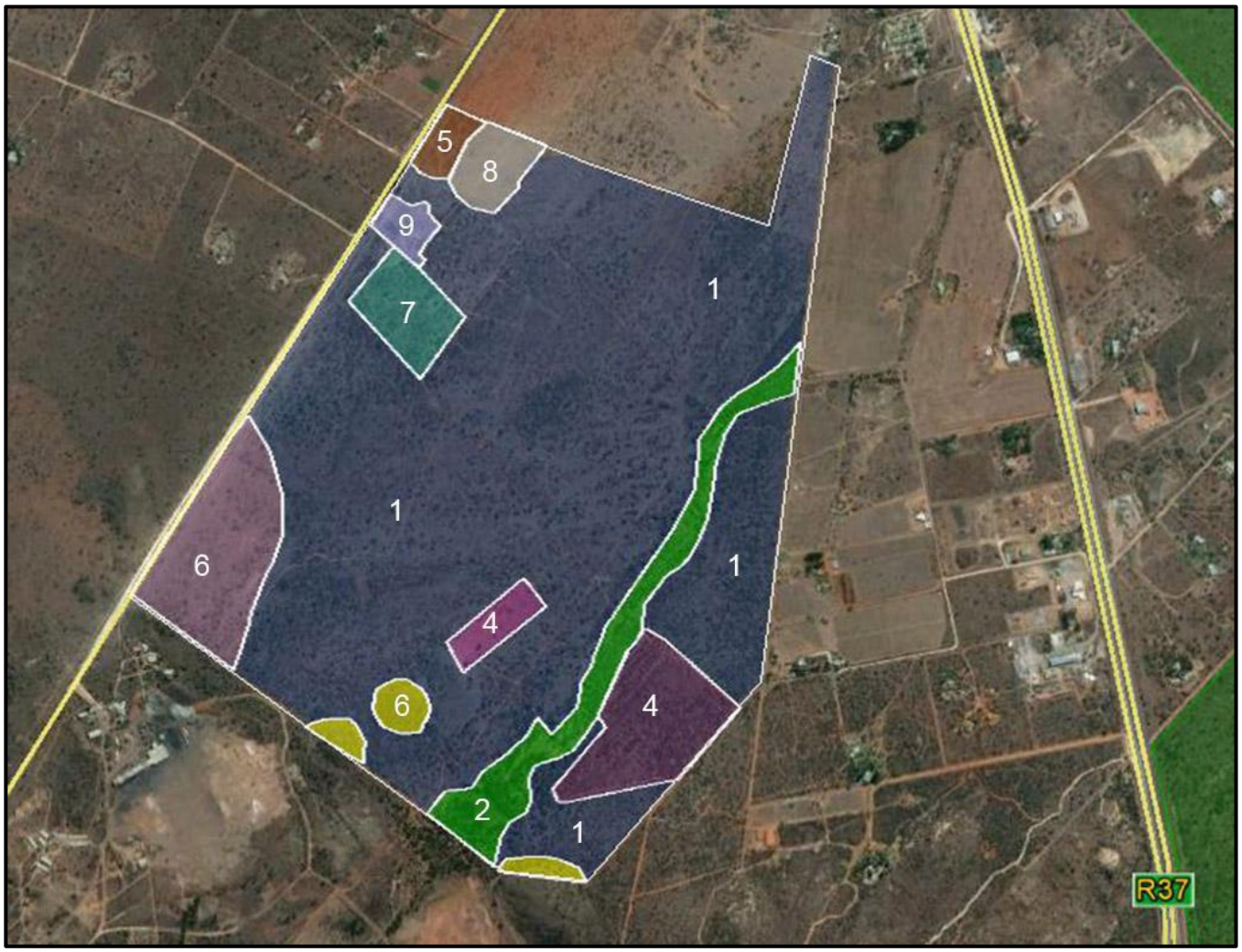
Golf courses substitute natural habitats with „artificial" ones and although some species may be attracted to the „new" habitats increasing the species richness it may also bring in „new" predators which may pose a threat to the existing species.

Once the two proposed developments have been completed i.e. golf course and housing development (Operational Phase) a further range of potential impacts on the birdlife of the area can be expected. An increased amount of humans in the area will bring a variety of anthropomorphic problems such as an increased amount of traffic during the day and night, pets, lights and pesticides.

The golf course, once established will also change the species diversity in terms of birds and mammals with an increased amount of predators. Other pressures on the birdlife may be the increased and uncontrolled movement of humans on and off the golf course, the possible use of pesticides, herbicides and fertilisers which could have harmful effects either directly e.g. poisoning or indirectly e.g. leaching and contamination of water bodies.

If the mitigation measures suggested in the Avifauna report are implemented, then the impacts on the avifauna in the area can be mitigated to acceptable levels both in the construction phase and in the operational phase provided that considered planning takes place beforehand and strict control measures are implemented during these phases.

Figure 6 A satellite image indicating the various plant communities / bird habitats on the remainder of portion 4 of the farm Roodepoort 744 LS and the remainder of portion 1 of the farm Langgenoeg 745 LS. 1 - Mixed Acacia woodland and shrubland, 2 – Drainage lines, 3 - Rocky ridges and outcrops, 4 - Mixed shrubland on old lands, 5 – *Acacia tortilis* open shrubland on Hutton soil, 6 – Open ridge shrubland, 7 - *Dichrostachys cinerea* / *Acacia nilotica* thicket, 8 - Tall *Hyparhenia* grassland and 9 – Farmstead.



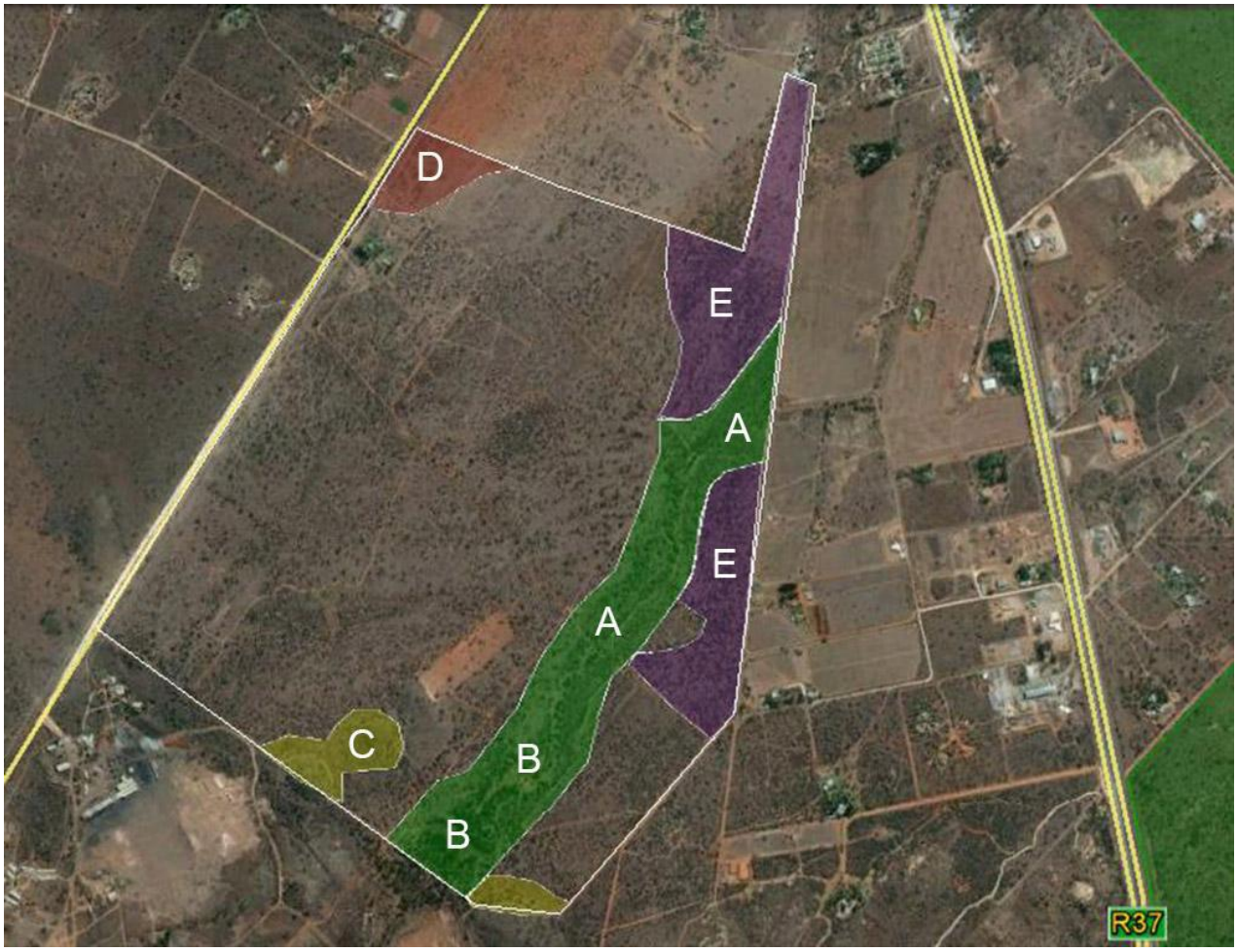
AREA SENSITIVITY

The ecological sensitive areas on the development site are mainly the koppies, rocky ridges and areas along the drainage lines and riparian vegetation. The areas for **avifauna habitat** which considered as **sensitive areas** are the

- Thickets along the drainage lines
- Seasonal streams and impoundments
- Rocky outcrops and ridges
- Open arid Acacia shrubland on Hutton soil
- Tall Acacia thickets

These areas are shown in Figure 4

Figure 7 A satellite image of Avian sensitive zones on the on the remainder of portion 4 of the farm Roodepoort 744 LS and the remainder of portion 1 of the farm Langgenoeg 745 LS. A - Thickets along the drainage lines, B - Seasonal streams and impoundments, C - Rocky outcrops and ridges, D - Open arid Acacia shrubland on Hutton soil and E - Tall Acacia thickets.



10.4.2 SOIL ASPECTS (APPENDIX F)

The assessment of the agricultural soil potential and land capability of the project site is detailed in a Soil potential report from Envirodel Ecological and Wildlife Management Services (Appendix F).

The land type units which is used to determine the potential agricultural value of soils in an area and represented within the study area include the Ae64 and Ea70 land types. The land type, geology and associated soil type is presented in Table 2 below.

Table 2 Land types, geology and soil types of the development area.

Landtype	Soils	Geology
Ae229	Red-yellow apedal, freely drained soils; high base status, > 300 mm deep.	Turfloop Granite; fine- to medium-grained grey and pink biotite granite with relics of migmatite and banded biotite granite-gneiss, sometimes porphyritic and pegmatitic. Pietersburg Group; acid to intermediate lava and pyroclasts.
Ae225	Red-yellow apedal, freely drained soils; high base status, > 300 mm deep.	Biotite granite-gneiss, migmatite, pegmatite, lava and pyroclasts

Langdale falls into two categories. The agricultural value of these soils as classified by ENPAT (2000) is as follows:

- Soils of intermediate suitability for arable agriculture where climate permits
- Soils highly suited to arable agriculture where climate permits

A map of the soil potential of Langdale was compiled, based on the different soil types in the development area. A total of 6 soil-potential units could be distinguished (Figure 5), identified below with the % of Langdale it covers in brackets:

1. **High potential areas** (14%): Dominated by high potential soil, highly suitable for arable agriculture under the reigning climatic conditions. Limited occurrence of intermediate or low potential soils. This is only 49% of the total area in 3 different areas.
2. **Areas of intermediate potential** (17%): Dominated by soils that is only moderately suitable for arable agriculture, with limited occurrence of high and/or low potential soils.
3. **Areas with intermediate to low potential** (15%): A mixture of soils with a more or less 60:40 mix of intermediate: low potential for arable agriculture occur.
4. **Areas with a low to intermediate potential** (14%): A mixture of soils with a more or less 60:40 mix of low: intermediate potential for arable agriculture occur.
5. **Areas with a low potential (**22%): Predominantly soils with a low potential for arable agriculture.
6. **Areas in which arable agriculture may not be practised** (17%): Drainage courses are forbidden terrain in terms of the cultivation of crops.

However, the areas which could be classified as high potential land occur in smaller patches of land, which are not uniform, with smaller sections of low potential soil in between. The smaller patches cannot be cultivated economically, even under irrigation, as it is too small, and are also too fragmented and small for dry land crop cultivation. The fact that those areas which can be classified as high potential for arable agriculture are however so fragmented render them uneconomical for dry land cultivation; those blocks of land are not uniformly high potential due to the presence of limited though significant portions of low potential soils in between where the soil depth and clay content vary to include values rendering them lower potential.

Figure 8 The soil potential map of the study area showing the potential of the different parts of the development area with regards to the agricultural potential of these parts.

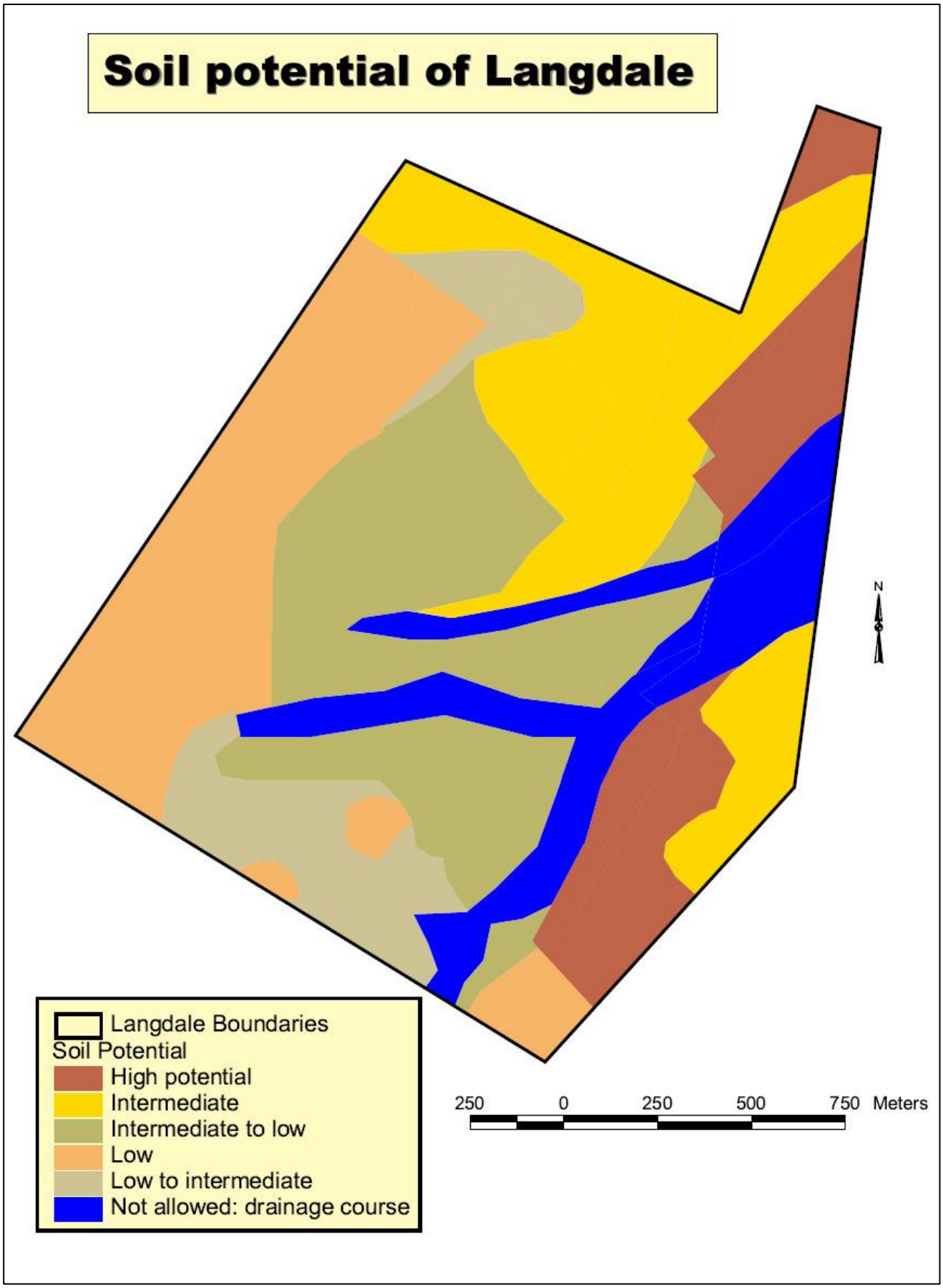


Figure 9 Overlay of old croplands on layout of development

10.4.3 GEOHYDROLOGICAL ASPECTS (APPENDIX H)

A geo-hydrological investigation was done on the project site to assess the regional groundwater potential in order to determine the volume of available groundwater to the proposed development to supplement the water to be used for the development from the Lepelle Northern Water Board. The lateral extent of the study area is approximately 340 ha and the extent of the localised catchment is in the order of 1610 ha. The study area is located in the Limpopo Catchment Management Area within the quaternary catchment area A71A. The study area is drained mainly by surface run-off to a series of north eastwardly flowing non-perennial streams through the southern portion of the study area.

Borehole yield in the different aquifer systems defined in the study area can be 1-2 l/s up to 8 l/s. Based on the yield testing of the borehole the sustainable utilisation of the borehole is a maximum abstraction of 216 m^3 per 24 hour period. This may not be exceeded as it will ultimately destroy the borehole and will negatively influence the water balance of the aquifer. The groundwater quality is deemed to be good and suitable for domestic application. Should the water level drop to within 5 m of the pump intake during regular pumping, the pumping rate should be reduced. Totalling flow meters should be installed on all production boreholes to monitor monthly abstraction volumes. An annual assessment of groundwater quality should be conducted to ensure that the water is potable and suitable for domestic use

A risk assessment for contamination of the borehole was done according to the aquifer vulnerability classes table of the Department of Water Affairs and Forestry of 2003. According to this table the aquifer classifies as having a medium vulnerability with a risk of contamination and a negligible risk for organic and microbiological constituents. The contaminant load is Medium, which means that with an aquifer vulnerability of Medium, the overall risk is deemed to be Medium. The relevance of the threat of contaminants is as a result high in the case of bacteria and viruses as the water is used for drinking. Nitrates pose a Medium risk and Chlorides pose a Minimal risk.

10.4.4 GEOTECHNICAL ASPECTS (APPENDIX I)

An engineering geological reconnaissance investigation was conducted on portions of the farms Roodepoort 744-LS and Langgenoeg 748-LS outside Polokwane in order to assess the generalized geotechnical character of the area in terms of proposed low-density residential development.

It must be noted that this investigation was conducted to facilitate planning of the proposed development, and that this report should not be used in the design and construction of structures.

The site does not reflect any risk for the formation of sinkholes or subsidence caused by the presence of water-soluble rocks (dolomite or limestone), and no evidence of mining activity beneath the study area has been revealed.

The seismic risk of the study area can be classified as being SLIGHT, and as such requires that Masonry Class B design and construction measures be implemented.

The engineering geological characteristics of the different soil type present within the study area can be summarized as follows:

SOIL TYPES	ADVERSE GEOTECHNICAL CHARACTERISTICS								
	EXPANSIVENESS		CONSOLIDATION UNDER LOADING		GROUNDWATER		EXCAVATABILITY PROBLEMS		POTENTIALLY DISPERSIVE
	Slight	Moderate to high	Slight to moderate	Moderate to high	Perched water tables possible	Prolonged saturation	Foundation trenches	Bulk service trenches	
Dundee				X	O			D	X
Glenrosa	X		X				O	D	X
Hutton			O	X					X
Inhoek	O			X	O			D	X
Katspruit	X		X	O	X	D		O	X
Mispah			X				O	X	X
Oakleaf	X			X					X
Rensburg	X	O	X	O	O	D		O / D	X
Shortlands	O		X						X
Valsrivier	O	X	X	O	O			O	X

O : occasionally X : expected D : at depth

In the light of the results of the results of this study, it can be stated that the natural soil underlying the study area exhibits adverse geotechnical characteristics that may require the implementation of specific design and/or precautionary measures to reduce the risk of structural damage. However, these characteristics do not disqualify the site from being used for the proposed development, but rather require the implementation of site-specific precautionary measures during the design and construction phases of the development.

The study area was divided into four provisional development potential zones (Figure 6-Fig 4 in geotechnical report), including areas falling within 1:100 year-flood lines of surface drainage features (to be determined separately from the geotechnical investigation), based on the classification system proposed by Partridge et al (1973).

A large portion of the study area is deemed the most favourable for low-density residential development, but exhibits the occurrence of a significant thickness of potentially compressible- and/or collapsible soil, as well as localized pockets of potentially expansive soil. These areas also exhibit a risk of excavatability problems due to the presence of weathered bedrock and/or dense/stiff material occurring at relatively shallow depth, as well as localized groundwater seepage at relatively shallow depth mainly after heavy precipitation events. It must be noted that the 1: 100 year-flood lines of non-perennial streams, deemed unsuitable for development, may intrude into these areas.

Localized portions in the west and southwest are deemed intermediately- to least favourable for low-density residential development, due to moderately steep to steep slopes, and scattered to extensive bedrock outcrop.

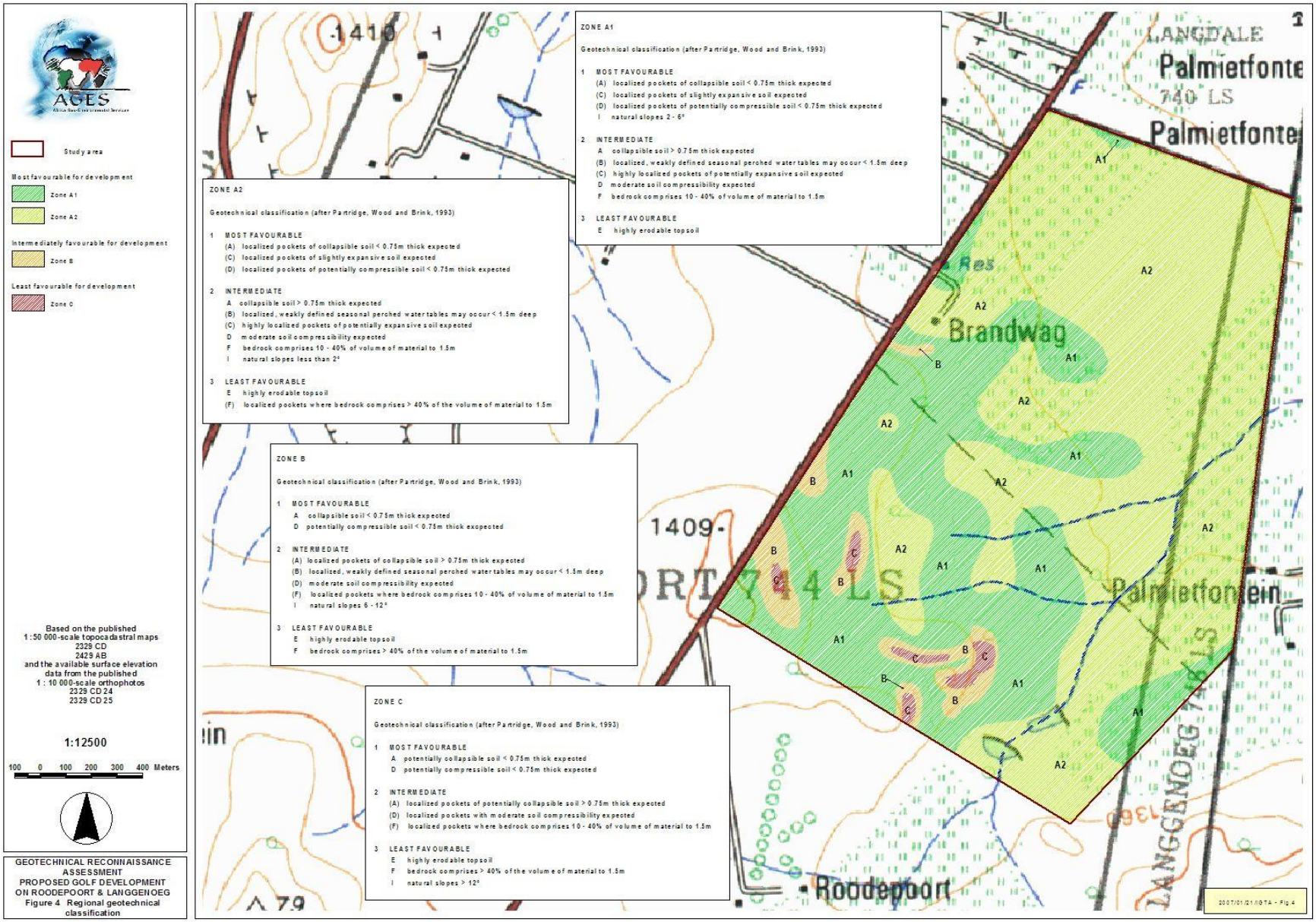
The use of septic tanks draining into “French Drain”-type soakaways is not recommended in these areas, due to:

- the seasonal localised occurrence of saturated conditions at shallow depth that will hamper and/or impair the proper functioning of on-site sanitation systems that rely on seepage for the disposal of liquids
- the expected difficulty in excavation deep trenches that will hamper the proper placement of septic tanks and soak-aways

In this light, it is recommended that either use be made of sealed cluster systems (e.g.: bio-toilets – LilliputTM systems) that render treated water suitable for irrigation purposes, or the development be connected to the existing municipal water-borne sewerage system.

It is recommended that detailed engineering geological investigations be conducted at all sites where structures are to be erected.

Figure 10 Regional Geotechnical classification of the area according to the Geotechnical assessment



10.4.5 SOCIO-ECONOMIC ASPECTS (FROM SCOPING REPORT)

The Langdale property is located within the jurisdiction area of the Polokwane Local Municipality as well as within the Polokwane/Perskebult Town Planning Scheme, 2007 area, Capricorn District. The Polokwane Local Municipality comprises a total area of approximately 377 579 hectares and is located in the central part of the Limpopo Province. Despite being predominantly rural in nature, Polokwane Local Municipality, located within the Capricorn District Municipality, is both the economic hub and administrative capital (Polokwane city) of the Limpopo Province.

The Langdale development should contribute substantially to provide accommodation to middle-higher income groups. Many of these will vacate houses affordable to lower income groups, so doing alleviating a pressing need for these houses.

Through job creation and business opportunities provided by the proposed new development, the ratio of lower income to higher income households could be improved substantially. Polokwane is the dominant municipal economy in the Capricorn district. It is also the largest municipal economy within Limpopo Province, contributing 18% to the provincial economy during 2010 and 66% into Capricorn economy.

The Minimum Living Level indicates the number of households that earn less income than the minimum living level. They indicate that the majority of the people in Polokwane fall within the lower and the middle income groups, which is a reflection of a developing economy. The many (estimated more than 1 000) new job opportunities – temporary and permanent - which could be created by the new development should increase the average household income by increasing the income of one or more members of many households substantially.

According to the IDP, the most pressing problem facing the City of Polokwane today is to create an environment of sustained economic growth and job creation, which are essential for poverty reduction and improving living conditions. Rapid urban growth, illegal land invasion and inadequate water sources threaten the city's ability to deliver services and realise local economic development and integrated human settlement. The current spatial layout of development and sprawling nature of human settlements provide the City of Polokwane with a serious challenge.

The Langdale development should definitely improve the unemployment figures.

10.4.6 VISUAL ASPECTS

Langdale is located on a predominantly north-east facing slope, against the western side of a rather wide valley which includes a large portion of the Palmietfontein small holdings from where the proposed development will be visible. From many parts of the Chunespoort road (the R37), Langdale is visible, from near the cemetery up to near Bakone Malapa.

Further north-east of this valley are more south-west facing slopes, sloping towards Langdale making it visible from a number of areas in Polokwane. The majority of the Polokwane Nature reserve is shielded from Langdale by a low ridge running near and along the western boundary of the reserve.

From the view of all of the above areas, the foreground of Langdale is small holdings - infrastructure such as houses and outbuildings, gardens, stores and workshops, cultivated fields (deforested), roads, greenhouses, shade-cloth-covered cultivations, water tank stands, some windmills, orchards and more. To the back (south-west) only the skyline is visible (horison), and to the south a low range of hills and koppies with some farm dwellings, while to the north another low range of hills are visible with many more houses and small-holding infrastructure.

Right behind (west of) Langdale runs a tarred road (the Roodepoort road) which carries the traffic to and from the bricks works located behind the hills in the south of Langdale. By night sporadic vehicle lights can be seen from far moving along this road. West of Langdale is also small holdings served by this road.

The kopjes and the wooded drainage course will remain undisturbed by the development. However, rows of houses, with some larger buildings for businesses and townhouses, along tarred streets dotted with street lights on tall poles will be built & constructed on about 40% of where there are currently bushveld, and about 20% will be transformed into golf course, which will have the typical appearance of open, green pastures with sparsely scattered, mostly medium to large sized trees lining the edges of the fairways. The fairways will be bordered by natural bushveld vegetation. From afar, a golf course generally has a pleasant appearance, especially during the winter period when the fairways are much greener than the surrounding veld.

The most prominent visual changes that will take place will be at night, when the current darkness of the bushveld will be replaced by the street lights, security lights and lights of the houses and business premises.

10.4.7 AIR QUALITY AND NOISE

The construction phase of the development will entail earthmoving equipment to clear and level the area for the construction of the roads and residential/commercial development as well as the golf course. The generation of dust, exhaust emissions and noise from the equipment and vehicles will be evident in the construction period. During the operational phase of the development the development will basically be dustless and with a low noise signature typical of the nature of an estate of this kind.

10.4.8 HERITAGE RESOURCES (APPENDIX G)

A Heritage Impact Assessment was conducted by Mr. Frans Roodt of R&R in April 2008. It is documented in the report and included in Appendix G.

The heritage resources on the terrain consist of Middle Stone Age, Iron Age and Historical remains. None of these have a high significance rating as all have been impacted on and are no longer conservation worthy. However, the Stonewalled Iron Age remains have significant scientific value to understand the distribution pattern and time depth on this type of walling. Their relationship and cultural affinity to nearby archaeological sites such as Bambo Hill at the Bakone Malapa Museum must also be determined. The earlier sites that pre-date stonewalling (Sites 6, 8 and 10) must also be assessed in order to accurately identify the period and their position within the cultural sequence of the region. In addition the archaeological sites probably contain human burials. A map of where the different heritage sites are located is shown in Figure 6.

The following mitigation measures were proposed:

- The Stone Age material (site 9) is of no significance; due to the low concentrations, it is not possible to do any further research.
- Two of the Iron Age sites are Later Stone walled sites (site 2&4) and are of medium significance, it is recommended that these areas not be developed. These areas must be fenced off properly.
- The other Iron Age remains are of very low concentrations, and as it could not be ascertained which group they belong to, it is advised that monitoring should be done during development and if remains of cultural importance were unearthed, mitigation measures will need to be instituted, possibly resulting in Phase 2 Heritage Impact assessment.
- The historical remains are of no significance but because one particular site (site 3) is on an Iron Age site (site 2) it is recommended to be left in situ. Sites 2, 3 & 4 of the heritage sites identified in the heritage report, were demarcated and the development will stay clear of these areas. The farmhouse is protected in terms of NHRA Act 25 of 1999. This prevents altering or destroying the structure without a permit. It is recommended that the house and iron age site 3 remain in situ or if development cannot accommodate this recommendation, a Phase 2 historical assessment of the structures will take place to comply with legal requirements.

Figure 11 Map depicting the different heritage sites found on the study area.

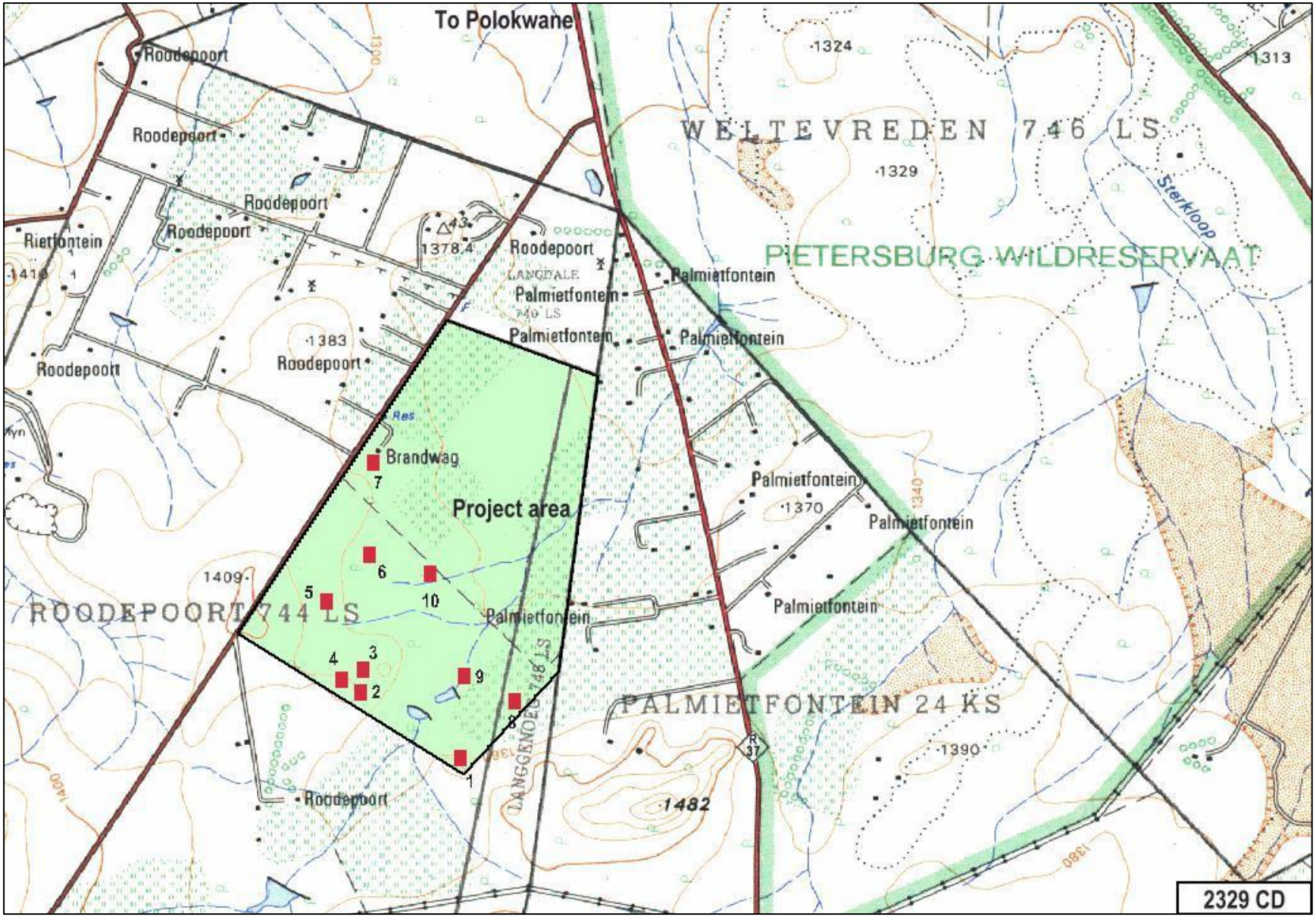


Figure 12 Heritage sites on development area

10.4.9 CLIMATE

The study area is located within the summer rainfall region of South Africa, with an annual rainfall of approximately 475 mm, as measured at weather station 0678-023 Broadlands, located directly to the northeast of Polokwane (Midgley et al, 1994). Precipitation is generally in the form of relatively short, but intense, thunder showers mainly in the period between November and March.

The study area has an annual evaporation of approximately 1 919 mm (S-Pan value), as measured at station A7E003 located to the west of Polokwane (Midgley et al, 1994). It must be noted that significant evaporation occurs throughout the year, well in excess of rainfall.

High temperatures are registered during the summer and frost is generally non-existent in the winter because of the relatively higher altitude. The monthly maximum and minimum temperatures for the Polokwane area is 32˚C and 5.7˚C for January and July respectively.

10.4.10 TOPOGRAPHY AND DRAINAGE

The land slopes from south-west, at 1405 m above sea level, to north-east (1 315 m), with a slope of 3.5%. A number of kopjes occur in the southern parts of the property, while the central and northern parts are slightly sloping but not undulating.

The site is located within the A71A quaternary catchment and is situated in the Limpopo Catchment Management Area. The land slopes from south-west, at 1405 m above sea level, to north-east (1 315 m), with a slope of 3.5%. A number of kopjes occur in the southern parts of the property, while the central and northern parts are slightly sloping but not undulating. Drainage occurs as sheet-wash towards the major rivers. The water is flowing in a north eastwardly direction from the study area.

10.5 IMPACTS AND RISKS IDENTIFIED

The environmental impacts associated with the Langdale Golf Estate development include mainly the following potential impacts:

- Visual impact
- Impact on biodiversity (including the potential loss of plant life and animals)
- Impact on soils (mainly in terms of soil erosion and pollution)
- Impact on water resources in terms of water quantity and water quality
- Impact on agricultural resources which will no longer be available.
- Potential impact on heritage resources and potential occurrences of graves.
- Potential impacts on river systems, drainage channels and wetlands.
- Socio-economic impacts, which is probably very positive as the development site is located in an area with a high unemployment rate.
- Impact on the traffic volumes and traffic flow in the area

Potential impacts identified include:

CONSTRUCTION PHASE:

- **Impacts on the road system and traffic;**
  - Extent: Surrounding and adjacent land
  - Duration: Construction Phase (12-24 Months –Different Phases)
  - Probability: Likely
  - *Significance: Low-Medium* (temporary impact)

- **Impacts on air quality and potential emissions;**
  - Extent: Regional
  - Duration: Construction Phase (12-24 Months –Different Phases)
  - Probability: Unlikely
  - *Significance: Low-Medium* (temporary impact)

- **Noise impacts;**
  - Extent: Locally at the proposed site
  - Duration: Construction Phase (12-24 Months –Different Phases)
  - Probability: Likely
  - *Significance: Low-Medium* (temporary impact)

OPERATIONAL PHASE:

- **Visual impacts.**
  - Extent: Locally at the proposed site (adjacent smallholdings and Polokwane)
  - Duration: Life of the project
  - Probability: Definite
  - *Significance: Medium-High*

- Impacts Biodiversity;
  - Extent: Locally at the proposed site (Roodepoort 744 LS and Langgenoeg 745 LS).
  - Duration: Life of the project
  - Probability: Definite
  - *Significance: Low-Medium*

- Geological, soil and erosion impacts;
  - Extent: Locally at the proposed site
  - Duration: Life of the project
  - Probability: Unlikely
  - *Significance: Low*

- Impacts on ground water;
  - Extent: Surrounding and adjacent land (A71A Quaternary Catchment)
  - Duration: Life of the project
  - Probability: Definite
  - *Significance: Low-Medium*

- Impacts on agricultural potential;
  - Extent: Locally at the proposed site
  - Duration: Life of the project
  - Probability: Definite
  - *Significance: Low-Medium* (only 49% of land has high agricultural potential)

- Impacts on heritage resources;
  - Extent: Locally at the proposed site
  - Duration: Life of the project
  - Probability: Unlikely
  - *Significance: Low* (with mitigation *i.e.* avoidance)

- Impacts on drainage areas;
  - Extent: Surrounding and adjacent land (A71A Quaternary Catchment)
  - Duration: Life of the project
  - Probability: Likely
  - *Significance: Low*

- Social impacts;
  - Extent: Regional & Locally
  - Duration: Life of the project
  - Probability: High
  - *Significance: High - Positive*

- Impacts on Traffic in the area;
  - Extent: Surrounding and adjacent land
  - Duration: Life of the project
  - Probability: Definite
  - *Significance: Medium*

10.5.1 DEGREE TO WHICH THE IMPACTS CAN BE REVERSED

- Visual impact will be for the life of the development. It's unlikely the development will be decommissioned. The impact is thus not reversible although the impact can be mitigated.
- Biodiversity impacts can be reversed to a small extent during operational phase of the development. Indigenous vegetation can be established and certain animals will return to the area; especially the golf course area as this area can still be habitat to the animals.
- Impacts on soil (erosion) can be reversed by careful handling of storm water on site. By removing the soil and by careful management of chemicals on site.
- Impacts on soil (pollution can be reverse
- Impacts on water quality and quantity cannot easily be reversed. Water use is a given for the development. The reliance on water from outside for the golf course will become less as more of the development is established with the different phases of the development.
- Agricultural resources will not become available again.
- Impacts on Heritage resources could be permanent without mitigation.
- The potential impacts on river systems, drainage channels and wetlands will be minimal. Impacts on these resources can be reversed successfully.
- Socio-economic impacts cannot be reversed as there will be no decommissioning phase.

10.5.2 DEGREE TO WHICH THE IMPACTS MAY CAUSE IRREPLACEBLE LOSS OF RESOURCES

- An impact which can cause an irreplaceable loss of resources is an impact on the heritage resources where heritage sources are destroyed. This should not happen as the heritage resources are well surveyed and protected from development impacts.
- The impact on the agricultural resources is not replaceable.
- The impact to the biodiversity of the area can be mitigated by creating a biodiversity offset area at another location with comparable ecological characteristics.
- A significant impact to groundwater resources may cause an irreplaceable loss of the resource.

10.5.3 DEGREE TO WHICH THE IMPACTS CAN BE AVOIDED, MANAGED OR MITIGATED

It is not possible to completely avoid the impacts from the development on the environment. By following the mitigation and management measures detailed in the impact section in this report, most of the impacts and the effects it can have on the environment can be successfully mitigated to a lower degree of significance to the environment. This is up to a point where the impacts are acceptable and where the benefits of the development are greater than the detrimental impact to the environment.

10.6 METHODOLOGY USED IN RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL IMPACTS AND RISKS ASSOCIATED WITH THE ALTERNATIVES

To assess the impacts on the environment, the process will be divided into two main phases namely the Construction phase and the Operational phase. The activities, products and services present in these two phases will be studied to identify and predict all possible impacts.

In any process of identifying and recognising impacts, one must recognise that the determination of impact significance is inherently an anthropocentric concept. Duinker and Beanlands, (1986) in DEAT 2002. Thompson (1988), (1990) in DEAT 2002 stated that the significance of an impact is an expression of the cost or value of an impact to society. However, the tendency is always towards a system of quantifying the significance of the impacts so that it is a true representation of the existing situation on site. This will be done by using where ever possible, legal and scientific standards which are applicable

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts. The consequence matrix uses parameters like severity, duration and extent of impact as well as compliance to standards. Values of 1-5 are assigned to the parameters that are added and averaged to determine the overall consequence. The same process is followed with the likelihood that consists of two parameters namely frequency and probability. The overall consequence and the overall likelihood are then multiplied to give values ranging from 1 to 25. These values as shown in the following table are then used to rank the significance. It must be said however that in the end, a subjective judging of an impact can still be done, but the reasons for doing so must be qualified.

Significance ratings (Plomp 2004)

Significance	Low -	Low-Medium -	Medium -	Medium-High -	High -
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25

Significance	Low +	Low-Medium +	Medium +	Medium-High +	High +
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25

Description of the parameters used in the matrixes

Severity:

Low	Low cost/high potential to mitigate. Impacts easily reversible, non-harmful insignificant change/deterioration or disturbance to natural environments
Low-medium	Low cost to mitigate Small/ potentially harmful Moderate change/deterioration or disturbance to natural environment.
Medium	Substantial cost to mitigate. Potential to mitigate and potential to reverse impact. Harmful Significant change/ deterioration or disturbance to natural environment
Medium-high	High cost to mitigate. Possible to mitigate Great/Very Harmful Very significant change/deterioration or disturbance to natural environment
High	Prohibitive cost to mitigate. Little or no mechanism to mitigate. Irreversible. Extremely Harmful Disastrous change/deterioration or disturbance to natural environment

Duration:

Low	Up to one month
Low-medium	One month to three months
Medium	Three months to one year
Medium-high	One to ten years
High	Beyond ten years

Extent:

Low	Within footprint area
Low-medium	Whole of site
Medium	Adjacent properties
Medium-high	Communities around site area
High	Polokwane Municipality area

Frequency:

Low	Once/more a year or once/more during operation
Low-medium	Once/more in 6 months
Medium	Once/more a month
Medium-high	Once/more a week
High	Daily

Probability:

Low	Almost never/almost impossible
Low-medium	Very seldom/highly unlikely
Medium	Infrequent/unlikely/seldom
Medium-high	Often/Regularly/Likely/Possible
High	Daily/Highly likely/definitely

Compliance:

Low	Best Practise
Low-medium	Compliance
Medium	Non-compliance/conformance to policies etc. - internal
Medium-high	Non-compliance/conformance to legislation etc. - external
High	Directive, prosecution of closure or potential for non-renewal of licences or rights

10.7 ASSESSMENT CRITERIA

The terms of reference for the study include criteria for the description and assessment of environmental impacts. These criteria are drawn from the *Integrated Environmental Management Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts*, published by the DEA in terms of the Environmental Impact Assessment. These criteria include:

Table 3: Impact Assessment Criteria

Nature of impact This is an appraisal of the type of effect the proposed activity would have on the affected environmental component. The description should include what's being affected and how.		
Extent The physical and spatial size of the impact.	**Site**	The impact could affect the whole, or a measurable portion of the above-mentioned properties.
	Local	The impacted area extends only as far as the activity, e.g. a footprint.
	Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
Duration The lifetime of the impact; this is measured in the context of the lifetime of the base.	**Short term**	The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than any of the phases.
	Medium term	The impact will last up to the end of the phases, where after it will be entirely negated.
	Long term	The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter.
	Permanent	The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
Intensity	**Low**	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
	Medium	The affected environment is altered, but function and process continue, albeit in a modified way.
	High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Probability The likelihood of impacts occurring. Impact may occur for any length of time during the life cycle of activity and not at any given time.	**Improbable**	The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
	Probable	There is a possibility that the impact will occur to the extent that provisions must be made therefore.
	Highly probable	It is most likely that the impacts will occur at some or other stage of the development. Plans must be drawn up before the undertaking of the activity.
	Definite	The impact will take place regardless of prevention plans, and there can only be relied on mitigation actions or contingency plans to contain the effect.

Determination of significance. Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.	**No significance**	The impact is not substantial and does not require any mitigation action.
	Low	The impact is of little importance, but may require limited mitigation.
	Medium	The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
	High	The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

The general approach to this study has been guided by the principles of Integrated Environmental Management (IEM). In accordance with the IEM Guidelines issued by the DEA, an open, approach, which encourages accountable decision-making, was adopted. The principles of the IEM require:

- informed decision-making;
- accountability for information on which decisions are made;
- a broad interpretation of the term “environment”;
- an open participatory approach in the planning of proposals;
- consultation with I&APs;
- due consideration of alternatives;
- an attempt to mitigate negative impacts and enhance positive impacts of proposals;
- an attempt to ensure that social costs of developments are outweighed by the social benefits;
- democratic regard for individual rights and obligations;
- compliance with these principles during all stages of the planning, implementation and decommissioning of proposals; and
- the opportunity for public and specialist input in the decision-making process.

10.8 POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY

- In the operational phase it will have a negative impact on the *visual environment, water quantity, water quality, soils and on the ecology and biodiversity* in the area of the Langdale Golf Estate.
- The positive impact that the development will have on the environment and community is a Socio-economic impact. It will create *temporary jobs* in the construction phase as well as up to 1000 permanent jobs during the operational phase in an area with a shortage of employment. It can also attract investment into the city. In this way it will help to alleviate poverty in the area.
- The development of housing unit in the Polokwane area is a positive impact
- The impact on the biodiversity of the area is negative in terms of a loss of fauna and flora of the area.
- The loss of Agricultural land is a negative impact but it will only affect 10 % of th land that is classified as high potential agricultural land.
- There could be an initial increase in security problems in the area especially in the construction phase. This can be mitigated through effective security guards in the development area and later in the estate during the operational period.
- The generation of waste in the construction period and later in the operational phase is a negative impact.
- Waste water will be produced in the development which can negatively influence surface and groundwater quality
- The use of mainly treated effluent from wastewater for irrigation of the golf course is a positive impact.
- Increased traffic flow in and around the areas can be a negative impact in the area.
- The use of water for the development will have a negative impact on the water resources in the province.
- Storm water can cause erosion and thus a loss of soil resources.
- The *generation of electricity* with photovoltaic cells and the use of solar heaters and gas stoves and heaters will help to reduce the pressure on the electrical system in the area. This is a positive impact.

10.9 POSSIBLE MITIGATION MEASURES AND RESIDUAL RISK

- To mitigate the visual impact screening of the facility can be done with vegetation
- Treated effluent used for irrigation purposes must comply with standards for irrigation with effluent.
- Treated wastewater will mainly be used for the irrigation of the golf course. It will partly be supplemented by groundwater.
- Potable water will be sourced not from groundwater, but from the Lepelle Northern Water Board to limit the impact on groundwater sources in the area.
- The impact to the biodiversity in the development area can be mitigated by creating a suitable biodiversity offset area in the vicinity of the development. Alien invasive vegetation needs to be removed to protect the local biodiversity and only indigenous vegetation should be allowed to be planted at the development.
- The storm water must be managed so that erosion is not caused on the site
- Domestic waste must be removed from the site on a regular basis not to impact on the soils or water bodies in the area.
- The least sensitive area is selected for the facility staying out of the drainage lines and having the smallest impact on the ecology
- Special measures to preserve and keep certain bird species on the site are detailed in the Avifauna report.

The residual risk on the development area is regarded as low if all the correct mitigation measures are applied throughout the life of the development.

10.10 MOTIVATION FOR NOT INVESTIGATING ALTERNATIVES

Different site lay out plans and development footprint areas as well as different technologies were investigated, giving rise to a number of alternatives.

10.11 CONCLUDING STATEMENT INDICATING THE PREFERRED ALTERNATIVE AND LOCATION OF THE ACTIVITY

The preferred alternative was selected based on the fact that it will have the smallest impact on the environment having been located on the lease sensitive area, avoiding the sensitive drainage areas and potentially sensitive heritage sites. The negative impacts can be effectively mitigated and managed to reduce the negative effect the impacts would have on the environment, so that the development with the positive effect of the socio-economic impact will have a positive effect on the environment that would offset the negative effects of the development.

The location of the preferred alternative is based on the availability of the land and by avoiding the environmentally sensitive portions on the development area. The actual footprint area is based on the results obtained from the specialists.

11 DESCRIPTION OF THE PROPOSED PROCESS TO IDENTIFY AND RANK THE ENVIRONMENTAL IMPACTS THAT THE ACTIVITY, ASSOCIATED STRUCTURES AND INFRASTRUCTURE WILL IMPOSE ON THE PREFERRED LOCATION THROUGH THE LIFE OF THE ACITIVITY

An environmental impact is defined as a change in the environment, be it the physical/chemical, biological, cultural and or socio-economic environment. Any impact can be related to certain aspects of human activities in this environment and this impact can be either positive or negative. It could also affect the environment directly or indirectly and the effect of it can be cumulative.

11.1 DESCRIPTION OF ENVIRONMENTAL ISSUES AND RISKS IDENTIFIED DURING THE EIA PROCESS

The potential aspects to assess during the EIA process may include:

- Soils & agricultural potential;
- Ground water aspects;
- Road system and traffic aspects;
- Air quality and potential emissions aspects;
- Geology, soils and erosion;
- Avifauna aspects;
- Vegetation aspects;
- Heritage resources aspects;
- Noise aspects;
- Socio-economic aspects;
- Visual aspects.

The **decommissioning** of the golf estate is not foreseen.

The following possible Key environmental impacts were identified:

ENVIRONMENTAL ISSUES	POSSIBLE CAUSE	POTENTIAL IMPACTS
Air Pollution and noise		
Dust	• Construction machines and vehicles during clearing and construction of the croplands	• Health problems • Air pollution • Public nuisance
Emissions	• During operation of construction equipment. • Spraying of insecticides and herbicides during operation • During veld fires • Vehicles in area	
Noise	• Construction noise • Activities during operational phase	
Water quality		
Pollution of water sources Pollution by *E.coli*	• Spillages of fuel & oil from vehicles during construction • Pollution from solid general waste if not removed regularly • By using insecticides and herbicides and fertilisers in the wrong way • Poorly planned and managed sanitation facilities during the operational phase	• Pollution of surface and groundwater • Health risk • Lower water quality • Soil degradation • Siltation of aquatic system
Silt deposition in surface water drainage lines	• Erosion from area during run-off (Rain)	
Water quantity		
Impact on amount of water resources available Over use of water allocation	• Use of water during construction of the Langdale Golf Estate • Water use during operation-estate and golf course • Pumping of more ground water than the system can deliver	• Loss of a scarce resource • Increased pressure on water supply sources • Drop of water table
Land/Soil degradation		
Soil contamination and degradation	• Spillages of oil, chemicals from machinery and vehicles during construction • Site clearing during construction • Use of Herbicides, Pesticides and Fertilizers • Loss of Agricultural potential of soil • Erosion if storm water is not correctly managed	• Pollution of soil • Soil degradation • Loss of topsoil • Effect soil characteristics, ecology & groundwater • Loss of topsoil

ENVIRONMENTAL ISSUES	POSSIBLE CAUSE	POTENTIAL IMPACTS
Biodiversity		
Decline in fauna and flora diversity	• Clearing of site for construction • Construction of the Langdale Golf Estate • Killing of wildlife by workers/inhabitants • Alien invasive plants	• Loss of biodiversity • Loss of habitat • Fragmentation of habitat • Negative impact on biodiversity • Negative impact on rare / endangered/ endemic species and habitats • Animal deaths.
Cultural/Heritage		
Possible loss of heritage sites	• Damage during construction or operation	• Possible loss of cultural heritage sites and graves
Visual impact		
Change in the visual characteristics of the site	• Clearing of vegetation for • Presence of golf estate	• Visual intrusion
Socio-economic impacts		
Job creation Crime	• Increase in temporary and permanent work opportunities during the construction and operational phases. • Increase in construction workers and other workers in area • Use of agricultural land for development	• Socio- economic benefit • Increase in crime in area • Loss of land available for farming. •

11.2 DESCRIPTION OF THE PROPOSED METHOD OF ASSESSING DURATION AND SIGNIFICANCE OF IMPACTS

To assess the impacts on the environment, the process will be divided into two main phases namely the Construction phase and the Operational phase. The activities, products and services present in these two phases will be studied to identify and predict all possible impacts.

In any process of identifying and recognising impacts, one must recognise that the determination of impact significance is inherently an anthropocentric concept. Duinker and Beanlands, (1986) in DEAT 2002. Thompson (1988), (1990) in DEAT 2002 stated that the significance of an impact is an expression of the cost or value of an impact to society.

However, the tendency is always towards a system of quantifying the significance of the impacts so that it is a true representation of the existing situation on site. This will be done by using where ever possible, legal and scientific standards which are applicable

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The consequence matrix uses parameters like severity, duration and extent of impact as well as compliance to standards. Values of 1-5 are assigned to the parameters that are added and averaged to determine the overall consequence. The same process is followed with the likelihood that consists of two parameters namely frequency and probability. The overall consequence and the overall likelihood are then multiplied to give values ranging from 1 to 25. These values as shown in the following table are then used to rank the significance. It must be said however that in the end, a subjective judging of an impact can still be done, but the reasons for doing so must be qualified.

Table 1: Significance ratings for negative (top) and positive (bottom) impacts (Plomp 2004)

Significance	Low -	Low-Medium -	Medium -	Medium-High -	High -
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25

Significance	Low +	Low-Medium +	Medium +	Medium-High +	High +
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25

Description of the parameters used in the matrixes

Severity:

Low	Low cost/high potential to mitigate. Impacts easily reversible, non-harmful insignificant change/deterioration or disturbance to natural environments
Low-medium	Low cost to mitigate Small/ potentially harmful Moderate change/deterioration or disturbance to natural environment.
Medium	Substantial cost to mitigate. Potential to mitigate and potential to reverse impact. Harmful Significant change/ deterioration or disturbance to natural environment
Medium-high	High cost to mitigate. Possible to mitigate Great/Very Harmful Very significant change/deterioration or disturbance to natural environment
High	Prohibitive cost to mitigate. Little or no mechanism to mitigate. Irreversible. Extremely Harmful Disastrous change/deterioration or disturbance to natural environment

Duration:

Low	Up to one month
Low-medium	One month to three months
Medium	Three months to one year
Medium-high	One to ten years
High	Beyond ten years

Extent:

Low	Within footprint area
Low-medium	Whole of site
Medium	Adjacent properties
Medium-high	Communities around site area
High	Polokwane Municipality area

Frequency:

Low	Once/more a year or once/more during operation
Low-medium	Once/more in 6 months
Medium	Once/more a month
Medium-high	Once/more a week
High	Daily

Probability:

Low	Almost never/almost impossible
Low-medium	Very seldom/highly unlikely
Medium	Infrequent/unlikely/seldom
Medium-high	Often/Regularly/Likely/Possible
High	Daily/Highly likely/definitely

Compliance:

The following criteria are used during the rating of possible impacts.

Low	Best Practise
Low-medium	Compliance
Medium	Non-compliance/conformance to policies etc. - internal
Medium-high	Non-compliance/conformance to legislation etc. - external
High	Directive, prosecution of closure or potential for non-renewal of licences or rights

11.3 IMPACTS & MITIGATION MEASURES OF CONSTRUCTION & OPERATIONAL PHASES

All the possible impacts that can be predicted in both the construction and operational phases of the Langdale Golf estate are addressed. Specific mitigation measures are proposed and the significance of these impacts is described with and without the mitigation measures.

11.3.1 ATMOSPHERIC POLLUTION AND NOISE

Construction Phase

- During this phase there will be a concentration of earthmoving equipment and construction vehicles that will level the area, clear vegetation for construction purposes and in the process will create dust and exhaust smoke and noise that will impact on air quality.
- There will also be more noise created by the vehicles during this phase.
- Burning of waste and fires at construction sites may also create smoke.

Operational phase

- The increased traffic volumes and people will lead to increased levels of air pollution and noise.
- Smoke from burning of waste can cause air pollution.

Project Phase	Impact Atmospheric Pollution and noise								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Earthworks and Vegetation clearance	Air pollution Dust	Low-medium	Medium-high	Medium	Medium-high	Medium-high	Low-medium	Medium
	Vehicle movement	Air pollution : Smoke	Low	Medium-high	Low-medium	Medium-high	Medium-high	Low	Low-Medium
	Vehicle movement	Air pollution : Dust	Low	Medium-high	Low-medium	Medium-high	Medium-high	Low	Low-Medium
	Vehicle movement	Noise pollution	Low-medium	Medium-high	Low-medium	Medium-high	Medium	Low	Low-Medium
	Burning of cleared vegetation, solid waste & veld fires	Air pollution by excessive smoke	Low-medium	Medium-high	Medium	Low-Medium	Medium	Low	Low-Medium
	Cooking fires of workers	Air pollution : Smoke	Low	Medium-high	Low-medium	Low-Medium	Medium	Low	Low-Medium
Operation	Vehicle movement	Noise pollution	Low	High	Low-medium	Medium-Low	Medium-Low	Low-medium	Medium
	Fire places and veldt fires	Air pollution caused by smoke	Low-medium	High	Low-medium	Low-medium	Low-medium	Low	Low-Medium
	Burning of vegetation refuse and solid waste	Air pollution by excessive smoke	Low-medium	High	Low-medium	Low-Medium	Low-medium	Low	Low-Medium
Cumulative impacts	Pollution & Noise	Increase in release of smoke and increase in noise levels	Low	High	Low-medium	Medium	Medium	Low	Low-Medium

Mitigation measures - Construction Phase

- Vehicles must be well serviced so that it does not produce excessive smoke and noise.
- Speed of construction vehicles must be kept as low as possible to reduce the generation of dust and noise.
- Construction areas must be damped/treated to prevent excessive dust formation.
- The clearing of the site should be done in phases as the construction progresses.
- Cleared topsoil must be stockpiled in such a way that transportation by wind or rain is limited. This can be done by e.g. restricting the height of stockpiles, covering it and/or sandbagging.
- Construction should only take place during the hours between sunrise and sunset on weekdays and Saturdays.
- Contractors must comply with Provincial noise regulations. The construction machinery must be fitted with noise mufflers and be maintained properly.
- Solid waste generated by the construction teams may not be burned on site or the surrounding areas, but be regularly removed to the municipal waste disposal site.

- Fire belts must be made around the development according to the regulations of the Veld and Forest Fire Act.
- The cleared vegetation must be stock-piled and should be removed to a licensed waste disposal site on a regular basis.

Mitigation Measures - Operational Phase

- A recycling management plan must be compiled for the proposed development. This plan should focus on reducing, recycling and reusing the waste generated during operation. Vegetation refuse should be composted if possible and re-used.
- Solid waste may not be burned on the estate area.
- Speed of vehicles on roads must be controlled e.g. speed bumps and speed restrictions.
- Fire belts around the development must be made according to the regulations of the Veld and Forest Fire Act. (see comments in scoping acceptance letter)

11.3.2 GROUNDWATER AND SURFACE WATER POLLUTION

Construction Phase

- Lack of sanitation could result in ground water pollution and associated health risks.
- Construction vehicles are refuelled at the construction camp.
- Spillage of fuel and lubricants from construction vehicles could occur.
- Storm water contamination by solid waste could lead to groundwater and surface water pollution.
- In this phase the soil cover as well as the vegetation is removed and storm water over the area could cause erosion as well as siltation of watercourses. Road construction will also increase the possibility of erosion and the siltation/sedimentation of surface water streams, because of increased storm water run-off.
- The drainage lines on the site must be avoided; Stay outside the 1:100 year flood lines.
- The area around the drainage lines should be considered complete no-go zones.

Operational Phase

- Pollution by sanitation leakages, solid waste and erosion may lead to water pollution.
- Irrigation with waste water can cause water pollution.
- Storm water run-off over open areas can cause erosion as well as the washing of soil into the surface water streams.
- Solid waste can cause water pollution.
- Storm water flowing over sealed and/or paved areas could lead to ground and surface water pollution. Chemicals could negatively impact on the quality of surface and groundwater resources.
- Fertilizers, pesticides and herbicides used at the project during operation can create water pollution if not handled and applied correctly.

Project Phase	Impact: Groundwater and Surface water Pollution								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
	Spillage of fuel and lubricants from construction vehicles	Water Pollution	Low-Medium	Medium-high	Medium	Medium	Medium-high	Low	Medium

Construction	Spillage of fuel and fuel tanks	Water Pollution	Low-Medium	Medium-high	Medium	Medium	Medium-high	Low	Medium
	Clearing of vegetation	Erosion & siltation of streams	Medium	Medium-high	Medium	Low-Medium	Medium-high	Low-medium	Medium
	Solid waste disposal freshwater resources	Pollution of freshwater resources	Low	Medium-high	Medium	Medium	Medium	Low-medium	Low-Medium
	Storage of chemicals	Water pollution	Low	Medium High	Low	Medium	Low-medium	Low	Low-Medium
	The use of herbicides to control exotic invasive vegetation species	Pollution of freshwater resources Impact on human& bio-diversity health	Low-Medium	High	Medium	Low	Medium	Low	Low-Medium
	Sanitation seepage from chemical toilets and/or from the temporary sanitation system	Water Pollution	Medium	Medium-high	Low-medium	Low-medium	Medium	Low	Low-Medium
Operation	Spillage of fuel and lubricants from vehicles	Water Pollution	Low	High	Low	Medium-high	Low	Low	Low
	Solid waste disposal-freshwater resources	Water Pollution	Low	High	Low-medium	Low-Medium	Low-medium	Low	Low-Medium
	Leakage from the permanent Sanitation system	Water Pollution	Medium-high	High	Low-Medium	Low	Low-Medium	Low-medium	Medium
	Irrigation with treated waste water	Water pollution	Low-medium	High	Low-medium	Medium-high	Medium	Low	Medium
	Use of fertilizers, insecticides and herbicides	Pollution of streams & rivers	Low-Medium	High	Medium	Low	Medium	Low	Low-Medium
	Storm water runoff	Erosion & siltation of streams	Low-medium	High	Medium	Low-medium	Medium-high	Low	Medium
Cumulative impacts	Water pollution and increased water run-off	Increased potential for water pollution and increased water run-off	Low-Medium	High	Medium	Low-Medium	Medium	Low	Low-Medium

Mitigation measures - construction phase

The following precautionary measures are recommended to prevent any surface or groundwater pollution:

- Clearance of vegetation should be restricted to footprint area of the development.
- Construction activities should be restricted to the proposed footprint area.
- The areas along the drainage lines must be cordoned off and avoided during the construction phase.
- Cleared areas must be rehabilitated by reintroducing a grass layer or paving as soon as possible to limit soil erosion.
- Berms to limit the flow of water over cleared areas will limit erosion and the siltation of surface streams.
- Slopes produced by removing of soil must be kept to a minimum to reduce the chances of erosion damage to the area. Trenches for pipes or cables will be constructed following the shortest and the most efficient possible route.
- Where possible the construction of these trenches will be dug next to the roads where it will have the smallest impact. Any trenches that are dug for the supply of services must be filled up and compacted well and slightly higher than the areas around it. This would allow for settling of the soil without trenches or erosion gullies forming again.
- Water falling on areas polluted with oil/diesel or other hazardous substances must be contained. Any excess or waste material or chemicals should be removed from the site and discarded in an environmental friendly way.
- Construction vehicles should be serviced on a regular basis to prevent or minimize the risk of spills or leakages.
- Drip pans should be used during re-fuelling and servicing of construction vehicles. Used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products.
- Oil traps must be installed in the vehicle wash bay to prevent pollution. Oil traps must be serviced on a regular basis by an approved service agent.
- Diesel storage must be less than 30 000 litres at construction camps. Diesel tanks and other harmful chemicals and oils must be stored within a bunded area. Any water from out of this bunding must flow through an oil/water skimmer.
- The vehicle maintenance yard and construction storage area must be placed 100m away from watercourses. No vehicles should be serviced on site but rather elsewhere at an appropriate facility.
- Chemicals must be stored on an impervious surface protected from rainfall and storm water run-off. It should be locked away.
- Mixing of cement, concrete, paints etc. must be done at designated areas within concrete aprons or on protected plastic linings to contain any possible spillages into surface or groundwater resources.
- Accidental spillages must be contained and cleaned up promptly according to an applicable procedure as determined by a plan of action for the specific type of disturbance
- Spill kits must be on-hand to deal with spills immediately
- Spillages or leakages must be treated according to an applicable procedure as determined by a plan of action for the specific type of disturbance
- Chemicals and oils must be stored under cover inside bunding to prevent spillages. This area must be lined with impermeable material to prevent ground and surface water pollution.
- Chemical sanitation facilities and the temporary sanitation system in the construction site must be regularly serviced by appropriate companies to ensure that no spills or leaks to surface and groundwater take place.
- Chemical toilets and the temporary sanitation system must not be placed within 100m from any watercourse.
- Waste may not be burned on site

- Solid waste must be kept in adequate waste bins. Building/construction rubble and various waste products should be removed on a regular basis to a licensed landfill site.
- Regular clean-up programs should be put into effect throughout the premises to limit the impact of littering caused by construction activities.
- The eradication and rehabilitation plan compiled for the exotic invasive plant species present on site must be followed. If needed, contact the ecologist (author of documents).
- The use of eco-friendly products to control pests / vermin and invasive plants should be promoted and an ecologist be consulted before use.
- If all possible soil pollution is restricted and prevented, there would be no cumulative impacts as a result of the establishment of the Langdale Golf Estate.

Mitigation measures - operational phase

- Vehicles must be serviced and checked regularly to prevent oil and fuel leaks
- Solid waste or vegetation refuse may not be burned on site. Solid waste may not be disposed or stored in areas other than designated waste disposal areas e.g. waste disposal bins. The Developer must collect and dispose of the waste to the Polokwane Municipality's landfill site on a weekly basis.
- Waste must not be allowed to get into the drainage line area to prevent surface water pollution
- A comprehensive waste and recycling management plan must be compiled for the proposed development. This plan should focus on reducing, recycling and reusing the waste generated during operation.
- The golf course management should employ best management practices and integrated pest management techniques to ensure safe storage, application, and handling of chemicals and reduce actual and potential environmental contamination associated with chemical use.
- The use of eco-friendly products e.g. Organic Compost, herbicides and insecticides on the golf course and at the residences should be promoted as well as rather the use of mechanical ways to combat invasive alien species.
- Establish "no spray zones" and buffer areas, particularly around water features and other environmentally sensitive areas.
- A water use license must be obtained for the irrigation with treated waste water from the development.
- No activity must take place within the 1: 100 year flood line zones.
- Sewerage infrastructure for the residential development must be developed according to formally approved specifications and standards
- The permanent sanitation systems must be regularly inspected to ensure that no spills or leaks from sanitation systems to groundwater take place.
- The water quality of the treated effluent must be tested on a regular basis according to the water use license to ensure that it conforms to set water standards.
- All possible pollution can be prevented/managed and therefore there would be no cumulative impacts where water pollution is concerned.
- Structures to slow down the speed of run-off must be used to limit erosion of the area and the siltation of water courses

11.3.3 WATER USE / WATER QUANTITY

Construction phase

- During this phase, water consumption will be the highest because it will be utilized for construction of roads and building construction. The water needed for the construction activities will be provided from the Lepelle Northern Water Board and from an onsite borehole.

- Water will be needed for the construction of the golf course as well, but the course will only be constructed once in the order of 35% of the development is established and enough treated waste water becomes available to establish part of the golf course.
- Alien invasive species could use more water than the indigenous vegetation.

Operational phase

- Water use will be serviced from the Lepelle Northern Water Board for potable water.
- The golf course will be irrigated with treated effluent from the development and supplemented with groundwater and if needed water from Lepelle Northern Water Board.
- Water use for the Golf course will be limited by using appropriate indigenous grass species that use less water and which is more drought resistant.

Project Phase	Impact: Water use								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Construction process	Depletion of water resources: Water consumption	Low-medium	Medium-high	Medium-high	High	High	Medium	Medium-high
Operational	Residential Water use and water use for the golf course	Depletion of water resources: Water consumption	Low	High	Medium-High	High	High	Low-Medium	Medium-high
Cumulative impacts	Water use	Increased pressure on local water resources	Medium	High	Medium-high	Low-Medium	Medium	Low-Medium	Medium

Mitigation measures – Construction Phase

- Water must be used sparingly and it must be ensured that no water is wasted.
- Roads should be surfaced to lower the use of water.
- Washing of construction vehicles should be limited to once or twice a month and must be done with high-pressure sprayers to reduce water consumption.
- Water tanks must be regularly inspected to ensure that no leaks occur
- Drinking water supply for the staff on site could be water supplied from the Lepelle Northern Water Board system or from the onsite borehole as the groundwater quality is suitable for drinking according to the Geohydrological report.
- Current exotic weed species should be eradicated, increasing water seepage towards the surface and groundwater resources.
- Drought resistant turf grass species must be used on the fairways of the golf course, and therefore less water will be required than usual.

Mitigation measures - Operational Phase

- Roads should be hard surfaced to limit the use of water.
- Residents must be educated to limit the use of water for their residences
- Planting drought resistant endemic species at residences and businesses should be promoted to save on the use of water. (water-wise gardening)
- Alien invasive species must be removed when it is found.
- Care must be taken not to waste any water. In the residences and businesses, half-flush systems in the toilets as well as water aerators in all taps must be installed to reduce water consumption.
- No private boreholes must be allowed at residences and at businesses.

- The installation of rain tanks at residences and businesses to save on water use should be promoted.
- Irrigate the golf course with treated waste water only.
- Workers must not waste any water. In the buildings and offices half flush systems in the toilets as well as water aerators in all taps must be installed to reduce water consumption.
- The workers must be educated on the value of water and how to use it sparingly.
- Only indigenous trees and plants should be planted around the buildings and offices.
- A water use license must be obtained for the abstraction of water from boreholes for the development.

11.3.4 LAND AND SOILS

Planning phase

The areas around the drainage lines on the site must remain undeveloped.

Construction phase

- During construction, the vehicles used have the potential to spill diesel and lubricants that can pollute the soil.
- Chemicals and sewage can be spilled and pollute the soil.
- The storage of solid waste before it can be disposed of has the potential to pollute the soil and becomes a nuisance.
- Storm water can cause erosion of the site.

Operational phase

- Solid waste can be a nuisance and has the potential to pollute the soil if not managed correctly.
- The use of conventional fertilizers, herbicides and insecticides should be limited as far as possible.
- Wastewater from waste water treatment plants can pollute the soil.
- Storm water can cause erosion and loss of soils can take place.
- Storm water will primarily be surface controlled and the roads will be used to collect storm water and to discharge it either onto the golf course or storm water will be directed and discharged into the existing flood line area in the eastern areas of the site, discharging in a controlled way into the existing flood line area in the eastern areas of the site, discharging in a controlled way into the stream running through Langdale. Three earth dams will assist to contain the water.
- A flood line investigation was conducted and is indicated on the layout drawing.

Project Phase	Impact: Land and soils								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Spilling of oil/diesel by construction machines or tanks	Contaminate soil	Low-medium	Medium-high	Low	Medium	Medium-high	Low	Low-Medium

Project Phase	Impact: Land and soils								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
	Spilling of chemicals/se-wage	Contaminate soil	Low-medium	Medium-high	Low	Medium	Medium-high	Low	Low-Medium
	Solid waste disposal	Soil pollution + nuisance	Low	Medium-high	Low-medium	Medium-high	Medium-high	Low	Low-Medium
	Storm water over roads and cleared areas	Erosion	Low-medium	Medium-high	Low-medium	Low-Medium	Medium-high	Low	Low-Medium
	Trenches for electric cables and water and sewerage pipes	Erosion	Low-Medium	Medium-high	Low	Low-Medium	Medium	Low	Low-Medium
	Handling of soils	Compaction of soils	Low-Medium	Medium-high	Low-Medium	High	Medium-high	Low-Medium	Medium
	Using land for golf estate	Sterilising of high potential soil.	Medium	Medium-high	Low-Medium	High	Medium	Low-Medium	Medium
Operation	Solid waste	Soil pollution + nuisance	Low	High	Low-Medium	Low-Medium	Medium	Low	Low-Medium
	Storm water from paved areas and roofs	Erosion	Low-medium	High	Low-medium	Low-Medium	Medium	Low	Low-Medium
	Storm water over roads and cleared areas	Erosion	Medium	Medium-high	Low-medium	Low-Medium	Medium-high	Low	Low-Medium
	Waste water from treatment plants	Soil pollution	Low-medium	Medium-high	Low	Medium	Medium-high	Low	Low-Medium
	Use of fertilizers, insecticides and herbicides	Pollution	Low-Medium	High	Medium	Low-Medium	Medium	Low	Low-Medium
Cumulative impacts	Increased potential for negative impacts on soil resource	Increased potential for erosion and soil pollution	Medium	High	Low-medium	Low-Medium	Medium-high	Low	Medium

Mitigation measures - Construction Phase

- Clearance of vegetation must be restricted to the footprint area of the development.
- Construction activities must be restricted to the proposed development footprint.

- Construction vehicles must be well maintained and serviced to minimise leaks and spills.
- Vehicle maintenance will not be done on site except in emergencies in which case mobile used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products.
- Prevent spillage of fuel or oil onto the soil, and put in place measures to ensure that any accidental spillages can be contained and cleaned up promptly
- Spill kits must be on-hand to deal with spills immediately
- Chemicals to be stored on an impervious surface protected from rainfall and storm water run-off. It should be locked away.
- Spill trays must be used during refuelling of vehicles on site.
- The temporary vehicle maintenance yard and storage area should be fenced off. Diesel storage must be less than 30 000 litres at construction camps. A bund wall should be constructed around the fuel tank structures and the run-off diverted to a conservancy tank. The spilled fuel must be disposed of at the nearest approved fuel recycling collection point. Alternatively drip pans can be placed underneath temporary fuel tanks.
- Chemical sanitation facilities must be used on site and regularly serviced by registered companies to ensure that no spills or leaks from toilets to groundwater or surface water take place. The ratio of one toilet for every 15 workers on site should be maintained.
- The temporary sanitation system in the construction site must be regularly inspected to ensure that no spills or leaks from sanitation system to groundwater take place.
- The toilets must be emptied on a regular cycle by a company registered to do it
- Solid waste must be kept in adequate animal-proof waste bins at the construction camp and at the construction sites. Building rubble and waste msut be removed on a regular basis to the Polokwane Municipality's landfill site.
- A comprehensive waste management plan must be compiled for the construction phase of the development. The aim of the plan will be to ensure that the construction materials/debris generated on site be reduced, reused and recycled.
- Regular clean-up programs must be put into effect throughout the premises to limit the impact of littering caused by construction activities.
- Build a fenced waste sorting and transfer site at the construction area so that the waste handling can be centralized and controlled. Any building rubble must be removed to a licensed disposal site on a regular basis during construction.
- Trenches for pipes or cables will be constructed following the shortest and most efficient possible route and where possible construction of trenches will be dug next to roads where it will have the smallest impact.
- Any trenches dug for supply of services must be filled up and compacted well and slightly higher than areas around it. This will allow for settling of soil without trenches or erosion gullies forming again.
- Repair all erosion damage as soon as possible and in any case not later than six months before the termination of the Maintenance Period to allow for sufficient rehabilitation growth
- Sufficient drainage must be provided along access roads to prevent erosion and pollution of adjacent watercourses
- Slopes produced by removing soil must be kept to a minimum to reduce the chances of erosion damage to the area.
- Soil should be handled when dry during removal and placement to reduce the risk of compaction
- During construction, sensitive soils with high risk of compaction (e.g. clayey soils) must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts
- Topsoil must not be compacted in any way, nor must any object be placed or stockpiled upon it.
- Stockpile topsoil for the minimum time period possible i.e. strip just before the relevant

activity commences and replace as soon as it is completed.
- Stockpile topsoil separately from subsoil.
- Stockpile in an area that is protected from storm water runoff and wind.
- Topsoil stockpiles should not exceed 2.0 m in height and should be protected by a mulch cover where possible.
- Maintain topsoil stockpiles in a weed free condition.
- Topsoil must only be used for rehabilitation purposes and not for any other use example the construction of roads.
- Rip and/or scarify all disturbed areas, including roads that are no longer in use (preferably before the rainy season). Do not rip and/or scarify areas under wet conditions, as the soil will not loosen.
- Compacted soil can also be decompacted by “Rotary Decompactors” to effectively aerate soils for vegetation establishment
- Institute a storm water management plan including both temporary (during construction) and permanent erosion control plans
- Sufficient drainage must be provided along access roads to prevent erosion and pollution of adjacent watercourses or wetlands
- Cleared areas should be re-vegetated allowing a grass layer to re-establish as soon as possible to limit erosion.
- Ensure the amount of bare soil exposed is minimized by staging earthworks in phases and leaving as much ground cover intact as possible during construction
- Construction vehicles and equipment must not be allowed to move around on any areas outside the development footprint of the estate.

Mitigation measures - Operational Phase
- Solid waste or vegetation refuse may not be burned on site.
- Solid waste may not be disposed or stored in areas other than designated waste disposal areas e.g. waste disposal bins. The Developer must collect and dispose of the waste to the Polokwane Municipality’s landfill site on a weekly basis.
- A recycling management plan must be compiled for the proposed development. This plan should focus on reducing, recycling and reusing the waste generated during operation.
- The surface drainage system must be monitored after storms and storm water damage should be repaired. The maintenance of the roads must be kept up to standard to prevent and reduce the incidence of erosion next to the roads.
- Structures to slow down the speed of run-off must be used to limit erosion of the area and the siltation of water courses
- Revegetate or pave bare areas to minimise soil erosion during wind- and rain storms.
- Treated waste water from the treatment plants must comply with legal standards to prevent pollution of soil resources
- The golf course management must employ best management practices and integrated pest management techniques to ensure safe storage, application, and handling of chemicals and reduce actual and potential environmental contamination associated with chemical use.
- The use of eco-friendly products e.g. Organic Compost, herbicides and insecticides on the golf course and at the residences should be promoted. Herbicides and insecticides should only be used according to the specifications.
- Where roads will cross streams a water use license must be obtained for the impact of the roads on stream environment.

11.3.5 ARCHAEOLOGICAL, CULTURAL AND SOCIAL FEATURES

Construction phase

- The clearing of the site may have a negative impact on the archaeological features of the site which were identified during a heritage impact assessment.
- Care must be taken in the excavations and moving of soil to observe any other archaeological, previously undetected, features of importance, which must be left and reported to the archaeological consultant for comments and actions.

Operational phase

- The operational phase will not have any negative impact on the archaeological features of the site, if the recommendations of the Heritage Impact Assessment (Appendix G) are strictly adhered to

Project Phase	Impact: Loss of Archaeological, Cultural and social features								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Earth moving and soil clearance	Destroy archaeological evidence and heritage and graves	Low-medium	Medium-high	Low	Low	Low-medium	Low	Medium-high
Operation	Operational activities of development	Destroy archaeological evidence and heritage and graves	Low-medium	High	Low	Low	Low-medium	Low	Medium-high
Cumulative impacts	Activities on site during construction and operational	Increase in potential to unearth archaeological evidence and graves	Low-medium	High	Low	Low	Low-medium	Low	Medium-high

Mitigation measures – Construction and operational phases

The heritage sites identified and indicated on the site lay out plan in the Phase 1 Heritage report must be cordoned off and be preserved. There should be no development in these areas and there should be no access to these either.

If there are any plans of removing or destroying the old farmhouse or any of the other identified heritage resources, then a phase 2 heritage assessment have to be done and authorisation of SAHRA must be obtained prior to doing that.

Care must be taken during the construction process that anything else of archaeological value that is unearthed must be recorded. Please refer to the Heritage Impact Assessment (Appendix G). The archaeologist or SAHRA must be notified whenever anything of importance is discovered.

11.3.6 IMPACT OF THE DEVELOPMENT ON THE ECOLOGY (FAUNA & FLORA) OF THE AREA

Planning and construction phase

- The removal of natural vegetation and destruction of habitat will have a negative effect on the biodiversity.
- The specific mitigation measures included in the Ecological and Avifauna Impact Assessment (Appendix D & E) should be adhered to.
- Fires can have a very negative effect on the ecology of the area.

Operational phase

- The operation of the development can have a negative impact on the bio-diversity if it is not managed correctly. (herbicides, pesticides, fertilisers, sewage, waste)
- Exotic invasive plant species can have a negative impact on the indigenous vegetation.
- Overuse of water can have a negative impact on the ecology of the area.
- Fires can have a very negative effect on the ecology of the area.

Project Phase	Environmental Aspect: Ecology (Fauna and Flora)								
	Activity that causes impact	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Earthworks and vegetation clearance at construction site	Loss of indigenous plant species & disturbance to sensitive habitat Loss of indigenous fauna to the area	Medium	Medium	Low-Medium	Medium	Medium-High	Low-medium	Medium
	Vegetation clearance and use of herbicides to control re-growth at different development areas	The eradication and control of exotic invasive plant species Loss of indigenous plant species	Medium	Medium	Medium	Low-Medium	Medium-High	Low-Medium	Medium
	The occurrence of veldt fires on site	Destruction of flora/habitats Loss of indigenous fauna	Medium-High	Medium	Medium	Medium-High	High	Medium	Medium-high
	Littering (e.g. cans and plastics) along access road and at construction site	Public nuisance and loss/death of indigenous fauna	Low-Medium	Medium	Medium	Medium-High	Medium	Low	Medium
	The erection of fences and the construction of roads with a kerb. Construction of golf course	The fragmentation of available habitat and the restriction of movement of small mammals, reptiles and amphibians	High	High	Low-medium	Low-Medium	High	Low-Medium	Medium
	Increase in traffic on the site	Increase in road kills (e.g. small mammals, reptiles and amphibians).	Low	Medium-high	Low	Low-medium	Low-medium	Low	Low
	The control of animals on site Killing, poisoning or hunting of animals	Loss of indigenous fauna to the area	Medium-High	Medium	Medium	Medium	Low-Medium	Low-Medium	Medium

Project Phase	Environmental Aspect: Ecology (Fauna and Flora)								
	Activity that causes impact	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Operation	Rehabilitation of cleared areas	The spreading of exotic invasive plant species Loss of habitat and indigenous flora	Medium	High	Medium	Low-Medium	Medium	Low-Medium	Medium
	Removal or addition of indigenous vegetation	Impact on biodiversity of area	Medium	High	Low	Low	Medium	Low	Low-medium
	The occurrence of veldt fires	The loss of indigenous fauna and flora	Medium-High	Medium	Medium	Low-Medium	High	Medium	Medium-high
	Functioning of permanent sewage treatment systems – treated sewage outflow	Deterioration in the habitat for avifauna and aquatic life	Medium-High	High	Medium	Medium-High	Medium	Low-Medium	Medium-High
	Disposal and storage of solid waste and littering	The death/loss of indigenous fauna e.g. raptors, mammals and reptiles	Medium-High	High	Medium-High	Medium-High	Medium	Low-Medium	Medium
	The control of pests and vermin	Killing and poisoning of fauna feeding on poisoned vermin / pest	Low-Medium	High	Low-Medium	Medium-High	Medium	Low	Medium
	The feeding of fauna e.g. birds &small mammals	Disturbance to bio-diversity and natural movement of animals through the site The death/loss of indigenous fauna	Low-Medium	High	Low-Medium	Medium-High	Low-Medium	Low	Medium
	Catching of wild animals e.g. reptiles, bids and small mammals as pets	Disturbance to bio-diversity and decline in indigenous faunal numbers	Medium-High	High	Low-Medium	Low-Medium	Low	Low	Medium
	Birds colliding with power line.	Electrocution of birds	Medium-High	High	Low-Medium	Low-Medium	Low	Low	Medium
	The erection of fences and the construction of roads with a kerb	The fragmentation of available habitat and the restriction of movement of small mammals, reptiles and amphibians	Low-Medium	High	Low-Medium	High	Medium	Low	Medium
Cumulative Impacts	Increased potential negative impacts on ecology of the area	Increase in natural vegetation to be removed.	Medium-High	High	Medium-High	Medium-High	Medium	Low	Medium-High

Mitigation measures – Construction phase

- Clearance of vegetation must be restricted to the footprint area.
- Construction activities must be restricted to the proposed development footprint.
- Clearly demarcate the entire development footprint prior to initial site clearance and prevent construction personnel from leaving the demarcated area. Construction activities must remain within defined construction areas and the road servitudes. No construction / disturbance must occur outside these areas
- Care must be taken that unnecessary clearance of vegetation does not take place. Where possible, natural vegetation must be retained. Restrict it to the footprint area.
- During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts

- All bare areas should be ripped/scarified after construction
- Cleared areas should be re-vegetated allowing a grass layer to re-establish as soon as possible to limit erosion.
- Permits need to be obtained from the Department of Agriculture, Forestry & Fisheries (DAFF) and from Limpopo authorities prior to the removal of protected tree species and plant species (if any) stipulated in the LEMA. Permits must be kept on site.
- The riparian habitat along the drainage lines must be cordoned off and access to the areas should be restricted during construction.
- An ecologist should be consulted in order to advise on crossing sites at drainage lines, in order to minimise impacts on riverine vegetation.
- The herbicides used to control the invasive plant species should be chosen in consultation with an ecologist, as some of the agents might be detrimental to the surrounding indigenous fauna and flora e.g. Roundup is for example extremely toxic to frogs.
- Exotic and invasive plants should be eradicated as the construction progresses.
- Rehabilitate disturbed areas as quickly as possible to reduce the area where invasive species would be at a strong advantage and most easily able to establish
- Institute a monitoring programme to eradicate alien invasive species.
- The ECO must regularly inspect the site, including storage facilities and compounds and eradicate any invasive or exotic plants
- No animals may be killed, captured or hunted or fed on site by construction workers. No poison should be used to control any animals without the input of an ecologist/zoologist.
- Do not feed any wild animals on site.
- Instruct employees, contractors, visitors to avoid harassment and disturbance of wildlife
- No pets must be allowed on the site
- Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.
- Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
- Fires must only be allowed in designated places within the construction camp and extra care should be taken to prevent veldt fires of occurring.
- Firebreaks must comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks).
- Educate construction workers regarding risks and correct disposal of cigarettes
- The cleared vegetation must not be burned on site. The cleared vegetation must be stockpiled and taken to the closest available landfill site.
- A fire hydrant system must be designed and installed
- Staff must be trained in the speedy combat of any veld fire occurring in the area
- Solid waste must be kept in adequate animal proof waste bins at the construction camp and construction sites. Building rubble and various wastes must be removed on a regular basis to the closest available landfill site.
- Regular clean-up programs must be put into effect along the access road and throughout the premises to limit the impact of littering caused by construction activities.
- Build a fenced waste sorting and transfer site at the construction area so that the waste handling can be centralized and controlled.
- Where trenches pose a risk to animal safety, they must be adequately cordoned off to prevent animals falling in and being trapped and/or injured. This could be prevented

by the constant excavating and backfilling of trenches during construction process.

- Road kerbs should be constructed at an angle to allow for the easy access by small animals.
- Minimize fences as far as possible to limit the effect of habitat fragmentation
- Provide for small animals to be able to pass through/under fences.
- The speed of construction vehicles on the internal roads must be kept as low as possible to reduce the incidence of road kill.
- Use existing roads to minimise new disturbance in the area
- During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts
- Construction activities must remain within defined construction areas and the road servitudes.
- Cumulative impacts on the ecology of the area can be significant. However, with the mitigation measures in place, the potential is low for significant negative impacts on the ecology of the area.
- The EMPr must be adhered to both during the construction as well as operational phases and regular monitoring should be done to ensure that there is sound environmental practice at the Langdale Golf estate

Mitigation measures – Operational phase

- The exotic invader plant species must be kept under control and removed during operation. No herbicides should be used to control the vegetation at these areas without consulting a competent ecologist.
- Bush encroachment must be controlled
- Firebreaks must comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks).
- It is further proposed that water be stored in storage tanks which will be available for firefighting purposes
- The herbaceous layer should be revived with indigenous vegetation after clearance of the vegetation.
- An ecologist should be consulted on the use of herbicides/eco-friendly products to control exotic tree and shrub species.
- No animals may be killed, captured, hunted or fed on site.
- Poisons for the control of problem animals should rather be avoided since the wrong use thereof can have disastrous consequences for the raptors occurring in the area. The use of poisons for the control of rats, mice or other vermin should only be used after approval from an ecologist.
- Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications.
- Not all trees will be removed from the golf course and as many indigenous trees as possible will be retained on the erven.
- Only indigenous trees will be planted in gardens and along the golf course.
- The construction of impenetrable fences around individual erven will be discouraged, and garden design promoting free passage of wildlife will be encouraged/promoted.
- Corridors will be created between development areas and pockets of natural vegetation to alleviate the fragmentation of habitat effect.
- Solid waste must be kept in animal proof waste bins.
- Waste must be removed on a regular basis to the Polokwane Municipality landfill site
- A monitoring program must be compiled and implemented to ensure that the sewage treatment system is functioning properly and that the treated wastewater conforms to the standards set by the Department of Water Affairs.

- Existing power lines will be marked and new power lines will be laid underground to limit the effect on birds and other animals on the estate site.
- Road kerbs should be installed at an angle to allow small animals to move over it without problems.
- The use of eco-friendly products e.g. Organic Compost and/or Effective Microorganisms (EM), which reduces the frequency of application of conventional fertilizers, herbicides and insecticides, should be promoted.
- The EMPr must be adhered to both during the construction as well as operational phases and regular monitoring must be done to ensure that there is sound environmental practice at the Langdale Golf estate.

11.3.7 VISUAL IMPACTS

Construction phase

- The natural aesthetic character and the visual impact of the site will be changed. However, the local people will be informed of the development stages and impacts on them during the construction phase.

Operational phase

- Buildings and the golf course have a *visual impact* and lights at night can be a *nuisance*.

Project Phase	Impact: Visual disturbance								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Construction of buildings, streets and golf course	Visual	Low	High	Low-Medium	High	High	Low-Medium	Medium
	Lights	Visual	Low	Medium	Low-medium	Medium-high	High	Low-Medium	Medium
Operation	Buildings, streets	Visual	Medium	High	Medium	High	High	Medium-High	Medium-high
	Golf course	Visual	Low	High	Low	High	High	Low=Medium	Medium
	Lights	Nuisance	Low-medium	High	Low-medium	Medium-High	High	Low-Medium	Medium
Cumulative Impacts	Increased visibility of the golf estate in the area	Increased visual intrusion and nuisance	Medium-High	Medium	Medium	Low-Medium	High	Low-Medium	Medium

Mitigation measures

- Earth works must be executed in such a way that only the footprint and a small "construction buffer zone" around the proposed components are exposed. In all other areas, the natural occurring vegetation, more importantly the indigenous vegetation should be retained.
- The materials and colours used in the construction of structures and infrastructure should give preference to natural and eco-friendly choices, if possible to minimize the visual impact on the aesthetic character of the surrounding area.
- On the golf course the maximum indigenous vegetation must be retained to screen off the residential development part of the estate.

- Security lights at the temporary maintenance yard and storage area should shine directly down and directed towards the site away from the surrounding properties.
- Minimise the amount of light fixtures in order to limit light pollution.

11.3.8 SAFETY, SECURITY AND FIRE HAZARDS

Construction phase

- Construction activities such as excavating of foundations and trenches, movement of construction vehicles, the use of equipment and the congregation of workers and staff on site further increases the risk of injury.
- The activities of construction personnel on site may contribute to an increase in the level of crime in the area and may also contribute to an increase in the risk for fires.

Operational phase

- Fires and criminal activities pose a significant risk during the operation of the development.
- The increase in traffic volumes in the area will present a safety risk on the roads in the vicinity of the proposed development.

Project phase	Impact: Safety, security and fire hazards								
	Activity/Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Construction activities – excavation of foundations, trenches etc.	Loss or injury to human life	Low-medium	Medium-high	Low	High	Medium	Low	Medium
	Construction activities – excavation of foundations, trenches etc.	Nuisance	Low	Medium - High	Low-medium	High	Medium	Low	Low-medium
	Security	Crime	Medium	Medium-high	Low-medium	Medium	Medium-high	Low - medium	Medium
	Fire hazards	Loss of human life and construction equipment etc.	High	Medium-high	Medium	Low	Low-Medium	Low-Medium	Medium
Operation	Security	Crime	Medium	High	Medium	Medium	Medium-high	Low-Medium	Medium
	Increase in traffic in area	Safety risk	Medium-low	High	Medium	High	High	Medium	Medium-high
	Fire hazards	Loss of human life, bio-diversity, buildings, infrastructure etc.	High	Medium	Medium -High	Low	Low	Low	Medium
Cumulative Impacts	Higher number of people in the area increases safety risks	Potential for an increase in criminal activity	High	Medium	Medium -High	Low	Low	Low	Medium

Mitigation measures

- The Contractor shall conform to the Occupational Health and Safety act (Act 85 of 1993) and regulations applicable. The Act requires the designation of a Health and Safety representative when more than 20 employees are employed.
- Construction activities must be restricted to working hours Monday to Saturday, unless otherwise approved by the appropriate competent person in consultation with the affected residents.
- Open trenches or excavations must be marked with danger tape.
- Only key construction workers and security personnel should be allowed to overnight on the site.
- Proper access control (I.D. cards) should be enforced to ensure that no authorised persons enter the site.
- Transportation should be pre-arranged for the construction worker to ensure that the workers from the surrounding local communities have daily transportation available to and from the site.
- A boundary fence can be constructed around the site, which will act as a security barrier. A temporary fence should be erected around the construction camp and storage area.
- The accesses to the site and the road upgrades to the roads and intersections in the area around the development site must be done according to the requirements in the traffic impact assessment done for the proposed development.
- No solid waste or vegetation may be burnt on the premises or surrounding areas.
- Firebreaks must comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to prepare and maintain firebreaks).
- Construction workers must be educated about the risk of fires in the area and how to prevent them. No solid waste or vegetation may be burnt on site or surrounding areas.
- No fires will be allowed outside designated areas (construction camp).
- Fire extinguishers and fire-fighting equipment must be available.
- The cumulative impacts of this impact can be successfully mitigated if managed properly.

11.3.9 SOCIO-ECONOMIC IMPACT

Construction phase

- The construction and operation phases of the development will have a positive impact on the socio-economic environment of the Polokwane area through employment opportunities and training and skills development.
- Agricultural land is transformed into residential/business and golf estate in an orderly fashion.

Operational phase

- A number of permanent jobs will be created for local people during this phase.
- The economy of the area is stimulated

Project phase	Impact: Job creation								
	Activity/ Aspect	Specific impact	Severity	Duration	Extent	Frequency	Probability	Significance	
								With Mitigation	Without Mitigation
Construction	Job creation	Job Creation	High +	High +	Medium-high +	High +	High +	N/A	High +
	Construction of estate	Change of land use	Medium-High-	High+	Low-medium+	Low-medium+	High+		Medium+
Operation	Golf course	Stimulati0n of recreation and tourism in area	Medium+	High+	Medium-high+	Medium high+	High+	N/A	Medium High +
	Businesses/ residences in estate	Stimulation of economy in area	High +	High +	Medium-high +	High +	High +	N/A	High +
Cumulative impacts	Increased potential for job creation.	Increased potential for stimulation of local economy	High +	High +	high +	High +	High +	N/A	High +

Mitigation measures

- Adherence to Local and District Municipality guidelines, principles and policies is imperative.
- During the construction and operational phases, jobs must be created for unemployed local people and skills must be transferred to them.
- Where viable, the work must be executed in a labour intensive manner to create as many jobs possible.
- The cumulative impact of this impact can be positive. As one of the poorest provinces in South Africa, the Limpopo Province is definitely in need of more job opportunities.

11.4 ASSESSMENT OF POTENTIALLY SIGNIFICANT IMPACTS AND RISKS

Impacts with a rating of Medium-high or High are impacts which are regarded as potentially significant, rated without any mitigation measures. In this impact assessment, the following impacts were regarded as potentially significant impacts:

i. Veld fires in both phases
ii. Water consumption and depletion in both phases.
iii. Loss of heritage resources.
iv. Functioning of sewage plants-Deterioration of habitat and aquatic life
v. Increase in natural vegetation that will be removed
vi. Visual impact of buildings and streets
vii. Safety impact of increased traffic in area

These impacts (i-iii) will now briefly be discussed.

11.4.1 CUMULATIVE IMPACTS

i. The effect of veld fires can be damage to the ecology and safety risk that can be cumulative.
ii. This effect is cumulative only if care is not taken to conserve water and if water usage of the estate is not monitored regularly.
iii. There will be a cumulative effect as more heritage resources are destroyed.
iv. The effect will only be cumulative if there is a constant pollution form sewage plants.
v. The effect of specific vegetation types is cumulative.
vi. The visual impact of the development is cumulative.
vii. The impact of increased volume of traffic is cumulative.

11.4.2 NATURE OF IMPACT

i. This can lead to losses of natural resources and life.
ii. This is a negative impact that affects water quantity available for use in the area.
iii. Damage to archaeological sites.
iv. Damage to habitats and aquatic life
v. This can lead to losses of natural resources.
vi. This is a visual impact.
vii. This is a safety impact.

11.4.3 EXTENT AND DURATION OF IMPACT

i. The extent will be within the farm of the proposed development but could also lead to damages outside of the site. The duration is short to medium term.
ii. The extent could potentially be within the area of the proposed development and the surrounding farms. The duration is for the life of the development.
iii. The extent is only on the development area and duration is for the life of the development.
iv. The extent could be adjacent properties. The duration is short term.
v. The extent is only the development area-more on the building site than on the golf course. The duration is permanent on the building site and temporary on the golf course site.
vi. The extent is up to Polokwane. The duration is permanent.
vii. The extent is up to Polokwane and the duration is permanent.

11.4.4 PROBABILITY OF OCCURRENCE

i. The probability is unlikely but possible
ii. The probability is possible.
iii. The probability is possible
iv. The probability is possible
v. The probability id definite
vi. The probability is definite
vii. The probability is likely.

11.4.5 DEGREE TO WHICH IMPACT CAN BE REVERSED

i. Impact is reversible if mitigated in time.
ii. This impact is reversible.
iii. This impact will be irreversible if not managed and preserved.
iv. The impact is reversible
v. The impact is partially reversible-on the golf course part of the development
vi. Impact is not reversible
vii. Impact is not reversible

11.4.6 DEGREE TO WHICH IMPACT CAN CAUSE IRREPLACEABLE LOSS OF RESOURCE

i. If this impact regularly takes place over a very long time and there is gross negligence, there will be serious loss of natural resources and property.
ii. The recovery of the water resource is linked to rainfall and will recover accordingly. Groundwater in the area will not be used in the development.
iii. If this impact is allowed to occur it will lead to an irreplaceable loss of archaeological resources.
iv. This will not cause an irreplaceable loss of resources.
v. This will cause a loss of the natural resource (vegetation) at the building part of the development
vi. This will not cause a loss of a resource.
vii. His will not cause a loss of a resource

11.4.7 DEGREE TO WHICH IMPACT CAN BE MITIGATED

i. Successful mitigation is possible
ii. Successful mitigation is possible
iii. Successful mitigation is possible
iv. Successful mitigation is possible
v. Partial mitigation is possible
vi. Successful mitigation is possible
vii. Successful mitigation is possible

12 SUMMARY AND FINDINGS AND RECOMMENDATIONS OF SPECIALIST REPORTS AND HOW THESE FINDINGS HAVE BEEN INCLUDED IN THE FINAL ASSESSMENT REPORT

The main issues identified as a result of the specialist studies include the following:

- Archaeological significant sites
- Protected trees and plants on site
- Sensitive bird species on site
- Drainage features
- Agricultural land availability
- Availability of water for the development

- Archaeological significant sites

The archaeological significant sites were identified and demarcated. These areas are to be avoided completely both during the construction and operational phases and are regarded as no-go zones. A phase 2 heritage assessment must be done at site 7 (farmhouse) to obtain a destruction permit.

- Protected trees and plants on site

Protected trees were found and identified on the development site. Permit applications will be submitted to the Department of Agriculture, Forestry and Fisheries for the removal of these trees where necessary. On the golf course as many indigenous trees as possible will be retained as part of the course.

The protected plants that were identified in terms of LEMA must be protected.

- Sensitive bird species on site

The golf course and natural areas around the course will preserve habitat for the birds of the area. Electrical lines in the development area will be laid underground limit the impact on the larger birds (raptors) in the area.

- Drainage features

All drainage features have been identified and a 1:50 as well as a 1:100 year flood line was delineated on the layout. Where the flood line and residential development intersected, the layout was amended to accommodate the flood line area. Where feature like roads have to go through drainage lines and flood lines, an application for a water use authorization for the crossing will be applied for at the Department of Water and Sanitation.

- Agricultural land availability

There is currently only a number of cattle and small game on the farm or project area and no croplands exist on the land. There are only three small areas which are regarded as high potential agricultural land that will be used to develop the estate on. The socio-economic value of the estate is higher than the loss in the agricultural land.

- Availability of water for the development

There is according to the geo-hydrological report in the order of 78 000 m^3 of groundwater available on the development per annum. The development is planning on using water from the Lepelle Northern Water scheme for potable water for the development to limit the impact on groundwater. For the golf course it is planned to only use treated effluent from the six treatment plants in the development to irrigate the course. The groundwater is available as backup potable water for the development.

13 ENVIRONMENTAL IMPACT STATEMENT

13.1 SUMMARY KEY FINDINGS OF THE EIA

It can be concluded that there will be environmental impacts as a result of the proposed development of the Langdale Golf estate. However, all the impacts can be mitigated to such an extent where the positive effect of the planned development outweighs the negative impacts of the development on the proposed site.. Most of the impacts can be avoided and potential impacted areas will be demarcated as no-go areas, therefore limiting the possible negative environmental impacts.

14 FINAL PROPOSED ALTERNATIVES RESPONDING TO THE IMPACT MANAGEMENT MEASURES, AVOIDANCE AND MITIGATION MEASURES IDENTIFIED IN THE ASSESSMENT

The preferred alternative was identified after all possible negative impacts were assessed and certain areas were demarcated as no-go zones.(flood line areas)

In order to minimize negative environmental impacts there are areas that is not available for future developments of any kind. In order to mitigate for most of the negative impacts, avoidance seemed to be the best option.

In terms of the main issues, including:

- Archaeological significant sites - avoidance
- Protected trees and plants on site – permit applications and avoidance
- Sensitive bird species on site-Avoidance
- Drainage features – avoidance
- Agricultural land availability – The land is used for the development as it is too small and patchy and not of uniform high potential to preserve as agricultural land.
- Availability of water for the development-Utilising other sources of water and reusing of treated waste water for the golf course.

15 ASPECTS WHICH WERE CONDITIONAL TO THE FINDINGS OF THE ASSESSMENT BY THE EAP OR SPECIALISTS WHICH ARE TO BE INCLUDED AS CONDITIONS OF AUTHORISATION

- Archaeological significant sites – must be demarcated and avoided. Phase 2 assessment to be done for the farmhouse.

  An archaeologist should be appointed to assist before construction commences.
- Protected trees and plants on site – permit applications and avoidance

  An ecologist should be appointed to assist with permit applications as well as assistance on site before construction commences.
- Drainage features – 1:50 and 1:100 year flood lines should be excluded from the development and be avoided
- Sensitive bird species on site- avoidance of certain natural areas.
- Water use for golf course-mainly treated waste water to be used for the irrigation of the golf course. The course can only be developed once there are enough waste water to use in the process (can be supplemented with water from Lepelle Northern water in the beginning until the waste water is enough)

16 UNDERTAKING UNDER OATH OR AFFIRMATION BY THE EAP

I, H.P. Jannasch, appointed EAP for the proposed Langdale Golf Estate application for Environmental Authorization, hereby confirm:

- Correctness of the information provided in this report
- All comments and inputs and responses from stakeholders and I&APs are included here.
- All inputs and recommendations from the specialist reports where relevant, are included.

Signed:…… Date…….

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