4.2.2 Transformed vegetation and developed areas

These areas are disturbed through past and present human activities and consist of current & past development with their associated infrastructure such as: cultivated lands, roads, rural dwellings (further afield), and associated infrastructure. Figure 15 to **Error! Reference source not found.** below illustrates the habitat assessment for site. The historical transformed areas are clearly marked in purple, yellow and blue.

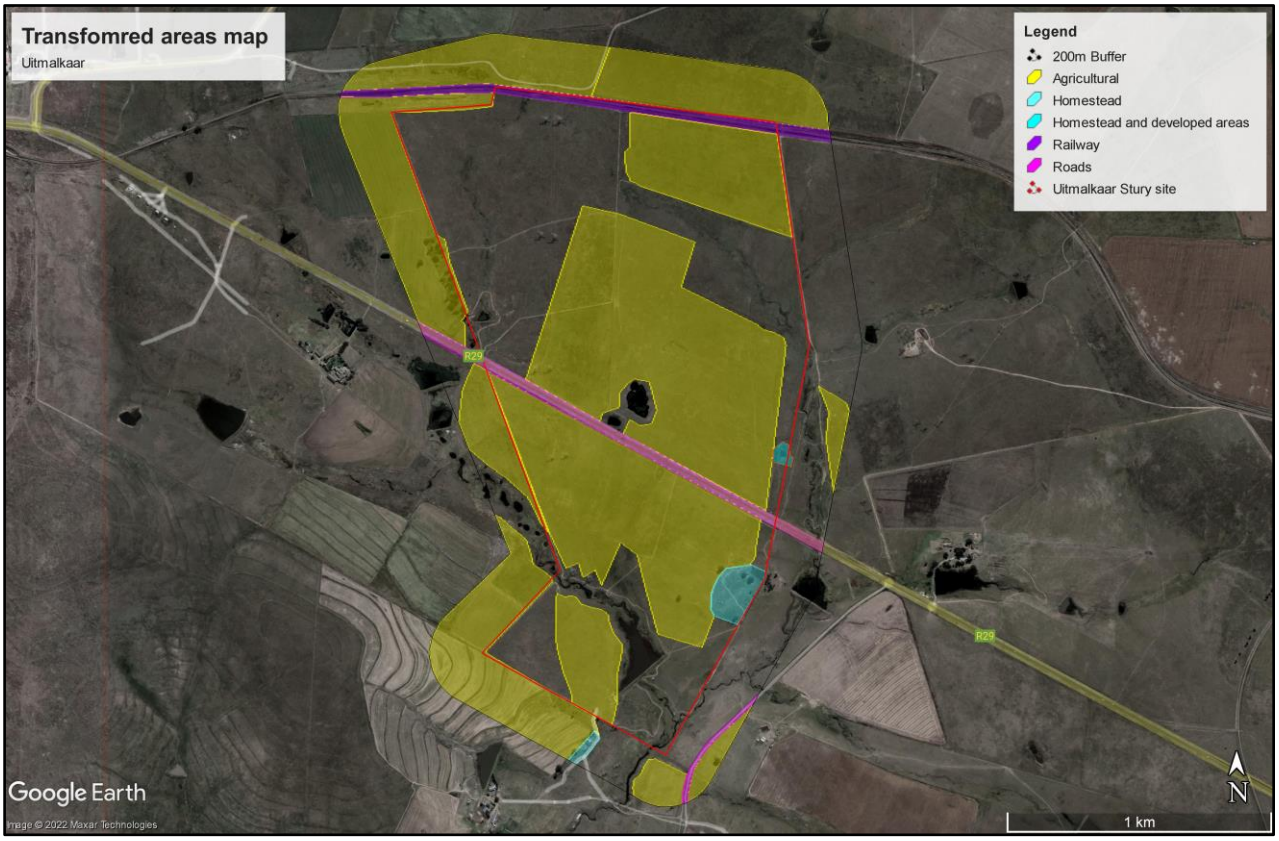

Figure 15: Habitat Assessment for the study site 1.

Figure 16: Image of transformed cultivated land in the background.

4.2.3 Indigenous and natural vegetation of the study site

The study site does show evidence of indigenous vegetation associated with the Soweto Highveld Grassland vegetation type. Areas of Indigenous vegetation is visible in green and orange in

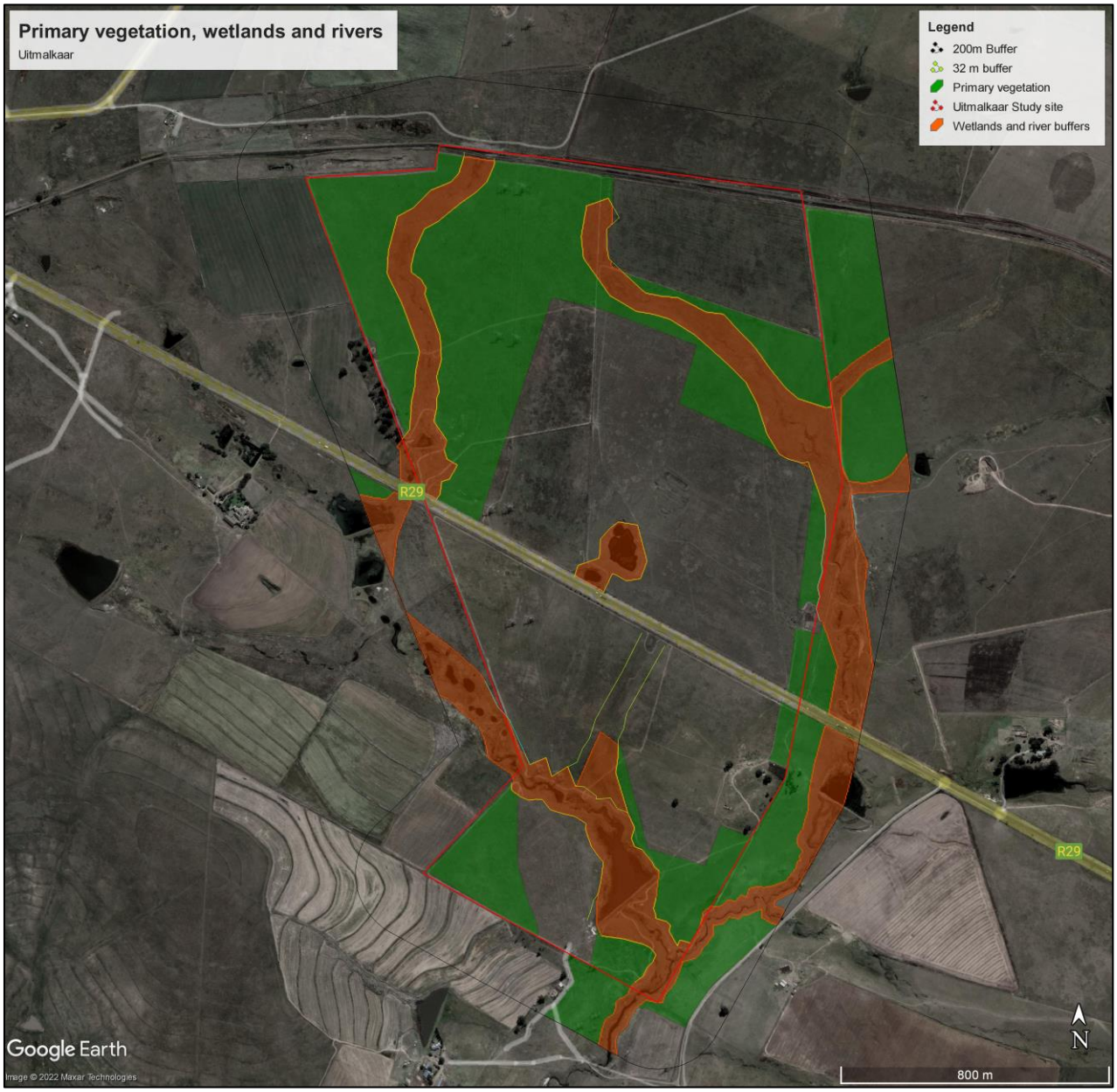

Figure 17 to **Figure 19**.

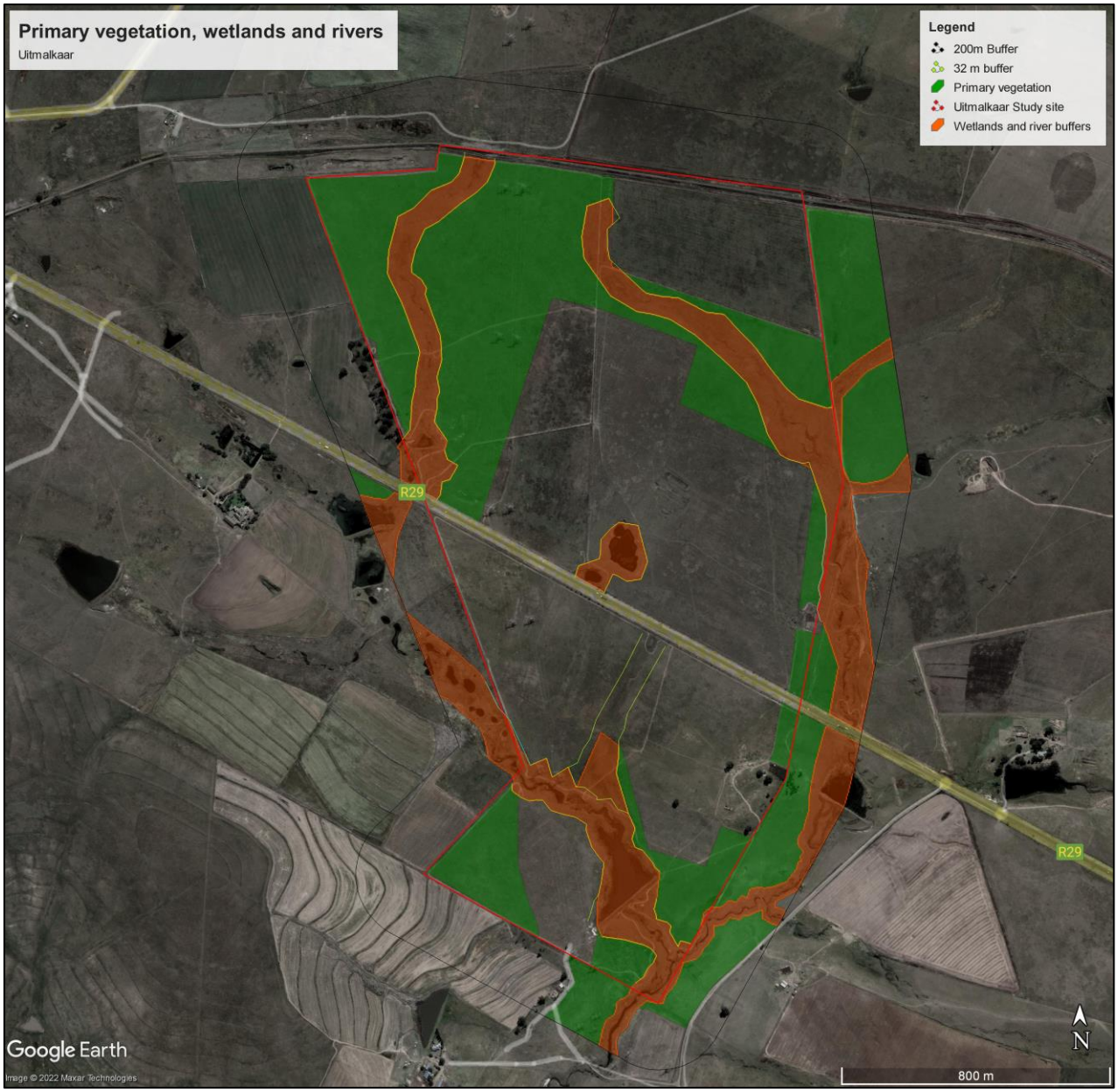

Figure 17: Indigenous vegetation map.

Figure 18: Characteristics of indigenous vegetation dominated by *Hyparrhenia* grass.

Figure 19: Characteristics of indigenous vegetation around the river areas.

4.2.4 Red data plant species

The screening report indicated a Medium sensitivity for one potential Species of Conservation Concern. This plant species may not be identified in this report. The site visit included the search for this plant species.

4.2.5 Vegetation found on site

Species encountered on site and directly adjacent is listed below.

TABLE 4: Checklist of Vegetation found onsite during February 2022.

GROWTH FORM	SCIENTIFIC NAME	COMMENT(S)
Trees	*Celtis africana*	
	Eucalyptus grandis	NEMBA 1b
	Vachellia karroo	
Herbs and forbs	*Amaranthus sp.*	
	Asparagus laricinus	
	Berkeya maritima	
	Berkheya setifera	
	Bidens pilosa	Black Jack
	Conyza bonariensis	
	Cosmos bipinnatus	
	Cotula sp.	
	Dicoma anomala	Associated with the Soweto Highveld Grassland
	Gomphocarpus fruticosus	
	Helichrysum nudifolium var. nudifolium	Associated with the Soweto Highveld Grassland
	Hibiscus sp.	
	Pseudognaphalium luteo-album	
	Selago densiflora	
	Senecio coronatus	
	Solanum mauritianum	NEMBA Category 1b
	Tagetes minuta	
	Wahlenbergia krebsii	
	Xanthium strumarium	NEMBA Category 1b
Grasses	*Aristida adscensionis*	Associated with the Soweto Highveld Grassland
	Aristida congesta	Associated with the Soweto Highveld Grassland
	Brachiaria serrata	
	Cymbopogon pospischilii	Associated with the Soweto Highveld Grassland
	Cynodon dactylon	Associated with the Soweto Highveld Grassland

GROWTH FORM	SCIENTIFIC NAME	COMMENT(S)
	Eragrostis chloromelas	Associated with the Soweto Highveld Grassland
	Eragrostis curvula	Associated with the Soweto Highveld Grassland
	Eragrostis racemosa	Associated with the Soweto Highveld Grassland
	Heteropogon contortus	Associated with the Soweto Highveld Grassland
	Hyparrhenia hirta	Associated with the Soweto Highveld Grassland
	Paspalum dilatatum	Associated with the Soweto Highveld Grassland
	Phragmites australis	
	Setaria sphacelata	Associated with the Soweto Highveld Grassland
	Sporobolus discosporus	
	Themeda triandra	Associated with the Soweto Highveld Grassland
	Typha capensis	
Wet areas	*Cyperus denudatus*	
	Eleocharis limosa	Wetland indicator plant
	Eleocharis palustris	Wetland indicator plant
	Persicaria attenuata	Wetland indicator plant

Field survey summary:

Description	**Total**
Trees, shrubs, and dwarf shrubs	3 species
Herbs and Forbs	19 Species
Grasses	16 Species
Wetland indicator plants	4
TOTAL	**42**

The above-mentioned species were recorded within the study site and directly adjacent to the site. Out of the 42 species observed on the site, 3 of the plants were NEMBA listed plants and are subject to actions as stipulated under the NEMBA Act. 14 species confirmed on site is associated with the Soweto Highveld Grassland vegetation unit as described by Mucina and Rutherford. This accounts for 33% of species found on site.

4.2.6 Alien and Invasive plant species

The list of Alien and Invasive plant species is presented. A total of 3 plants were identified on and around the site that is listed in the Alien and Invasive Species Regulations of 2014 (NEMBA) which needs management.

- 3 NEMBA Category 1b plants were identified and must be controlled.

These invader plants were mostly limited to areas of disturbance and isolated due to the transformation activities. Only Eucalyptus trees were distributed further along the site due to historical human settlement and people planting trees.

4.3 Sensitivity Analysis

Areas containing untransformed natural vegetation of conservation concern, high diversity, habitat complexity, red list organisms and / or systems vital to sustaining ecological function are considered sensitive. In contrast, areas that are transformed and have little importance for ecological functioning are of low sensitivity.

For the sensitivity analysis, the following is of importance:

- The study site is not situated in any centres of endemism (Van Wyk and Smith, 2001).
- The study site is not located within a provincial protected area.
- The initial survey determined and confirmed that none of the protected tree species are present on site: *Acacia erioloba, Boscia albitrunca, Combretum imberbe, Pittosporum viridiflorum, Prunus Africana* and *Sclerocarya birrea subsp. caffra*.
- Areas already transformed by historical activities within the proposed footprint area are because of historical clearance such as roads and large parts are transformed due to cultivation.
- The study site is located within a vegetation type that is Vulnerable in terms of Threatened Ecosystems in need of Protection. The National Biodiversity Assessment of 2018 indicated that most of the site is transformed and the remainder that is part of the Vulnerable Ecosystem, is not protected.

- The sites are situated within “other natural areas” and “Heavily modified” in terms of the Mpumalanga Biodiversity Sector plan.

Using the methodology as indicated in Table 1 in Section 2.4, a sensitivity rating of **Medium sensitivity** was given to the areas excluding the wetland areas and still have indigenous vegetation. This is due to the following:

- Other indigenous natural areas in which factors listed above are of no particular concern. May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural habitat is still ecologically functional.
- No orange or red data plants were found on site.

4.3.1 Sensitivity Mapping

The vegetation sensitivity map was drawn up for the site to determine areas of more sensitivity. The map corresponds with the methods of determining the sensitivity of the site as described in Section 2.4, Table 3 of this report.

Figure 20: Sensitivity map

4.4 Impact Assessment

Mitigation measures are proposed to ensure that the rating of significance could be reduced into a more acceptable rating. The impact assessment focuses on the proposed activity of clearance of vegetation and will not include any operational aspects.

Impact 1: Loss of Indigenous and / or Natural vegetation and habitat fragmentation.

Site clearance and destruction of vegetation habitat leading to increase in habitat loss.

Impact rating before mitigation:

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Impact on Indigenous Natural Vegetation.	5	5	2	4	5	5	5	20 **High**

Mitigation measures for Impact on Natural vegetation:

- Unnecessary impacts on surrounding natural vegetation must be avoided.
- The wetlands and rivers were delineated by a wetland specialist. Wetland and river buffers must be imposed around these sites as indicated within a High sensitivity.
- The construction impacts must be contained within the footprint of the proposed areas. Wetland areas must be avoided, and the site must be shifted to exclude wetland areas and buffers.
- Areas containing indigenous vegetation of the Soweto Highveld grassland is marked as Medium in the sensitivity assessment. These areas are isolated and impacted on in terms of the Mpumalanga sector plans.
- Disturbed areas beyond the footprint of the infrastructure must be rehabilitated as quickly as possible.

Impact rating after mitigation:

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Impact on Indigenous Natural Vegetation	3	4	1	2.66	5	2	3.5	9.81 **Low**

Impact 2: Loss of Individual or threatened plants

1 species were identified to potentially occur in and around the study site by using the DEFF screening tool. This species was searched for and not found on site or within 200m around the study site. The overall significance of the impact is therefore rated as low. No Orange data plant was found inside of the development area.

Impact rating before mitigation:

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Impact on Indigenous Natural Vegetation.	3	4	1	2.66	5	2	3.5	9.81 **Low**

Mitigation measures for Loss of individual or threatened plants:

- Unnecessary impacts on surrounding natural vegetation must be avoided.
- The construction impacts must be contained within the footprint of the development. Disturbed areas beyond the footprint of the development must be rehabilitated as quickly as possible.

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Impact on Indigenous Natural Vegetation	3	4	1	2.66	5	2	3.5	9.81 **Low**

Impact 3: Establishment and spread of declared weeds and alien invader plants

Clarence of vegetation will lead to the establishment of pioneer species and alien and invasive plant species. This is already evident as there is 3 NAMBA listed invader species found on site.

Impact rating before mitigation:

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Establishment and spread of declared weeds and alien invader plants.	5	5	2	4	5	5	5	20 **High**

Mitigation measures for establishment and spread of declared weeds and alien invader plants:

- Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled to avoid the development of a soil seed bank of alien plants within the stock-piled soil.
- Any alien plants must be immediately controlled.
- An on-going monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.

Impact rating after mitigation:

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Establishment and spread of declared weeds and alien invader plants	4	4	2	3	4	1	2.5	7.5 **Low**

Impact 4: Soil Erosion

After the clearance of vegetation, soils are vulnerable to erosion. In the absence of mitigation, the likelihood and severity of this impact will increase the longer the soil is exposed. However, if mitigation measures are implemented this can be reduced to a low negative significance if the recommended mitigation measures are implemented

Impact rating before mitigation:

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Potential of soil erosion	3	3	2	2.66	5	5	5	13.3 **Medium**

Mitigation measures for erosion

- All cleared areas to be reseeded immediately to stabilize the soil.
- Any removed topsoil must be replaced as soon as possible for reseeding and resprouting of seeds to take place.

Impact rating after mitigation:

Impact	Severity	Duration	Extent	Consequence (S + D + E / 3)	Frequency	Probability	Likelihood (F + P / 2)	Significance (C*L)
Potential of soil erosion	4	4	2	3	4	1	2.5	7.5 **Low**

4.5 ASSESSMENT OF ALTERNATIVES

4.5.1 Location Alternative

The sites selected contains more than 80% transformed vegetation and was historically used for cultivation. The developer/applicant should move and keep out of areas identified as Highly sensitive areas as per the Sensitivity Map provided. The development could also be undertaken within areas marked as low sensitivity in the sensitivity maps.

4.5.2 Land use alternatives

The current land use of the adjacent farms and areas is agricultural. The planned development will also expand on an agricultural use. No land use alternatives are proposed.

5 CONCLUSION AND RECOMMENDATIONS

The project scope included the assessment of the remainder of Portion 2 of the Farm Uitmalkaar 126 IR, Mpumalanga. The scope of the project is to use the area for crop production and other agricultural uses.

The proposed site is located within a Vulnerable Vegetation unit (Soweto Highveld Grassland) in terms of the List of Threatened Ecosystems in need of protection (GN1002 of 2011). The 2018 National Biodiversity Assessment indicated the site as being located within areas that are not protected and indicated them as of " Vulnerable". The site is in an area of "Heavily Modified" and partially in " Other Natural areas" as per the Mpumalanga Biodiversity Sector Plan. Lastly is the site indicated as "No Natural Habitat remaining in the Mpumalanga terrestrial assessment except for a part on the far south of the site.

The sensitivity analysis indicated that the site had a sensitivity for areas not contained within river and wetland areas as per the methodology used listed in Section 2.4 of this report. The wetland areas and stream areas were awarded a High Sensitivity and other natural areas were rated as having a medium sensitivity.

Four impacts were identified in the Impact Assessment section in 4.4 above. All the impact significance could be mitigated to a low sensitivity with the implementation of measures.

A total of 3 plants were identified on and around the site that is listed in the Alien and Invasive Species. These plants need to be controlled in accordance with an Alien Invasive Plant management plan.

6 RECOMMENDATIONS

The following recommendations are made with regards to the proposed development:

(i) An Environmental Control Officer must be appointed to oversee mitigation measures during construction and will be responsible for the monitoring and auditing of the contractor's compliance with the conditions of the Environmental Impact Management Plan/ Programme.

(ii) Clearance of areas deemed of high significance must be avoided as these areas include wetland pan areas and streams.

(iii) A wetland delineation was undertaken by KEMS, and all buffer areas must be adhered to.

(iv) Areas to be disturbed by construction activity as well as areas for ancillary activities such as stock piles must be clearly demarcated in already disturbed areas or areas where they will cause minimal disturbance.

(v) Alien invasive species must be controlled before and after construction commences for the 3 recorded alien and invasive plant species recorded on site.

(vi) Care needs to be taken to avoid the establishment and spread of pioneer and alien invasive species.

(vii) Measures should be implemented to stop potential erosion.

(viii) All mitigation measures described in this report must be adopted into a legal Environmental Management Programme to be used during construction of the planned project.

7. SPECIALIST STATEMENT

The site was evaluated for terrestrial biodiversity and Plant species. The terrestrial Assessment indicated that most of these sites were in heavily modified areas and partially in Significant areas to the far south as flagged by bioregional maps or plans.

The sensitivity assessment resulted in a medium sensitivity with wetland and river areas rated as high. It was recommended that wetland areas and rivers be avoided, especially to the far south.

If these measures above have been implemented, it would be possible to develop the area as per the project proposal without having a high significance impact on the terrestrial biodiversity of the site.

No red or orange data plant species were found in or around the site.

It is my opinion that the development will not have a significant effect on the status of the Soweto Highveld Grassland Vegetation as a unit and that the site is mostly situated within transformed historical cultivated areas. Areas of indigenous vegetation is concentrated around the wetland and river areas and should be protected. Planned agricultural activities within the site should be concentrated around low sensitivity areas where possible ad where medium sensitivity areas will be transformed, these areas should be included in a formal application.

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APPENDIX 8B

WETLAND DELINEATION, EIS PES AND RISK ASSESSMENT

REC SERVICES
ENVIRONMENTAL CONSULTANTS

WETLAND ASSESSMENT AND DELINEATION ON THE REMAINDER OF PORTION 2 OF THE FARM UITMALKAAR 126IR, MPUMALANGA.

August 12, 2022

Based on the format of: -

No. 40713 GOVERNMENT GAZETTE, 24 MARCH 2017 GN R.267

And

GN 39458 of November 2015 – DWS Notice 1180 of 2015.

Dr SA Mitchell

Pr.Sci.Nat; Aquatic Sciences (400129/12)

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PROJECT:	Uitmalkaar wetland delineation
CLIENT:	KEMS
CONSULTANT:	
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Executive Summary

The area under investigation lies between the towns of Leandra and Kinross on the Mpumalanga Highveld. It is to be developed as a vegetable farm. This implies intensive agriculture with staff on site for much of the time. The site slopes from North to South so it is necessary to ensure that the agricultural practices involved do not cause erosion.

The one wetland identified (South of the R29) should be avoided in any development, and if an access road needs to cross it or a water course, then this should be constructed in such a way as to avoid causing erosion. The water courses identified should also be avoided where possible. If this is not possible then care should be taken to protect these.

Vegetable farming will require both people and vehicles to be on the site. This implies that infrastructure will be developed to support these activities.

Recommendations

To preserve the integrity of the wetland and the water courses on the site developments should be done in such a way as to avoid erosion or pollution from other sources.

Developments such as roads, product handling facilities and ablution facilities should be constructed in such a way as to preserve the integrity of the site.

As far as possible, waste that cannot be treated to acceptable standards on the site should be removed for off-site disposal.

Table of Contents

Figures

Tables

1 Introduction

KEMS was commissioned to undertake a Wetland assessment and wetland delineation for wetlands located on the remainder of Portion 2 of the Farm Uitmalkaar 216-IR. The site is located within the Mpumalanga Province and is located close to the town Kinross (Figure 1-1). The site is accessible from the R29 between Leandra and Kinross and is in an area where high voltage overhead lines run through the property from the north to the South. The wetland assessment and delineation will be accompanied by a risk assessment. This site PES and EIA will also be determined.

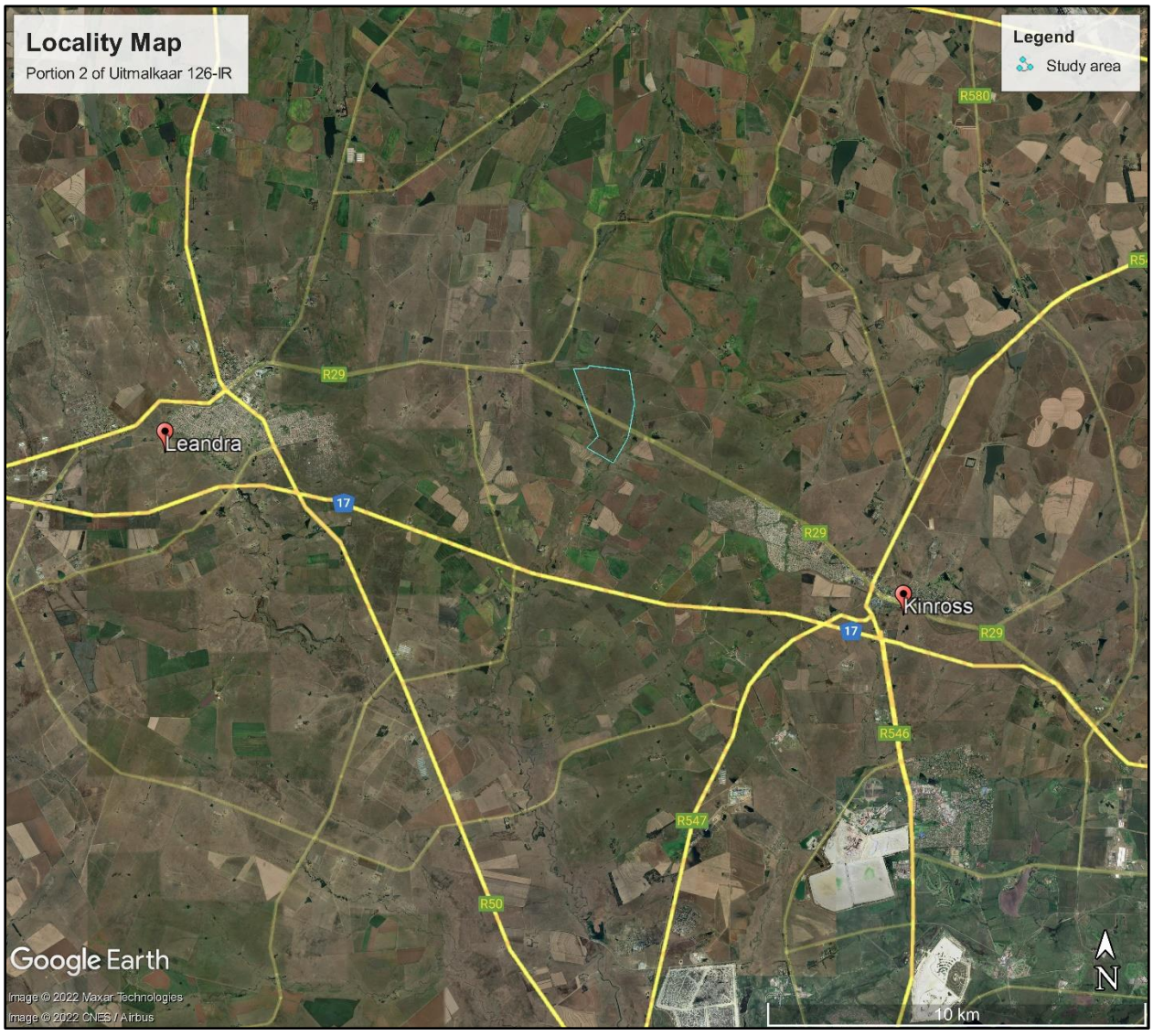

Figure 1-1: Locality map

2 Terms of Reference

The assessment and delineation of the Uitmalkaar site, together with a Risk assessment, is required for a basic assessment for developments within 500 m of wetlands and riparian areas.

3 Knowledge gaps

No specific knowledge gaps were identified.

4 Study area

The study area is illustrated in the Google Earth image below in blue (Figure 4-1). The area can be characterized by grazing and the presence of the wetland is evident. Evidence of historical cultivation is visible on the northern side of the R29. He said rated on the southern side and has associated wetlands. The railway line marks the border of the northern part of the site and runs from east to west.

Figure 4-1: The location of the proposed development site

5 Expertise of specialist

Dr SA Mitchell is a registered Natural Scientist (Pr.Sci.Nat; Aquatic Sciences (400129/12)) and has the following experience in wetlands:

- During my time in the Water Research Commission as Director: Water Linked Ecosystems I initiated and managed several research projects on wetlands. Apart from the individual projects I also initiated and managed the National Wetlands Research Programme. This programme led to the publication of several handbooks / guides for wetland management which have contributed to the current level of expertise in wetland management. The main contributions from this programme are:
- WET series of guides (10 guides)
- Wetland Health and Importance Research Programme (12 guides)
- Since my retirement I have attended the short course in wetland delineation presented through the Centre for Environmental Management of the University of the Free State.
- Since my retirement I have been involved in several WRC projects on wetland and water resource management.
- During this period, I have carried out several wetland and riparian delineations in the Gauteng, Mpumalanga, North-West provinces, the Northern Cape, Western Cape, and KwaZulu-Natal.
- During this period, I have also contributed to, managed, and completed water use license applications.
- I served on the 4-member Panel of Experts for the Lesotho Highlands Development Authority between and 2018 and 2021.
- I have conducted and compiled wetland studies

6 Aim and objectives

The aim of this project is to assess the wetlands and riparian areas in the landscape as shown in Figure 4-1.

This was done through the delineation, functional assessment, and PES of the wetland as well as the Risk Assessment to the site.

7 Description of the area

7.1 7.1 Climate

Kinross is in the summer rainfall area.

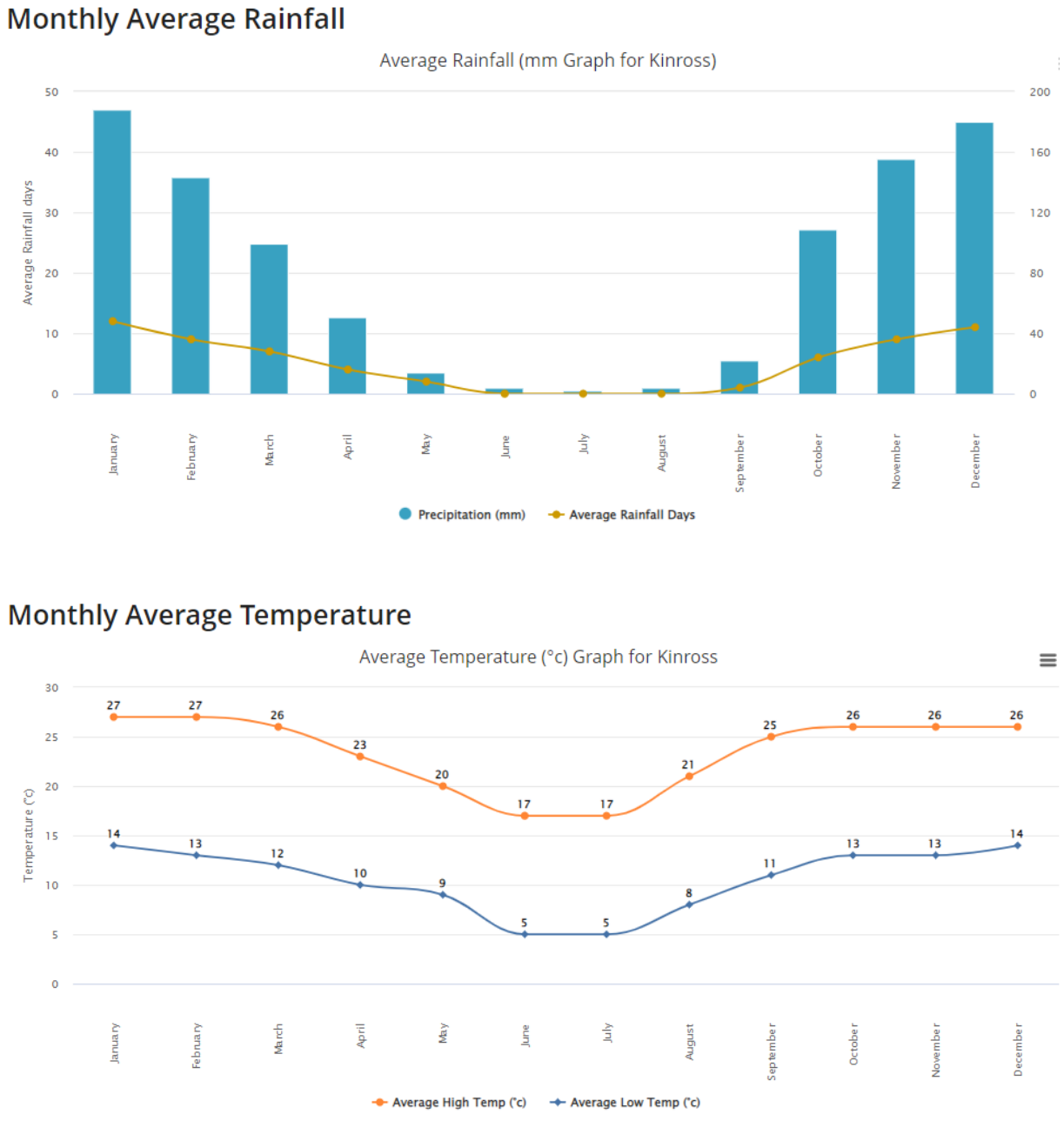

Figure 7-1: The climate fror (Meteoblue)

7.2 7.2 Elevation profile

The elevation profile across the development site and the wetland shows that the site is upslope from the wetland area (Figure 7-4). The drainage from the development site will flow into the wetland and adjacent area. North to South drops 44 m; but the gradient is not even, some parts have a higher gradient than others.

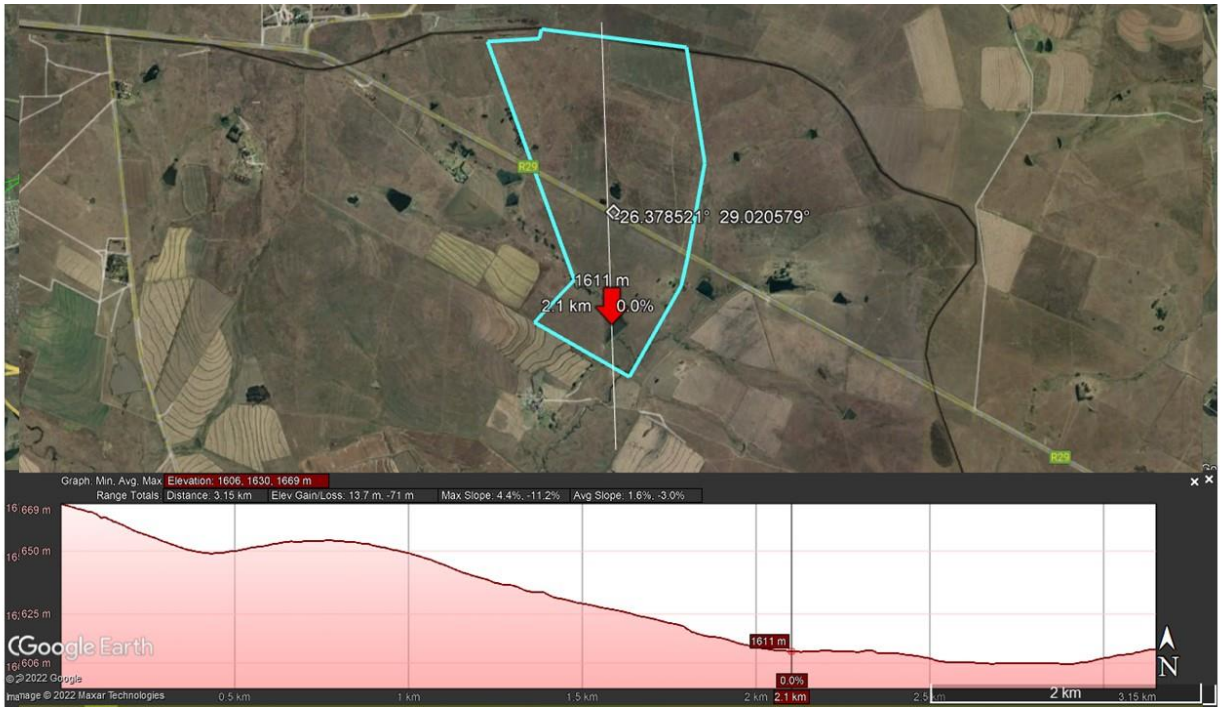

Figure 7-2: The elevation profile across the development site (Google Earth Pro)

The property to be developed is shown in Figure 7-4. The site is intersected by the R29.

8 Methodology

8.1 Desktop

At the desk-top level the site was examined using the following material:

- Google Earth Pro

8.2 Site visit

The site was photographed. Following the heavy rain, the soil was so wet that soil samples were not conclusive. As a result, the delineation was made using the indicators given in Section 8.3.1.

The site slopes from North to South, with a drop of approximately 44 m over 2.5 km, giving a gradient of approximately 1:2.5. there were no palustrine Wetlands but there are several water courses, mostly ephemeral. Much of the area investigated was clay. The field investigation followed an extended period of rainfall. The clay was wet, and water was oozing onto the surface in many areas.

8.3 Wetland delineation Methods

Wetland delineation followed the methods prescribed in DWAF (2005).

Indicators used

- Terrain unit indicator
- Soil form indicator
- Soil wetness indicator
- Vegetation indicator

Wetland unit identification

The hydrogeomorphic type of wetland (Figure 8-1) provides the wetland unit setting.

Hydrogeomorphic types		Description	Source of water maintaining the wetland[1]	
			Surface	Sub-surface
Floodplain		Valley bottom areas with a well defined stream channel, gently sloped and characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel		Valley bottom areas with a well defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/ ***
Valley bottom without a channel		Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/ ***
Hillslope seepage linked to a stream channel		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well defined stream channel connecting the area directly to a stream channel.	*	***
Isolated Hillslope seepage		Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes Pans)		A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

Figure 8-1: Wetland Hydrogeomorphic types (Kotze et al., 2009)

Wetland functional assessment Method

The method developed by Kotze et al. (2009) was followed when assessing the ecosystem services provided by wetlands, with a brief description of each, is given in Table 8-1.

Table 8-1: The ecosystem services provided by wetlands (Kotze et al., 2009)

Ecosystem services supplied by wetlands	Indirect benefits	Regulating and supporting benefits	Flood attenuation	The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream
			Streamflow regulation	Sustaining streamflow during low flow periods
			Water quality enhancement benefits: Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters
			Water quality enhancement benefits: Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters
			Water quality enhancement benefits: Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters
			Water quality enhancement benefits: Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff waters
			Water quality enhancement benefits: Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation.
			Carbon storage	The trapping of carbon by the wetland, principally as soil organic matter
	Direct benefits	**Biodiversity maintenance[2]**		Through the provision of habitat and maintenance of natural process by the wetland, a contribution is made to maintaining biodiversity
		Provisioning benefits	Provision of water for human use	The provision of water extracted directly from the wetland for domestic, agriculture or other purposes
			Provision of harvestable resources	The provision of natural resources from the wetland, including livestock grazing, craft plants, fish etc.
			Provision of cultivated foods	The provision of areas in the wetland favourable for the cultivation of foods
		Cultural benefits	Cultural heritage	Places of special cultural significance in the wetland, e.g. for baptisms or gathering of culturally significant plants
			Tourism and recreation	Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife
			Education and research	Sites of value in the wetland for education or research

Determining the ecological integrity of the wetland / water courses on site

8.3.1.1 Determining the present state (PES) of the wetland

Taken from Kleynhans et al. (2008): Assessment of habitat ecological integrity is based on an interpretation of the deviation from the reference condition. Specification of the reference condition follows an impact based approach where the intensity and extent of anthropogenic changes are used to interpret the impact on the habitat integrity of the system. To accomplish this, information on abiotic changes that can potentially influence river habitat integrity are obtained from surveys or available data sources. These changes are all related and interpreted in terms of

modification of the drivers of the system, namely hydrology, geomorphology, and physico-chemical conditions and how these changes would impact on the natural riverine habitats.

The reference condition of the two sites was not determined, but the present state of the sites was assessed, and the assessment of the PES is based on that. Water quality analyses were not undertaken.

Table 8-2 provides a measure of the severity of the impact at a site (Kleynhans et al., 2008).

Table 8-2: the severity of the impact at a site (Kleynhans et al., 2008)

IMPACT/SEVERITY CLASS	DESCRIPTION	RATING
None: reference	No discernible impact or the modification is located in such a way that it has no impact on habitat quality, diversity, size and variability.	0
Small	The modification is limited to very few localities and the impact on habitat quality, diversity, size and variability are very small.	0.5-1.0
Moderate	The modifications are present at a small number of localities and the impact on habitat quality, diversity, size and variability are limited.	1.5-2.0
Large	The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size and variability. Large areas are not influenced.	2.5-3.0
Serious	The modification is frequently present and the habitat quality, diversity, size and variability in almost the whole of the defined area are affected. Only small areas are not influenced.	3.5-4.0
Critical	The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally.	4.5-5.0

Table 8-3 (from Kleynhans et al., 2008) describes the drivers of the habitat integrity which between them contribute to the physical template of the PES and describes how they were assessed.

Table 8-3: The drivers of the habitat integrity which between them contribute to the physical template of the PES (Kleynhans et al., 2008)

HABITAT INTEGRITY CATEGORY	DESCRIPTION	RATING (% OF TOTAL)
A	**Unmodified, natural reference condition:** All physical drivers unmodified or virtually unmodified. If use of the resource is present, the impact of such use falls completely within the natural disturbance regimes both in terms of extent and severity.	90-100
B	**Largely natural with few modifications:** A small change in natural habitats may have taken place but the ecosystem functions are essentially unchanged. *Physical drivers:* • Hydrology: The flow regime has only slightly been modified • Geomorphic: limited to slight sediment changes • Physico-chemical changes: Water clarity may sporadically be slightly influenced. At worst, only sporadic traces of toxics present. Salts may sporadically be slightly increased. *Associated habitat conditions:* • Instream: Very little change in habitat types and their dimensions and frequency. Connectivity between habitats virtually unchanged. • Riparian: Riparian habitat close to natural in terms of biophysical characteristics. Very little modification and use of riparian zone. Virtually no fragmentation.	80-89

HABITAT INTEGRITY CATEGORY	DESCRIPTION	RATING (% OF TOTAL)
C	**Moderately modified**: Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. *Physical drivers:* • Hydrology: The flow regime may have been significantly modified and direct manipulation by impoundments may be present. • Geomorphic: sediment changes due to increased inputs or flow may have increased significantly. • Physico-chemical changes: changes in nutrients, salts, oxygen concentration and temperature may deviate significantly from the reference. Low levels of toxics may sporadically be present. *Associated habitat conditions:* • Instream: Dimensions and frequency of some habitat types have changed significantly. Fragmentation of habitats may often be present • Riparian: Changes in the structure of the zone may be common. Some fragmentation of the zone may often be present.	60-79
D	**Largely modified.** A large loss and change of natural habitat, biota and basic ecosystem functions has occurred. *Physical drivers:* • Hydrology: The flow regime has been extensively modified and manipulation by impoundments may be present. • Geomorphic: Drastic changes in sediment loads due to increased inputs or flow modification may have occurred. • Physico-chemical changes: nutrients, salts, oxygen concentration and temperature may deviate considerably from the reference. Low levels of toxics may regularly be present. *Associated habitat conditions:* • Instream: Dimensions and frequency of some habitat types may differ drastically from the reference. Fragmentation of habitats may often and extensively be present. • Riparian: Extensive changes of the zone may be present. Significant fragmentation of the zone may have occurred.	40-59
E	**Seriously modified.** The loss of natural habitat, biota and basic ecosystem functions is extensive. *Physical drivers:* • Hydrology: The flow regime may have been extensively and severely modified and manipulation by impoundments is likely to be present. • Geomorphic: Extensive and severe changes in sediment loads due to increased inputs or flow modification may have occurred. • Physico-chemical changes: nutrients, salts, oxygen concentration and temperature may deviate severely and regularly from the reference. Significant levels of toxics may regularly be present. *Associated habitat conditions:* • Instream: Dimensions and frequency of some habitat types may differ extensively and severely from the reference. Fragmentation of habitats may regularly and extensively be present. • Riparian: Severe and extensive changes of the zone may be present. Extensive fragmentation of the zone may have occurred.	20-39

HABITAT INTEGRITY CATEGORY	DESCRIPTION	RATING (% OF TOTAL)
F	**Critically / Extremely modified:** Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible. *Physical drivers:* • Hydrology: The flow regime may be extensively and extremely modified and manipulation by impoundments is often present. • Geomorphic: Extensive and extreme changes in sediment loads due to increased inputs or flow modification may have occurred. • Physico-chemical changes: Nutrients, salts, oxygen concentration and temperature may deviate extremely and very regularly from the reference. High levels of toxics may regularly be present. *Associated habitat conditions:* • Instream: Dimensions and frequency of some habitat types may differ extensively and extremely from the reference. Fragmentation of habitats may be severe. • Riparian: Extreme and extensive changes of the zone may be present. Fragmentation of the zone may be severe.	0-19

Figure 8-2 provides a graphical representation of the ecological categories on a continuum (From Kleynhans and Louw, 2007)

Figure 8-2: a graphical representation of the ecological categories on a continuum (From Kleynhans and Louw, 2007)

9 Results

The relevant results from the desk-top investigation are illustrated in Section 7 above. The site was assessed on the 24th of April 2022. There is evidence of previous cultivation in the North-eastern section of the property. There is also evidence of previous cultivation on the South-western side of the dam South of the R29 (Figure 9-1).

9.1 Wetland and riparian delineation

The riparian areas were delineated both from ground trothing and from Google Earth imagery. In addition, there are two borrow pits to the North of the road.

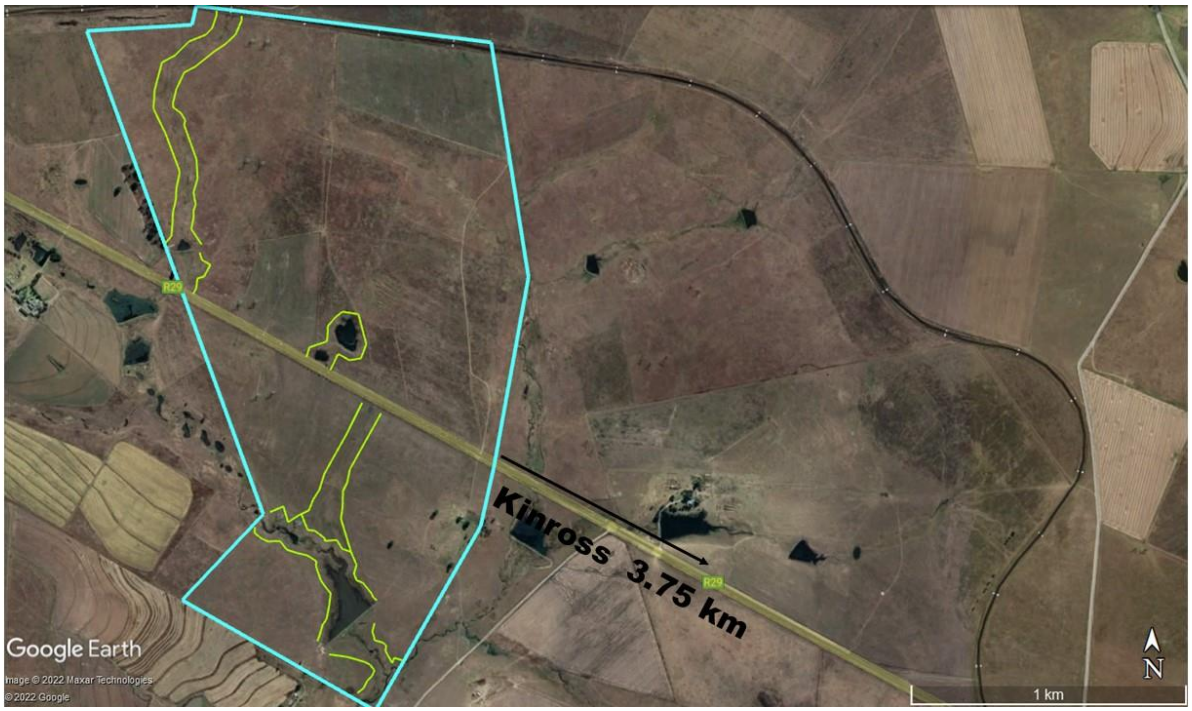

Figure 9-1: Wetland and riparian delineation. The 32 m buffer zones are marked in green.

7.1.1 North of the R29

Water course. There is a water course crossing the North-western part of the site. At the upstream (Northern) part of the site there was standing water (Figure 9-2A). There are small dams on this water course but at the time of the site visit these were not holding water (Figure 9-2B). The water visible in the dam in Figure 9-2B is on the neighbouring property.

A: Northern part of the water course

B: Dry dam on the southern part of the water course

Figure 9-2: Water course crossing the North-western part of the site

Roadside borrow pits. There are two borrow pits to the north of the road. Both of these were holding water at the time of the site visit (Figure 9-3 A and B).

A: Larger borrow pit

B: Smaller borrow pit

Figure 9-3: Borrow pits to the North of the R29

7.1.2 South of the R29

There is a drainage line flowing across the southern part of the site (Figure 9-1). There is a dam on this drainage line which was overflowing through the spillway at the South-western end of the wall (Figure 9-4 A&B). The drainage line flowing across the North-western side of the property flows into this line, flowing back onto the property South of the R29 (see Figure 9-1).

There is an unchannelled valley bottom wetland running southwards from the R29 (-26.379583° 29.021565°) joining this drainage line at the upstream end of the dam (-26.383543° 29.019655°) (Figure 9-1). At the time of the site visit the clay in this unchannelled valley bottom wetland was wet, indicating that it is a temporary wetland and so it has been delineated as such. The average slope of this unchannelled valley bottom wetland is 3.6 m/100 m which is steeper than palustrine wetlands are generally found. However, the clay soil, the moisture content and the vegetation indicate that this is, in fact, a wetland.

A: The dam on the southern side of the site, looking downstream

B: The spillway at the South-western end of the wall

Figure 9-4: the dam on the southern side of the R29

There was a lot of seepage downstream of this dam wall, contributing to the flow of water downstream.

Most of the wet areas on the site were riparian. The only wetland area is the unchannelled valley bottom wetland running from the R29 southwards into the dam to the South of the R29.

9.2 Wetland unit identification

Following Figure 8-1 the wetland is identified as an unchannelled Valley bottom wetland.

9.3 Description of wetland type

This unchannelled Valley bottom wetland is relatively short (±500 m) with a relatively steep gradient (3.6 m / 100 m).

9.4 General functional description of wetland types

The length combined with the gradient of the wetland means that this wetland does not make much contribution to the ecosystem services. The vegetation of the wetland is in good condition so there is no erosion.

9.5 Wetland ecological functional assessment

This is a seasonal wetland, verging on temporary. It will only be wet in the wet season. The soil type (clay) will, however, hold water for some time after it has been wetted.

9.6 Present ecological State (Ecological Health) assessment

The riparian and wetland areas on the site are generally in good condition.

7.6.1 General

Hydrology. The area is generally wet with the water courses holding surface water and the seasonal wetland being moist.

- Severity of impact (Table 8-2) – 1

Geomorphology. The gradient of the general area is steeper than would normally support palustrine wetlands, but the water courses on the property are not eroded.

- Severity of impact (Table 8-2) – 1.5

Physico-Chemical changes. Physico-Chemical changes were not measured, although there was no cultivation, implying that currently there would be no fertiliser runoff.

This is likely to change, however, when the area is developed for vegetable production.

- Severity of impact (Table 8-2) – 1

Overall assessment of PES (From Table 8-2) B (Largely natural with few modifications / C (Moderately modified). The reason for the B/C assessment is that the area has been cultivated in the past but it is currently reverting to a less disturbed state. (Table 8-3: score – 79 – 80)

9.7 Impact Assessment discussion

Currently the only use of the property is for cattle grazing, and so the impact is low. The dams on site have been there for some time and so are not posing any additional risks or impacts.

The slope of the site will make it vulnerable to erosion if developments are not carefully planned and carried out. This means that the proposed development will need to be done carefully and at a time when there is less likelihood of rain. so as not to pose risk to the site.

10 8. Risk Assessment discussion

Risks identified during the development and operational phases are listed in the Appendix (attached).

All the risks listed may be mitigated and controlled through the effective management of operations stipulated in the assessment (see Annexure).

11 9. Conclusions

The property has water courses and a wetland, and these should be avoided when planning developments. The average gradient of the site is relatively high and so the area is susceptible to erosion if measures are not put in place to prevent this from happening.

The risks identified, as listed in the Annexure, may all be mitigated provided that the ongoing management of the measures taken is maintained.

12 10. Recommendations

Care should be taken to undertake all developments on the property in such a way that soil erosion is avoided.

The planned use would need workers on the site for much of the time. It is, therefore, necessary that there are adequate ablution facilities on the site and that these are serviced regularly.

Risk Assessment for the Uitalkaar development site

Dr SA Mitchell: SACNASP Registration No. 400129/12

Construction phase

			Severity																	
Activity	Aspect	Impact	Flow regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial Scale	Duration	Consequences	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk rating	Confidence level (%)	Control measures	Borderline LOW/Moderate rating classes
This site	The gradient of the site	Potential for erosion during the construction and operation phases	3	1	1	1	1.5	2	2	5.5	4	4	5	1	14	77	M	95	Design and construct drainage (from buildings, roads and other infrastructure) so that it will minimise environmental impact	L
Vehicle access to the site	Creating Access roads for infrastructure	Disturbance of vegetation will increase erosion and dust generation	2	2	1	2	1.8	2	2	5.8	2	2	5	1	10	58	M	85	Design and construct road drainage so that it will minimise environmental impact	L
	Maintenance and repair of existing access roads.	Poor maintenance will increase negative environmental impact	2	2	1	1	1.5	2	2	5.5	3	2	5	1	11	61	M	90	Ensure that road infrastructure is well maintained	L
	Provision for construction vehicles	Area will be subject to erosion	2	3	3	2	2.2	1	2	5.2	2	2	5	1	10	52	L	90	Turning and parking areas must be adequate and designed to protect the environment	L
	Fuel and oil spills	Pollute the environment	2	3	3	3	2.8	2	2	6.8	1	1	5	2	9	61	M	85	Vehicles must be checked regularly and serviced off site	L

Activity	Aspect	Impact	Flow regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial Scale	Duration	Consequences	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk rating	Confidence level (%)	Control measures	Borderline LOW/Moderate rating classes
Construction Acrivities	Solid Waste creation	Waste produced during developpment will impact the surrounding land	1	1	1	1	1	1	2	4	2	2	5	1	10	40	L	85	Facilities must be provided for the on-site collection and removal of solid waste from the site	L
	Liquid Waste creation	Liquid waste will end up in the runoff, polluting the river and wetlands	3	3	2	3	2.8	1	2	5.8	2	2	5	2	11	63	M	90	Facilities must be provided for the on-site collection and removal or treatment of liquid waste from the site	L
	Domestic waste - Increase in the number of personnel on site	Sewage will cause pollution if adequate facilities are not provided	1	1	1	1	1	1	2	4	2	2	5	1	10	40	L	90	Ensure that adequate on-site facilities are provided and maintained	L
	Dust creation	Dust will smother vegetation and create a health hazard for workers	2	2	2	3	2.3	2	2	6.3	2	2	5	1	10	63	M	85	Keep the dust-generating areas watered	L
	Spills	Spills (eg petro-chemical, fertiliser) will pollute the environment	3	3	2	3	2.8	2	2	6.8	2	2	5	1	10	68	M	80	Good supervision of activities and rapid response to incidents	L
	Creating a platform for Infrastructure (Fuel & fertiliser distribtion)	Potential spills and dust creation	3	3	2	3	2.8	2	2	6.8	2	2	5	1	10	68	M	85	Good supervision of activities and rapid response to incidents	L

Activity	Aspect	Impact	Flow regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial Scale	Duration	Consequences	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk rating	Confidence level (%)	Control measures	Borderline LOW/Moderate rating classes
Natural Environment	Hydrology	Change in vegetation cover. This will be particularly noticeable during heavy rainfall events	3	3	3	3	3	2	2	7	2	2	5	1	10	70	M	80	Construct drainage in such a way as to limit the erosive potential of runoff	L
	Noise	Industrial machinery will make a noise during operations	1	1	3	3	2	2	2	6	2	2	5	1	10	60	M	90	Limit activities to normal working hours	L
	Impact on wetlands	Sediment and Pollution will potentially increase and impact on the streams, reducing the suitability as a habitat for both fauna and flora	3	3	2	2	2.5	2	2	6.5	2	2	5	1	1	6.5	M	90	Runoff during construction should be controlled by temporary structures to provide flow velocity reduction and place for sediment to settle. This can then be cleaned out as necessary.	L
	Application of herbicides	This has the potential to damage the wider environment	1	3	3	3	2.5	3	2	7.5	2	2	5	2	11	83	85	90	Where herbicides are required, ensure that the operators are properly trained and that the herbicide selected for use is suitable for the task.	L

Activity	Aspect	Impact	Flow regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial Scale	Duration	Consequences	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk rating	Confidence level (%)	Control measures	Borderline LOW/Moderate rating classes
Operation Phase																				
Vehicle access to the site	Creating Access roads for servicing the operations	Service roads to be kept for the operational phase must be properly constructed. Other roads must be revegetated	3	3	2	2	2.5	2	4	8.5	4	2	5	1	12	102	M	90	Vehicle access must be limited to clearly defined routes	L
	Maintenance and repair of existing access roads.	Poor road maintenance will lead to erosion and sediment deposition on the site	2	2	2	2	2	2	4	8	2	2	5	1	10	80	M	95	Routine road maintenance must be ongoing and inspected regularly	L
	Provision for service vehicles	Uncontrolled vehicle movement will damage the environment	4	4	4	4	4	2	4	10	2	3	5	1	11	110	M	95	Adequate turning and parking facilities must be provided and used	L
	Waste creation	Failure to use proper facilities will cause pollution and be unsightly	1	2	2	2	1.8	1	4	6.8	4	2	5	1	12	81	M	95	Ensure that proper waste disposal facilities are available and serviced regularly, and train personnel to use these.	L
	Dust creation	Dust will smother facilities and create a health hazard	1	2	2	2	1.8	1	4	6.8	2	3	5	1	11	74	M	90	Surface roads with a finish which will control dust generation	L

Activity	Aspect	Impact	Flow regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial Scale	Duration	Consequences	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk rating	Confidence level (%)	Control measures	Borderline LOW/Moderate rating classes
Operational Activities	Solid and liquid waste	This will cause pollution of the environment and, depending on the waste, create a health hazard	2	2	1	3	2	2	4	8	4	4	5	1	14	112	M	90	Ensure that proper solid and liquid waste disposal facilities are available and people are trained to use them.	L
	Domestic waste	Sewage will pollute the environment	2	2	1	2	1.8	1	4	6.8	4	3	5	1	13	88	L	95	Ensure that clean ablution facilities are available and serviced regularly	L
		Food waste will cause a health hazard and attract vermin	1	1	1	2	1.3	1	4	6.3	4	3	5	2	14	88	L	95	Ensure that food disposal facilities are available and serviced regularly	L
	Spills	Pollution may be severe depending on the substance and extent of the spill	3	3	2	3	2.8	1	1	4.8	1	1	5	3	10	48	M	90	Ensure that facilities to handle pollution are readily available and the people are trained to use them. Where required, make sure that the required reporting procedures are known and that people are trained to respond appropriately.	L
	Creating a platform for Infrastructure (e.g. grading and packing shed)	Spillage will attract vermin and potentially be a cause for disease	1	1	1	2	1.3	1	4	6.3	2	2	5	1	10	63	L	90	Train operators in good hygene practices and make sure that these are practised.	L

Activity	Aspect	Impact	Flow regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	Spatial Scale	Duration	Consequences	Frequency of activity	Frequency of impact	Legal issues	Detection	Likelihood	Significance	Risk rating	Confidence level (%)	Control measures	Determine LOW/Moderate rating classes
Natural Environment	Hydrology	Hard surfaces will increase the runoff which will increase erosion	2	2	2	2	2	3	4	9	2	3	5	1	11	99	M	90	Construct and maintain proper drainage systems that will not damage the environment.	L
	Impact on the stream	Increased runoff and threat of pollution	2	2	1	2	1.8	2	4	7.8	2	3	5	3	13	101	L	90	Construct sediment and pollution trapping facilities in runoff channels to protect the environment	L
	Application of herbicides	This has the potential to damage the wider environment	1	3	3	3	2.5	2	4	8.5	3	3	5	2	13	111	L	90	Where herbicides are required, ensure that the operators are properly trained and that the herbicide selected for use is suitable for the task.	L

APPENDIX 8C

HERITAGE IMPACT ASSESSMENT

REC SERVICES
ENVIRONMENTAL CONSULTANTS

PHASE 1 HERITAGE IMPACT ASSESSMENT (HIA) FOR THE PROPOSED FARMING ACTIVITIES FOR CROP PRODUCTION AND ASSOCIATED INFRASTRUCTURE SUCH AS A WORKSHOP AND CROP PRODUCTION TUNNELS ON THE REM. OF POR. 2 OF THE FARM UITMALKAAR 126IR, MPUMALANGA

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For:

August 2022

REPORT DETAILS

Report Details	Rev 0
Report Title	Phase1 Heritage Impact Assessment (HIA) for the proposed farming activities for crop production and associated infrastructure such as a workshop and crop production tunnels on the Remainder of Portion 2 of the Farm Uitmalkaar 126IR, Mpumalanga
Date Submitted	August 2022
Project Consultant	Leonie Marais Heritage Practitioner
Prepared by	Leonie Marais BA (Archaeology and Cultural History) (UP) BA (Hons) Cultural History (UP) Post Grad. Diploma in Museum Science (UP) Diploma in Basic Principles of Public Relations (Damelin) Cert Conservation of Traditional Buildings (Univ of Canberra) Management Development Programme (UP) Post Grad Dip (Heritage) (WITS) Accredited member: SA Society for Cultural History (CH002)
Declaration	I, Leonie Marais as authorised representative of Leonie Marais Heritage Practitioner hereby confirm my independence in terms of Section 13.(1)(a) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) 2014 EIA Regulations as amended and the National Heritage Resources Act, 1999 (Act 25 of 1999).
Copyright Warning	Unless otherwise noted, the copyright in all text and other content (including the manner of presentation) is the exclusive property of Leonie Marais Heritage Practitioner.
Disclaimer	Although all possible care is taken to identify/find all sites of cultural importance during the initial survey of the study area, the nature of archaeological and historical sites is as such that it is always possible that hidden or sub-surface sites could be overlooked during the study. Leonie Marais Heritage Practitioner will not be held liable will not be held liable for such oversights or for the costs incurred as a result thereof.

EXECUTIVE SUMMARY

Leonie Marais was appointed by KEMS to carry out a Phase1 Heritage Impact Assessment (HIA) for the proposed farming activities for crop production and associated infrastructure such as a workshop and crop production tunnels on the Remainder of Portion 2 of the Farm Uitmalkaar 126IR, Mpumalanga. The site visit took place on 24 April 2022.

A field survey was conducted after which a survey of literature was undertaken.

No heritage sites nor items are present on the sites earmarked for development.

It should be noted that the sub-surface archaeological and/or historical deposits and graves are always a possibility. Care should be taken during any work in the entire area and if any of the above is discovered, an archaeologist/heritage practitioner should be commissioned to investigate.

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DEFINITION OF TERMS:

''alter'' means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means.

"archaeological'' means—
(a) material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;
(b) rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;
(c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and
(d) features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

''conservation'', in relation to heritage resources, includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance.

''cultural significance'' means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

''development'' means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including—
(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;
(b) carrying out any works on or over or under a place;
(c) subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;
(d) constructing or putting up for display signs or hoardings;
(e) any change to the natural or existing condition or topography of land; and
(f) any removal or destruction of trees, or removal of vegetation or topsoil; or object that is specifically designated by that state as being of importance.

''grave'' means a place of interment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place.

''heritage resource'' means any place or object of cultural significance.

''heritage resources authority'' means the South African Heritage Resources Agency (SAHRA), or in respect of a province, a provincial heritage resources authority.

''heritage site'' means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority.

''improvement'', in relation to heritage resources, includes the repair, restoration and rehabilitation of a place protected in terms of Act 25 of 1999.
''living heritage'' means the intangible aspects of inherited culture, and may include—
(a) cultural tradition;
(b) oral history;
(c) performance;
(d) ritual;
(e) popular memory;
(f) skills and techniques;
(g) indigenous knowledge systems; and
(h) the holistic approach to nature, society and social relationships.

''local authority'' means a municipality as defined in section 10B of the Local Government Transition Act, 1993 (Act No. 209 of 1993).

''management'', in relation to heritage resources, includes the conservation, presentation and improvement of a place protected in terms of Act 25 of 1999.

''meteorite'' means any naturally-occurring object of extraterrestrial origin.

''object'' means any movable property of cultural significance which may be protected in terms of any provisions of Act 25 of 1999, including—
(a) any archaeological artefact;
(b) palaeontological and rare geological specimens;
(c) meteorites; and
(d) other objects.

''palaeontological'' means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trance.

''place'' includes—
(a) a site, area or region;
(b) a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;

(c) a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures;
(d) an open space, including a public square, street or park; and
(e) in relation to the management of a place, includes the immediate surroundings of a place.

''presentation'' includes—
(a) the exhibition or display of;
(b) the provision of access and guidance to;
(c) the provision, publication or display of information in relation to; and
(d) performances or oral presentations related to, heritage resources protected in terms of Act 25 of 1999.

''public monuments and memorials'' means all monuments and memorials—
(a) erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; or
(b) which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.

''site'' means any area of land, including land covered by water, and including any structures or objects thereon.
''structure'' means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.
''victims of conflict'' means—
(a) certain persons who died in any area now included in the Republic as a direct result of any war or conflict as specified in the regulations, but excluding victims of conflict covered by the Commonwealth War Graves Act, 1992 (Act No. 8 of 1992);
(b) members of the forces of Great Britain and the former British Empire who died in active service in any area now included in the Republic prior to 4 August 1914;
(c) persons who, during the Anglo-Boer War (1899-1902) were removed as prisoners of war from any place now included in the Republic to any place outside South Africa and who died there; and
(d) certain categories of persons who died in the ''liberation struggle'' as defined in the regulations, and in areas included in the Republic as well as outside the Republic.

1. INTRODUCTION

PROJECT INFORMATION

➢

PROPOSED ACTIVITY

➢ The proposed establishment of new land for crop production and some associated infrastructure such as a workshop and crop production tunnels, on the Rem. of Por. 2 OF the farm Uitmalkaar 126IR, Mpumalanga Province.

BASIC PROJECT DESCRIPTION

It is determined that the project will cover more than 20 ha of land which will be disturbed by the clearing of indigenous vegetation for the establishment of vegetable production in a tunnel and on open land.

LOCALITY

➢ The turn-off to the farm, from the R29, is about 7.2km from the R29 and R547 interchange at Kinross. GPS coordinates of site: -26.383846°, 29.022789°.

1.1 WHY A PHASE 1 HERITAGE IMPACT ASSESSMENT IS REQUIRED?

This project may potentially impact on any types and ranges of heritage resources that are outlined in Section 3 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999). Subsequently a Phase 1 Heritage Impact Assessment (HIA) was commissioned by KEMS and conducted by Leonie Marais.

1.1.1 BASELINE STUDY

The objective of this Phase 1 Heritage Impact Assessment (HIA) was to gain an overall understanding of the heritage sensitivities of the area and indicate how they may be impacted on through development activities. The site survey took place on 24 April 2022.

A baseline study was conducted to identify and compile a comprehensive inventory of sites of cultural heritage within the proposed project area, which include:
(i) all sites of archaeological interest;
(ii) all buildings and structures older than 60 years;
(iii) landscape features include sites of historical events or providing a significant historical record or a setting for buildings or monuments of architectural or archaeological importance, historic field patterns and graves.

The baseline study also included a desk-top research and a field survey.

The desktop research was conducted to analyse, collect and collate extant information. The desktop research included:

- Search of the list of declared heritage sites protected by the National Heritage Resources Act, 1999 (Act no. 25 of 1999);

- Search of publications on local historical, architectural, anthropological, archaeological and other cultural studies;
- Search of other unpublished papers, records, archival and historical documents through public libraries, archives, and the tertiary institutions; and
- Search of cartographic and pictorial documents and maps.

The above baseline categories are sufficient for a report of this nature.

1.1.2 SEASON AND RELEVANCE THEREOF

The survey was conducted during Autumn. Unlike botanical studies heritage surveys are not restricted by season.

1.2 ARCHAEOLOGICAL CONTEXT AND HISTORY OF THE STUDY AREA

1.2.1 Archaeological context

1.2.1.1 The Stone Age

Concentrations of Early Stone Age (ESA) sites are mainly found on the flood-plains of perennial rivers and may date to over 2 million years ago. The said sites may contain scatters of stone tools and manufacturing debris or concentrated deposits ranging from pebble tool choppers to core tools such as handaxes and cleavers.

Middle Stone Age (MSA) sites are also present on flood plains, but are also associated with caves and rock shelters. Such sites usually consist of large concentrations of knapped stone flakes such as scrapers, points and blades and associated manufacturing debris. Limited drive-hunting activities are also associated with this period.

Late Stone Age (LSA) sites are preserved in rock shelters, although open sites with scatters of mainly stone tools can occur. Deposits are well-protected in shelters and these stable conditions result in the preservation of organic materials such as wood, bone, hearths, ostrich eggshell beads and even bedding material. South African rock art is associated with this period.

1.2.1.2 The Iron Age

In the northern regions of South Africa at least three settlement phases can be distinguished associated with early pre-historic agro-pastoralist settlements during the Early Iron Age (EIA). Diagnostic pottery assemblages can be utilised to infer group identities and to investigate movements across the landscape. The first phase of the EIA, known as Happy Rest (named after the site where ceramics were first identified), is representative of the Western Stream of migrations, and dates 400-600 AD. The second phase of Diamant is dated 600-900 AD and was first recognised at the eponymous site of Diamant in the western Waterberg. The third

phase, characterised by herringbone-decorated pottery of the Eiland tradition, is regarded the final expression of the EIA and occurs over large parts of the North West Province, Limpopo Province, Gauteng Province and Mpumalanga Province. This phase has been dated to approximately 900-1200 AD. These sites are usually located on low-lying spurs close to water. No EIA sites occur in the Free State Province.

The Late Iron Age (LIA) settlements are characterised by stone-walled enclosures situated on defensive hilltops *circa* 1640-1830. This occupation phase has been linked to the arrival of ancestral Northern Sotho, Tswana and Southern Ndebele (Nguni-speakers) in the northern and Waterberg regions, and dates from the 16th and 17th centuries. The terminal LIA is represented by late 18th and early 19th century settlements with multichrome Moloko pottery commonly attributed to the Sotho-Tswana. These settlements can in various instances be correlated with oral traditions on population movements during which African farming communities sought refuge in mountainous regions during the processes of disruption in the northern interior of South Africa, resulting from the so-called Difaqane or Mfecane.

1.2.2 Historical period

In the 1820's the area was affected by the disruptive influence of Mzilikazi (Zulu warrior) and later during the middle and late 19th century the area was settled in by white farmers which resulted in the establishment of fenced farms and formal towns.

1.3 LOCATION AND PHOTOGRAPHIC RECORD OF STUDY AREA

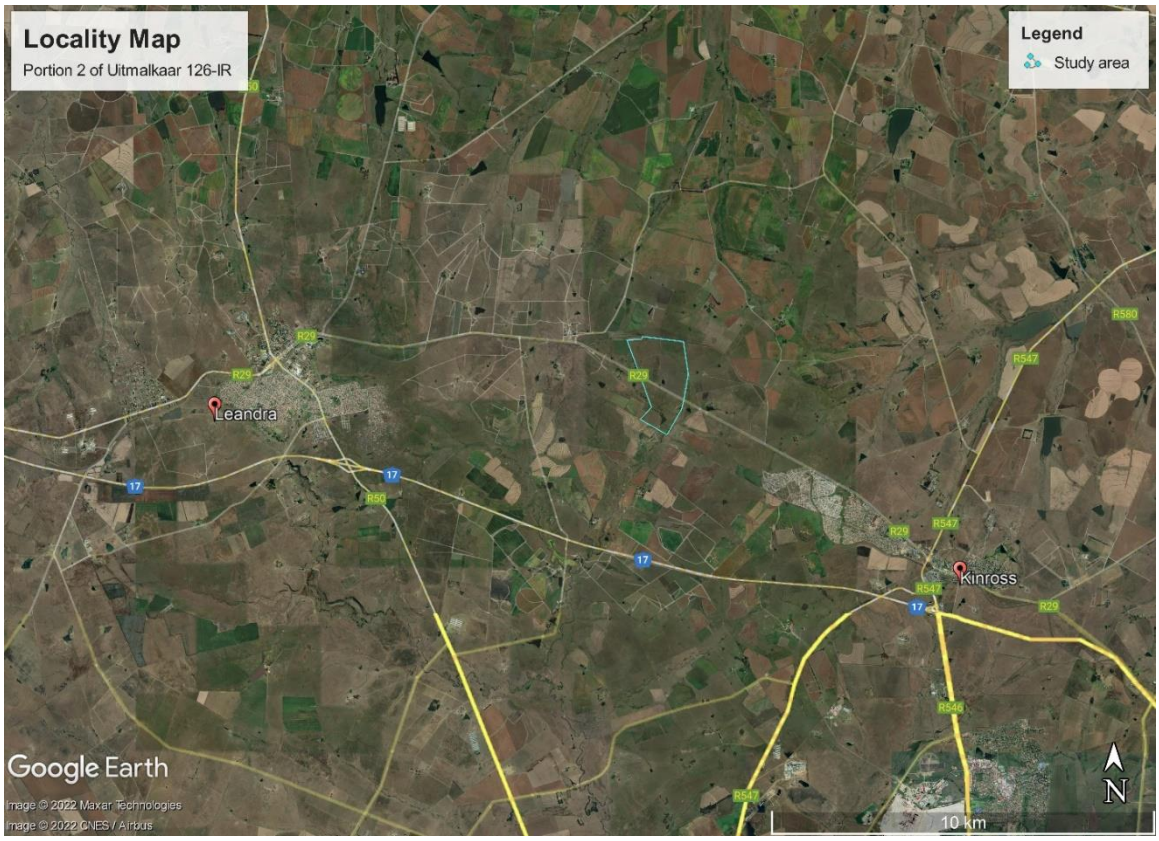

Figure 1: Location of study area

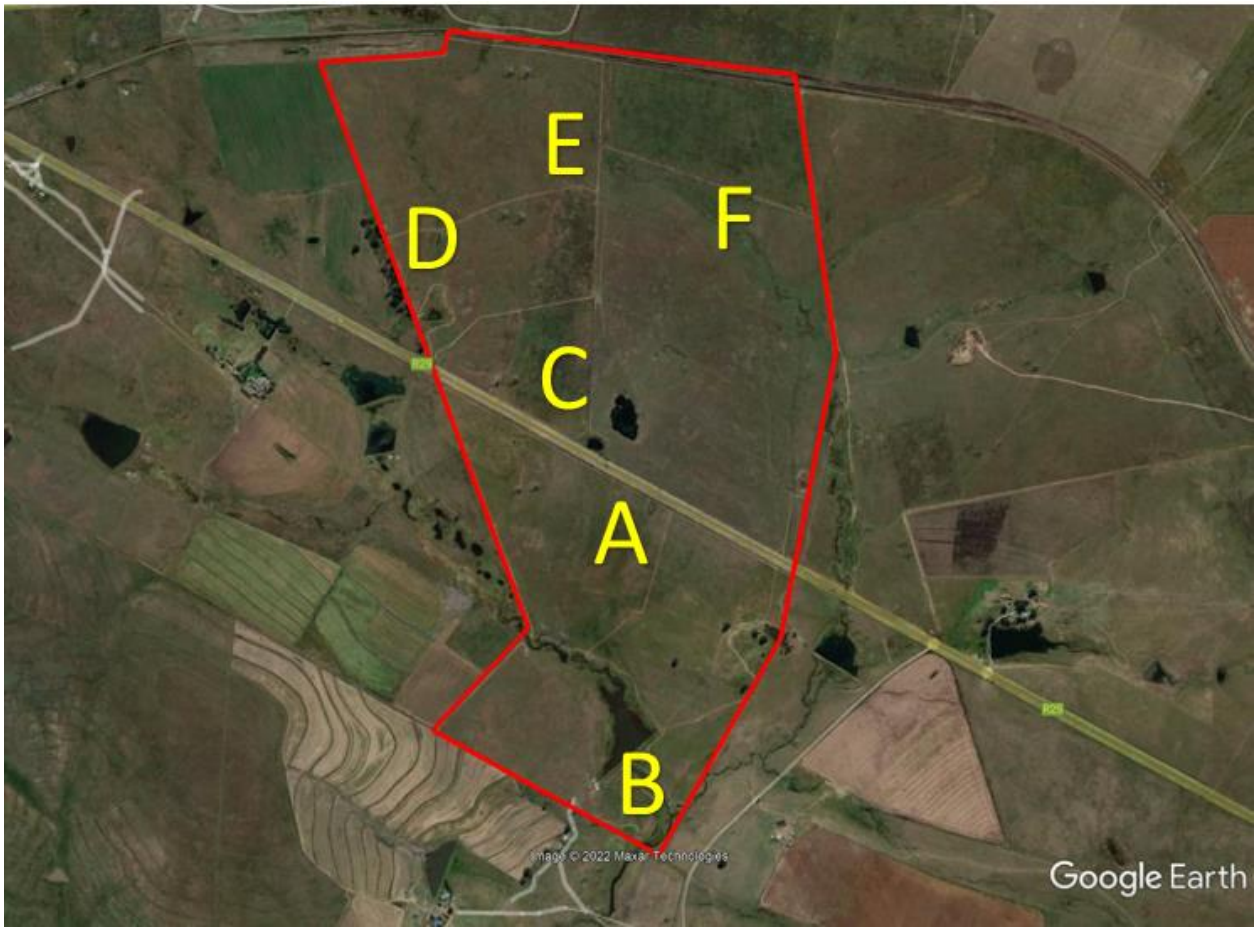

Figure 2: Photograph positions

Photograph 1: Site characteristics A

Photograph 2: Site characteristics B

Photograph 3: Site characteristics C

Photograph 4: Site characteristics D

Photograph 5: Site characteristics E

Photograph 6: Site characteristics F

2. FINDINGS

2.1 PRE-COLONIAL HERITAGE SITES

Possibilities: Greater study area taken into account.

Stone Age

The Stone Age is the period in human history when stone material was mainly used to produce tools[1]. In South Africa the Stone Age can be divided in three periods[2];

- Early Stone Age 2 000 000 – 150 000 years ago
- Middle Stone Age 150 000 – 30 000 years ago
- Late Stone Age 40 000 years ago - +/- 1850 AD

Iron Age

The Iron Age is the period in human history when metal was mainly used to produce artefacts[3]. In South Africa the Iron Age can be divided in three periods;

- Early Iron Age 250-900 AD
- Middle Iron Age 900-1300 AD
- Late Iron Age 1300-1840 AD[4]

There are no pre-colonial heritage sites evident in the study area.

2.2 HISTORICAL PERIOD HERITAGE SITES

Possibilities: Greater study area taken into account.

- Pioneer sites;
- Sites associated with early mining;
- Structures older than 60 years;
- Graves (Graves younger than 60 years, graves older than 60 years, but younger than 100 years, graves older than 100 years, graves of victims of conflict or of individuals of royal descent).

There are no historical period sites evident on the site earmarked for development.

[1] P. J. Coertze & R.D. Coertze, *Verklarende vakwoordeboek vir Antropologie en Argeologie*.
[2] S.A. Korsman & A. Meyer, *Die Steentydperk en rotskuns* in J.S. Bergh (red) *Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies*.
[3] P.J. Coertze & R.D. Coertze, Verklarende vakwoordeboek vir Antropologie en Argeologie.
[4] M.M. van der Ryst & A Meyer. *Die Ystertydperk* in J.S. Bergh (red) Geskidenisatlas van Suid-Afrika. Die vier noordelike provinsies and T.N Huffman, *A Handbook to the Iron Age: The Archaeology of Pre-Colonial Farming Societies in Southern Africa*.

2.3 ORIGINAL LANDSCAPE

Most of the original landscape features are still intact.

2.4 INTANGIBLE HERITAGE

The intangible heritage of the greater study area can be found in the stories of past and present inhabitants.

3 CATEGORIES OF HERITAGE VALUE (NATIONAL HERITAGE RESOURCES ACT, 1999 (ACT NO. 25 OF 1999)

The National Heritage Resources Act, 1999 (Act no. 25 of 1999) identifies the following categories of value under section 3(1) and (2) of the Act under the heading "National Estate":

"3 (1) For the purpose of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.

(2) Without limiting the generality of subsection (1), the national estate may include-

(a) places, buildings, structures and equipment of cultural significance;

(b) places which oral traditions are attached or which are associated with living heritage;

(c) historical settlements and townscapes;

(d) landscapes and natural features of cultural significance;

(e) geological sites of scientific or cultural importance;

(f) archaeological and palaeontological sites;

(g) graves and burial grounds, including-

(i) ancestral graves;

(ii) royal graves and graves of traditional leaders;

(iii) graves of victims of conflict;

(iv) graves of individuals designated by the Minister by notice in the Gazette

(v) historical graves and cemeteries; and

(vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);

(h) sites of significance relating to the history in South Africa;

(i) movable objects, including-

(i) objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects and material, meteorites and rare geological specimens;

(ii) objects to which oral traditions are attached or which are associated with living heritage;
(iii) ethnographic art and objects;
(iv) military objects;
(v) objects of decorative or fine art;
(vi) objects of scientific or technological interests; and
(vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section I (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

(3) Without limiting the generality of the subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of-

(a) It's importance in the community, or pattern of South Africa's history;
(b) Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
(c) Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
(d) Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural objects;
(e) Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
(f) Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
(g) Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
(h) Its strong or special association with the life and work of a person, group or organisation of importance in the history of South Africa; and
(i) Sites of significance relating to the history of slavery in South Africa".

3.1 HERITAGE VALUE WEIGHED AGAINST CULTURAL SIGNIFICANCE CATEGORIES

3.1.1 Spiritual value

During the site visit/field work no indication of spiritual activity was observed on the sites earmarked for development.

3.1.2 Scientific value

No sites of scientific value were observed on or near the sites earmarked for development.

3.1.3 Historical value

No historical value associated with the sites could be found in primary and secondary sources.

3.1.4 Aesthetic value

No heritage item with exceptional aesthetic (architectural) value was identified in the study area.

3.1.5 Social value

Social value is attributed to sites that are used by the community for recreation and formal and informal meetings regarding matters that are important to the community. These sites include parks, community halls, sport fields etc.

None of the above is situated on the area earmarked for development.

3.2 SPECIFIC CATEGORIES INVESTIGATED AS PER SECTION 3 (1) AND (2) OF THE NATIONAL HERITAGE RESOURCES ACT, 1999 (ACT NO. 25 OF 1999)

3.2.1 Does the site/s provide the context for a wider number of places, buildings, structures and equipment of cultural significance?

The study area does not provide context for a wider number of places, buildings, structures and equipment of cultural significance. The reason being the low density of heritage items in the study area.

3.2.2 Does the site/s contain places to which oral traditions are attached or which are associated with living heritage?

Places to which oral traditions are attached or associated with living heritage are usually found in conjunction with traditional settlements and villages which still practise age old traditions. None of these are evident near or on the proposed sites.

3.2.3 Does the site/s contain historical settlements?

No historical settlements are located on or near the proposed sites.

3.2.4 Does the site/s contain landscapes and natural features of cultural significance?

The site/s do not contain landscapes and natural features of cultural significance.

3.2.5 Does the site/s contain geological sites of cultural importance?

Geological sites of cultural importance include meteorite sites (Tswaing Crater and Vredefort Dome), fossil sites (Karoo and Krugersdorp area), important mountain ranges or ridges (Magaliesburg, Drakensberg etc.). The proposed site/s are not located in an area known for sites of this importance.

3.2.6 Does the site/s contain a wide range of archaeological sites?

The proposed site/s do not contain any surface archaeological deposits, a possible reason is previous agricultural and infrastructure development.

The possibility of sub-surface findings always exists and should be taken into consideration in the Environmental Management Programme.

If sub-surface archaeological material is discovered work must stop and a heritage practitioner preferably an archaeologist contacted to assess the find and make recommendations.

3.2.7 Does the site/s contain any marked graves and burial grounds?

The site/s do not contain marked graves or burial grounds.

The possibility of graves not visible to the human eye always exists and this should be taken into consideration in the Environmental Management Plan. It is important to note that all graves and cemeteries are of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (Act 25 of 1999) whenever graves are 60 years and older. Other legislation with regard to graves includes those when graves are exhumed and relocated, namely the Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended).

If sub-surface graves are discovered work should stop and a professional preferably an archaeologist contacted to assess the age of the grave/graves and to advice on the way forward.

3.2.8 Does the site/s contain aspects that relate to the history of slavery?

No evidence of the above evident on the site earmarked for development.

3.2.9 Can the place be considered as a place that is important to the community or in the pattern of South African history?

In primary and secondary sources the proposed site/s are not described as important to the community or in the pattern of South African history.[5]

3.2.10 Does the site/s embody the quality of a place possessing uncommon or rare endangered aspects of South Africa's natural and cultural heritage?

The proposed site/s do not possess uncommon, rare or endangered aspects of South Africa's natural and cultural heritage. These sites are usually regarded as Grade 1 or World Heritage Sites.

3.2.11 Does the site/s demonstrate the principal characteristics of South Africa's natural or cultural places?

The sites earmarked for development do not demonstrate the principal characteristics of South Africa's natural or cultural places. These characteristics are usually associated with aesthetic significance.

3.2.12 Does the site/s exhibit particular aesthetic characteristics valued by the community or cultural groups?

This part of the greater study area does not exhibit particular aesthetic characteristics valued by the community or cultural groups. The reason being the low density of heritage buildings and structures located in the greater study area.

3.2.13 Does the site/s contain elements, which are important in demonstrating a high degree of creative technical achievement?

The site/s do not contain elements which are important in demonstrating a high degree of creative technical achievement. Reason being none of the above are evident on site.

3.2.14 Does the site/s have strong and special associations with particular communities and cultural groups for social, cultural and spiritual reasons?

The proposed site/s do not have a strong or special association with particular communities and cultural groups for social, cultural and spiritual

[5] *Standard Encyclopaedia of Southern Africa and the TAB database at the National Archives of South Africa*;

reasons. No comment in this regard was received during the Public Participation Process (PPP).

3.2.15 Does the site/s have a strong and special association with the life or work of a person, group or organisation?

No indication of the above could be found in primary and secondary research sources.[6]

4. RECOMMENDATIONS

- In terms of heritage the project may continue;
- The discovery of subsurface archaeological and/or historical material as well as graves must be taken into account in the Environmental Management Programme. See 3.2.6 and 3.2.7; and
- Submit this report as a Section 38 application to the relevant heritage authority for approval/comment.

5. WAY FORWARD

- Submit this report as a Section 38 application in terms of the National Heritage Resources Act, 1999 (Act no. 25 of 1999) to the relevant heritage authority for approval/comment.

[6] *Dictionary of South African Biography (vol I-V) and the TAB database at the National Archives of South Africa*

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APPENDIX 8D

LAND CAPABILITY REPORT

REC SERVICES
ENVIRONMENTAL CONSULTANTS

Rowan van Tonder

From: e.snyman@makwenzeke.com
Sent: Tuesday, November 15, 2022 4:20 PM
To: 'Rowan van Tonder'
Subject: RE: Uitmalkaar Tunnels: Agri inset nodig
Attachments: Uitmalkaar.Project Plan Layout.November 2022.version 3.pdf; Scoping acceptance13-10-2022-110029.pdf

Good day Rowan,

In response to Pnt 6 on the Scoping Acceptance letter received form the Dept, please see attached our revised Project Layout Plan which excludes the Removal of Indigenous Vegetation completely.

I trust that you will find this in order. Please do advise should you require any additional information.

Kind Regards,

Makwenzeke Cleaning and Hygiene
A division of Makwenzeke Solutions
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Ewert Snyman
SHEQ Manager
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E e.snyman@makwenzeke.com

From: Rowan van Tonder <rowan@recservices.co.za>
Sent: Tuesday, November 8, 2022 11:55 AM
To: 'Ewert Snyman' <e.snyman@makwenzeke.com>
Subject: Uitmalkaar Tunnels: Agri inset nodig

More Ewert,

Soos bespreek sien aangeheg. Punt 6.

Kind Regards/Groete,

REC SERVICES
ENVIRONMENTAL CONSULTANTS

ROWAN VAN TONDER
Environmental Assessment Practitioner
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Zonke A Nhleko
(Owner and CEO)
Cell: 072 977 7633
Email: zonke@makwenzeke.com

Ewert Snyman
(Farm Manager)
Cell: 084 511 5811
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November 2022

DEVELOPMENT LAYOUT AND GENERAL LAND USE PLANNING:

For the Remainder of Portion 2 of the Farm Uitmalkaar 126 IR, Kinross, Mpumalanga, 2270

SCOPE

The main scope of the project is to use the areas for crop production and other agricultural uses. The project will also include the construction of operational facilities for crop and vegetable production activities.

REFERENCE

The overall development Layout and Operational Planning for the Farm were determined with due respect to the outcome(s) of the specialist studies conducted as required and which forms part of the WULA Application.

Reference to Specialist Studies:

- *Terrestrial Biodiversity and Plant Species Assessment*
- *Wetland Assessment & Wetland Riparian Delineation*
- *Heritage and Archaeological Impact Assessment*
- *Geophysical Borehole Survey*
- *Borehole Test Results*
- *Geohydrological Assessment – Pending (Dec 2022)*

PURPOSE

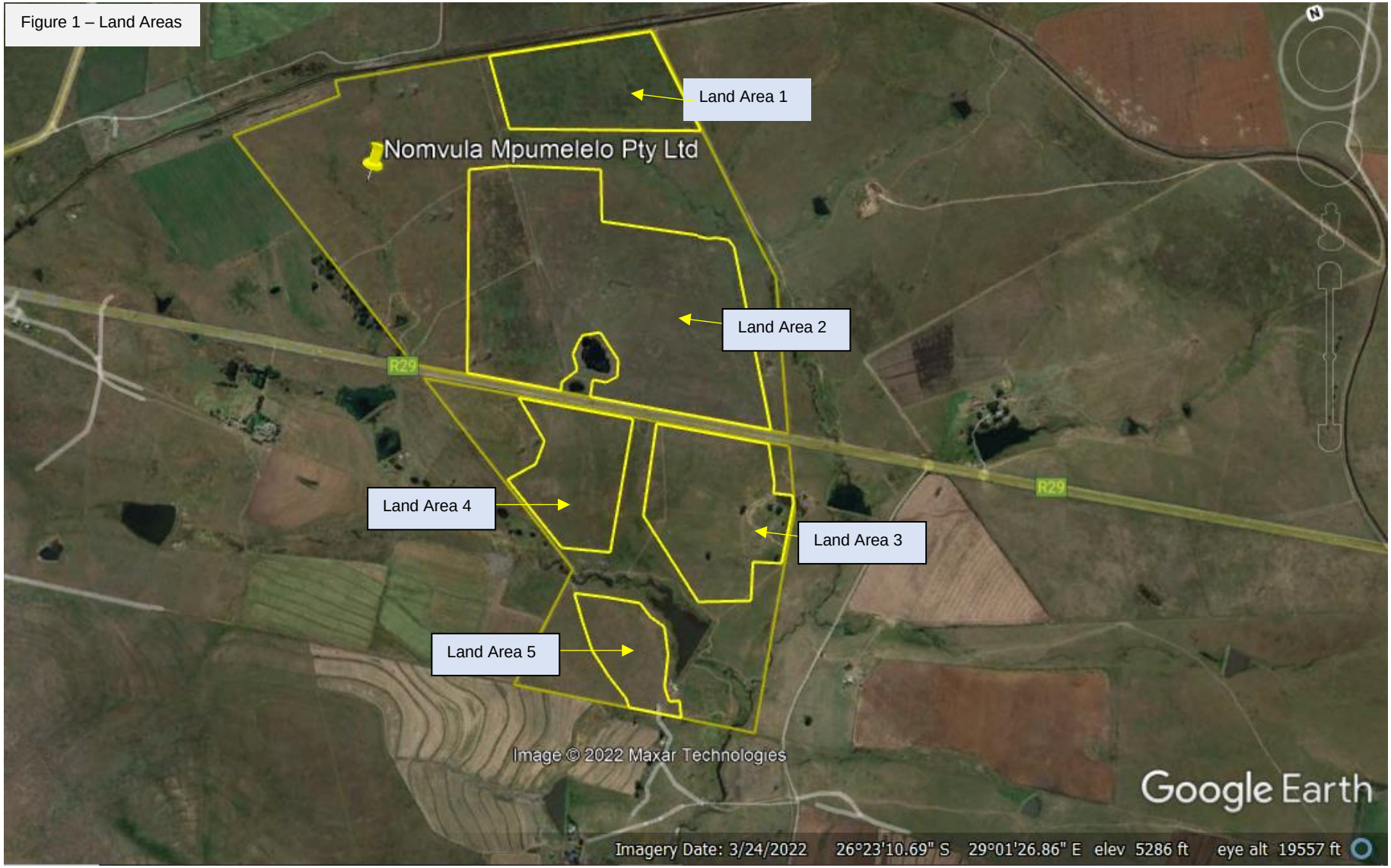
The purpose of this document is to define the areas for development and operations on the Farm.

With reference to the below 'Figures':

Figure 1 – Land Areas
Figure 2 – Land Areas vs Habitat Map
Figure 3 – Land Areas vs Sensitivity Map
Figure 4 – Development Layout (Total Farm)
Figure 5 – Development Layout (Northern Farm Portion)
Figure 6 – Development Layout (Southern Farm Portion)
Figure 7 – Development Layout (Southern F P Detailed)
Figure 8 – Development Layout (Water Use)

The following Land Areas have been determined for Primary Agriculture and related Operations:

Figure 1 – Land Areas



Reference to ''Terrestrial biodiversity and Plant species Assessment for Uitmalkaar''

The proposed Land Areas incorporated with the Habitat Map below, indicates that all agricultural and operational developments will be kept within the boundaries not to disturb Primary Vegetation, Wetlands and or Rivers. The Land Areas shall be developed in relation to its purpose and not exceeding its resource capacity i.e Agricultural Land shall be used for Agriculture respectively and Developed Areas shall be used for Operations mainly.

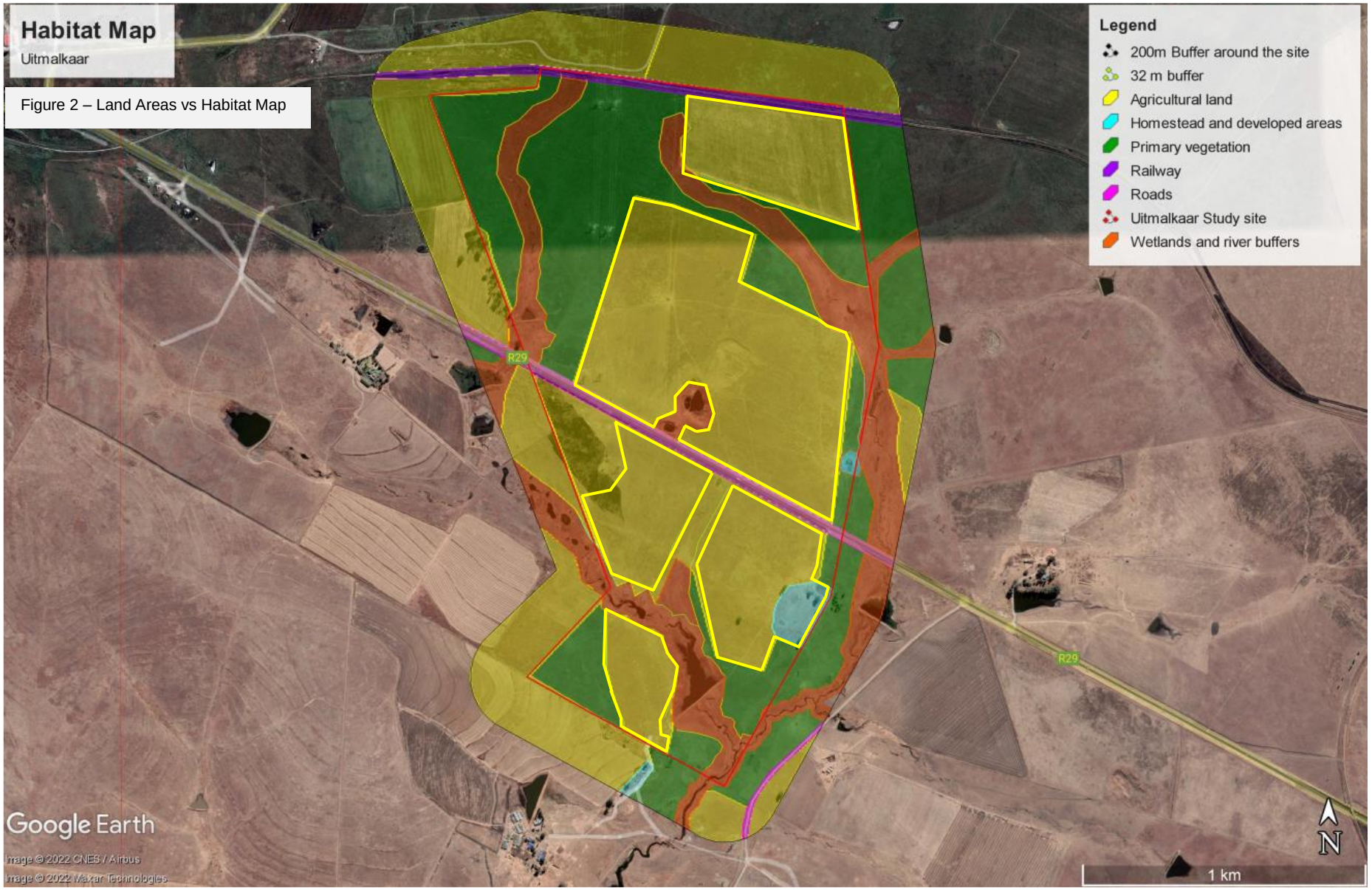


Figure 2 – Land Areas vs Habitat Map

Reference to ''Terrestrial biodiversity and Plant species Assessment for Uitmalkaar''

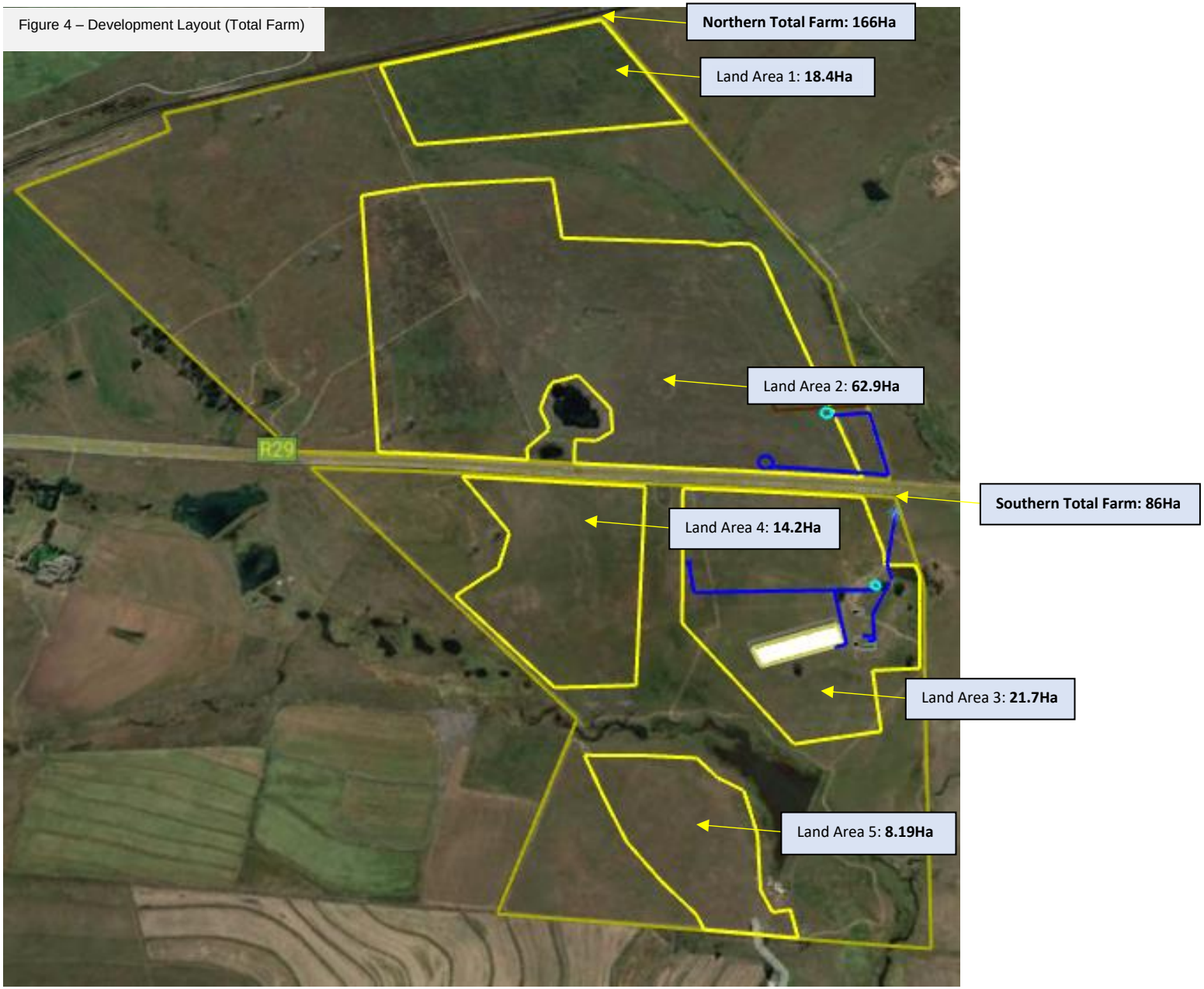
The proposed Land Areas incorporated with the Sensitivity Map below, indicates that all agricultural and operational developments will be kept within the boundaries not to affect indigenous vegetation.

Figure 3 – Land Areas vs Sensitivity Map

Development Layout (Total Farm)

The Land Areas for the proposed development on the Northern Portion of the Farm is dedicated to 81.3Ha, of which a total of 84.7Ha have been restricted from development. The Southern Farm Portion has 44.09Ha dedicated to development and a total of 41.91 has been restricted.

Figure 4 – Development Layout (Total Farm)



Development Layout ''Northern Farm Portion''

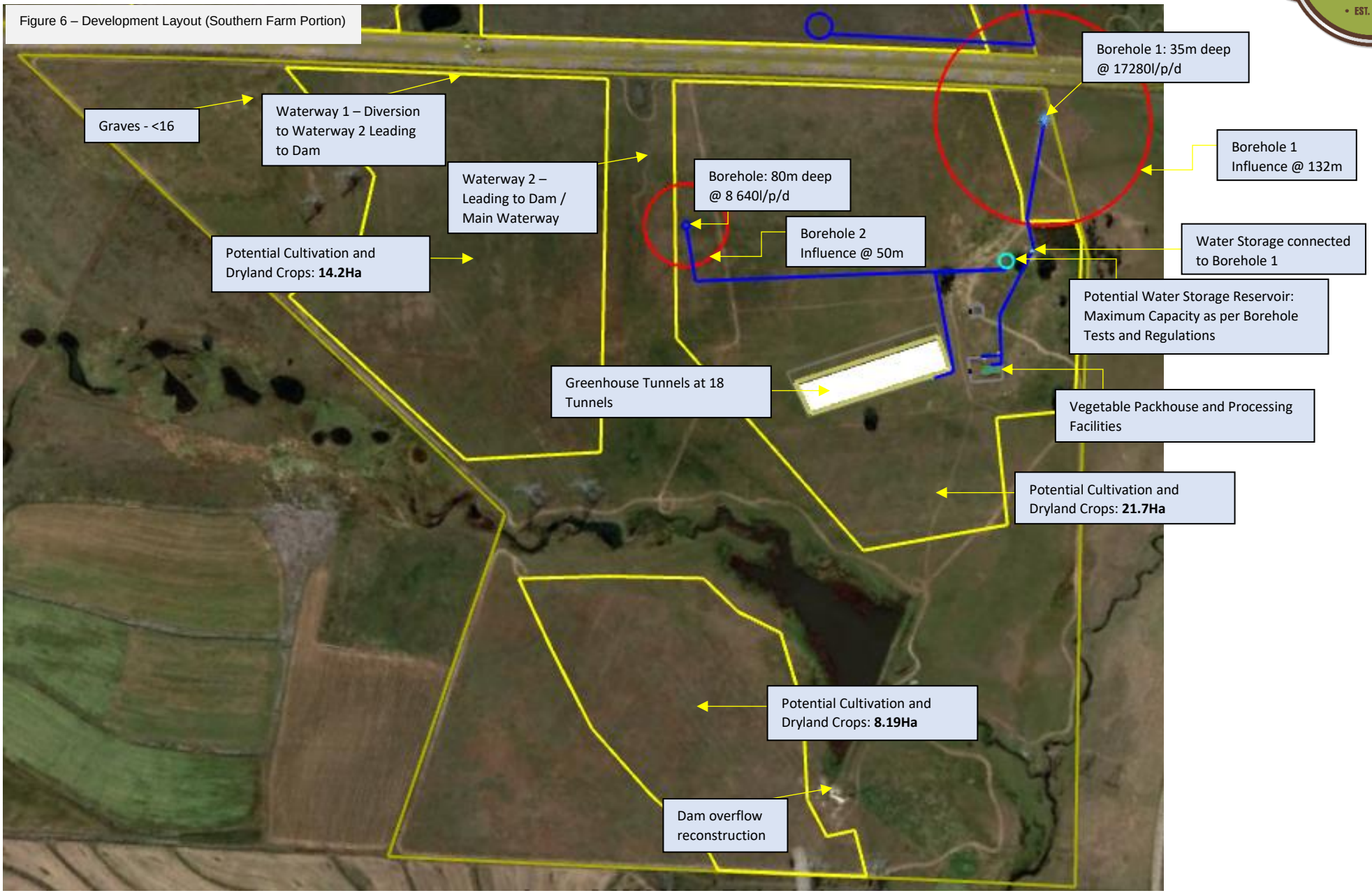
The Northern Portion shall be developed primarily for Agriculture, Livestock and Grazing. Potential Cultivation and other Agricultural Activities shall also be pursued at that stage.

Figure 5 – Development Layout (Northern Farm Portion)

Development Layout ''Southern Farm Portion''

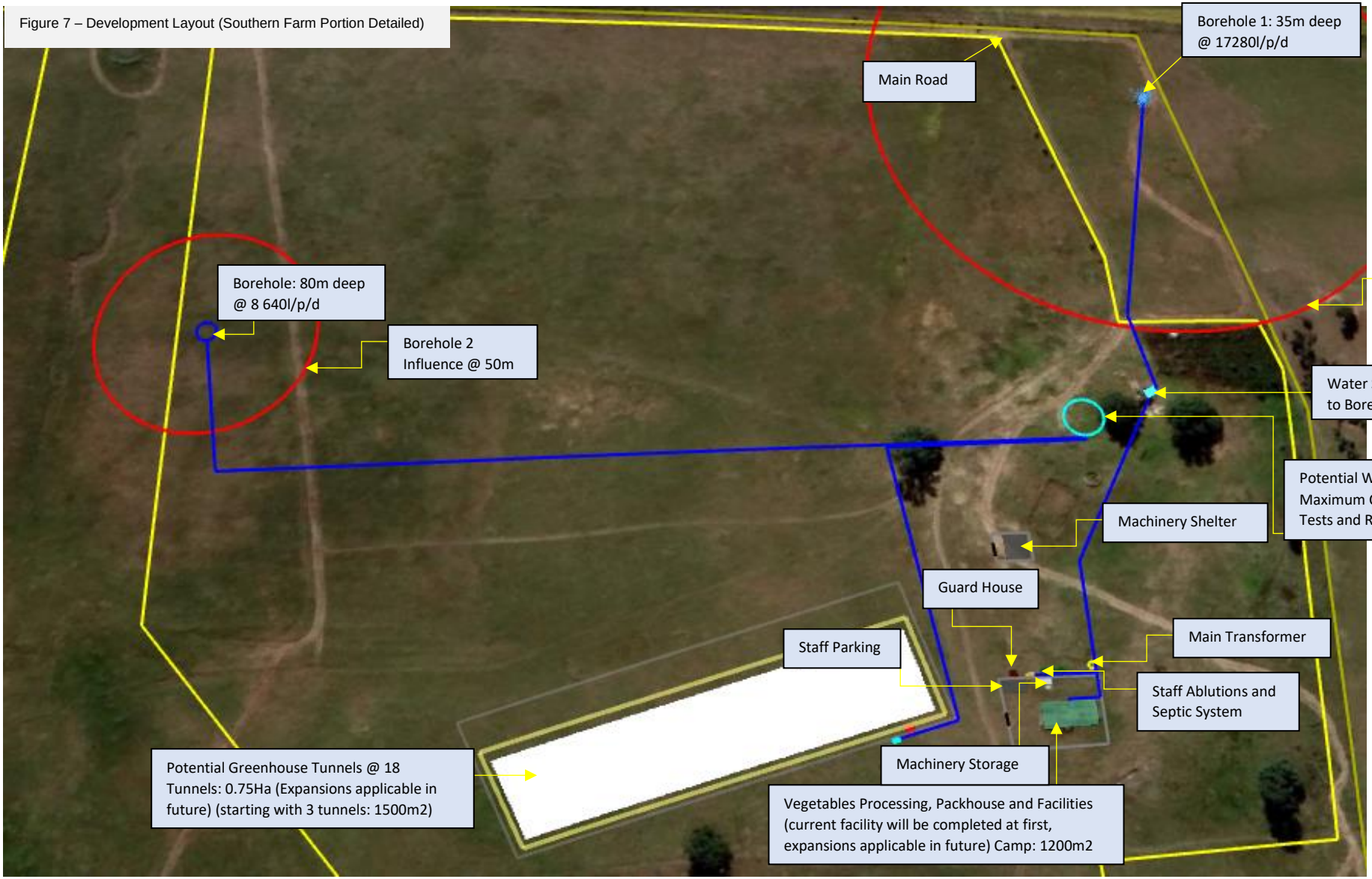
The Southern Portion shall be developed and used for Agriculture, Crops and Vegetable Cultivation. The Primary Operational Facilities shall also be constructed on the defined locations.

Figure 6 – Development Layout (Southern Farm Portion)



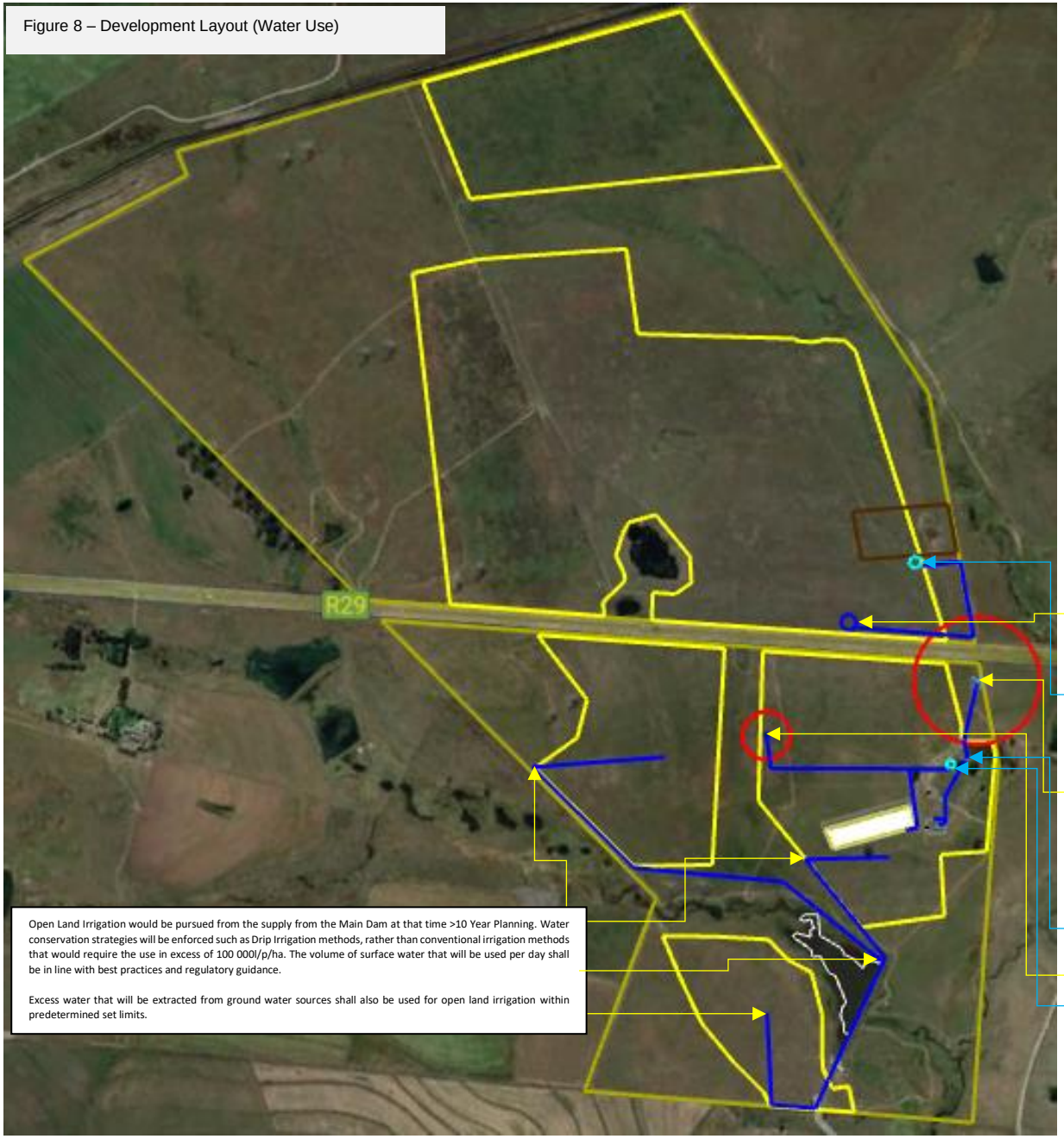
Development Layout ''Southern Farm Portion Operations - Detailed''

Figure 7 – Development Layout (Southern Farm Portion Detailed)



Development Layout ''Water Use''

Figure 8 – Development Layout (Water Use)



Open Land Irrigation would be pursued from the supply from the Main Dam at that time >10 Year Planning. Water conservation strategies will be enforced such as Drip Irrigation methods, rather than conventional irrigation methods that would require the use in excess of 100 000l/p/ha. The volume of surface water that will be used per day shall be in line with best practices and regulatory guidance.

Excess water that will be extracted from ground water sources shall also be used for open land irrigation within predetermined set limits.

NORTHERN PORTION (5-10 YEAR):

Usage:

- 7000 l/p/d - 217 000 l/p/m - 2 600 000 l/p/a

Storage:

- 50 000L (weekly use)

SOUTHERN PORTION (1-5 YEAR):

Usage:

- 15 000 l/p/d - 465 000 l/p/m - 5 500 000 l/p/a

Storage:

- 100 000L (weekly use)

SOUTHERN PORTION (<10 YEAR):

Usage:

- 66 000 l/p/d - 2 050 000 l/p/m - 24 100 000 l/p/a

Storage:

- 465 000L (total weekly use + reserve)

SOUTHERN PORTION (>10 YEAR):

Usage:

- 100 000 l/p/d - 3 100 000 l/p/m - 36 500 000 l/p/a

Storage:

- 700 000L (total weekly use)

The Borehole Target (78) will be pursued at that stage of establishment of the Northern Portion. The average carrying capacity of the natural veldt in this vicinity is ±4 ha/LSU and ±2 ha/LSU on the permanent established pastures. With 25 ha established pastures available a total of <46 LSU's will graze this land as per sustainable principles of cattle farming. Water consumption amounts to 7000 l/p/d which will be extracted from the borehole and stored within Water Storage Tanks with the capacity of 50 000L and water troughs will be filled by these tanks.

As per the Geophysical Survey (below), other borehole Targets (92,99,120) will also be pursued should additional water be required for 'possible' expansion of the Crops Cultivation operations conducted on the Southern Portion, which will result in the need for additional Water Storage. With this said, the water use limits will be honored to ensure sustainability and compliance with the Water Use requirements, the overall possibilities for operations and also the scale of such operations will be limited to the water availability within the said area.

The Borehole (Windmill) was recently tested with a supply of 1440l/h. An additional submersible pump will be installed to enable constant water supply to the Water Storage Tanks. These Water Storage Tanks will supply water to the Facilities, Packhouse and Facilities and Initial Cultivation Tunnels. The Water Storage Tanks and Water Supply / Use per area shall be as follows:

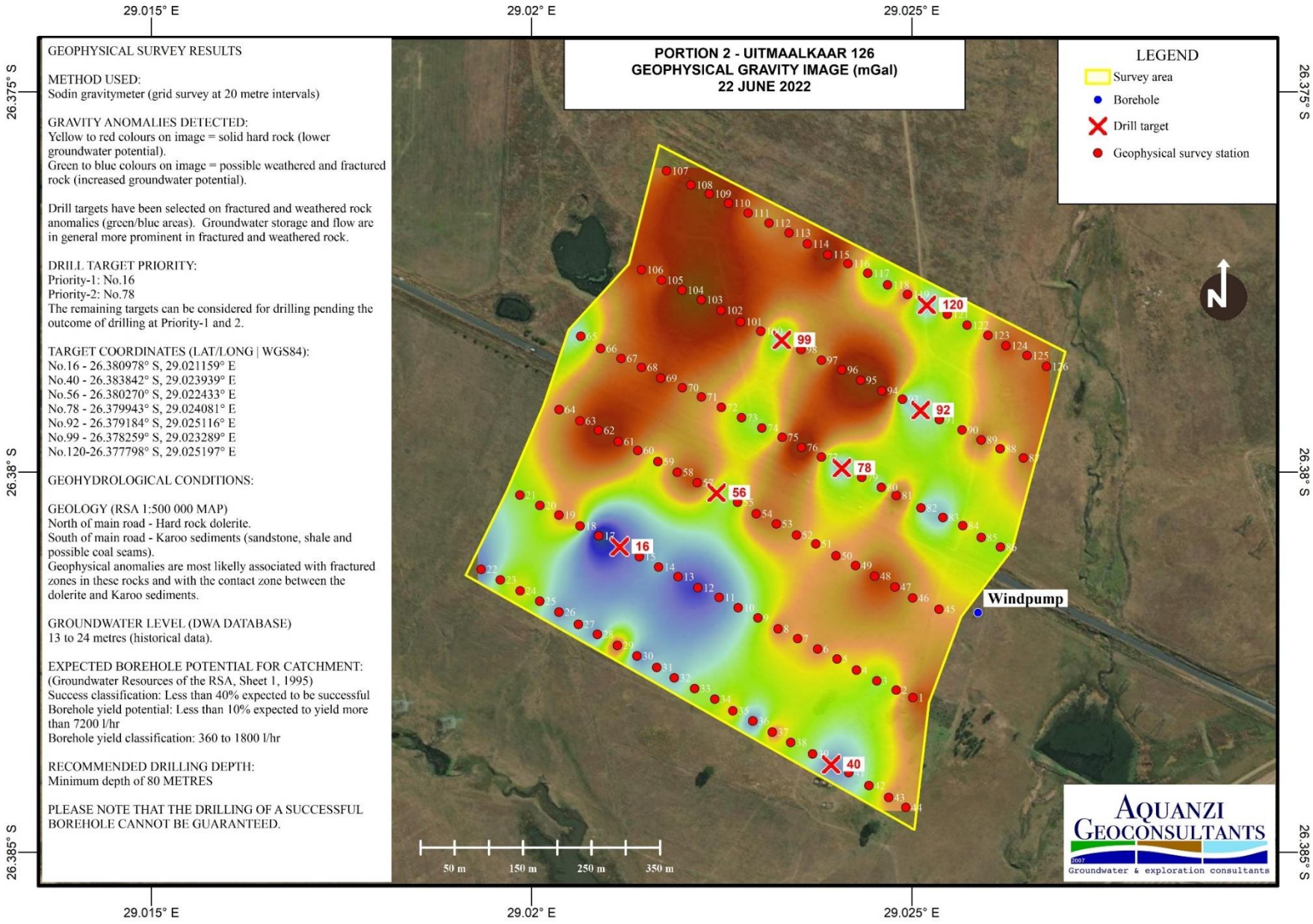
- 10 x 10 000L Storage Tanks supplying the Tunnels, of which 9000L will be actively used each day.
- An additional 5000L Tank will be installed at the tunnels that will be filled by the 10 x 10 000L tanks;
- 1 x 10 000L Tank supplying the Packhouse facility, of which a maximum of 2000L will be actively used each day.
- 1 x 5000L Tank which will be used as spare / fire emergency.

This amounts to 100 000L Water Storage and 11 000 – 15 000 max Liters of Water use per day 1-<5 Year Planning. At maximum, 15 000L of water will be extracted from this borehole p/d.

Borehole 16 shall support the initial supply demand 1-<5 Year Planning. The borehole was recently tested and supplies 720l/h / 8 640l/p/d.

At 3000L of water needed per tunnel, future expansions @ 18 Tunnels >10 Year Planning, will require a water use of 54 000 l/p/d. This will require a water Storage (reservoir) at the capacity of minimum 465 000L. Borehole Targets (40,56) will be pursued for additional water abstraction supply to this reservoir. Should the additional borehole(s) supply capacities not support the needed water supply to the reservoir, additional areas will be surveyed for other potential borehole targets. Assumption is that these boreholes should also supply +- 1000 l/p/h.

Reference to ''Geophysical Survey''



APPENDIX 8E

GEOHYDROLOGICAL REPORT

To be included in the final EIR

REC SERVICES
ENVIRONMENTAL CONSULTANTS