WETLAND ASSESSMENT

ERF 5 AND 6, SUNRELLA AGRICULTURAL HOLDINGS

LANSERIA, GAUTENG

PRELIMINARY REPORT REV 1

March 2024

COMPILED FOR:
Seedcracker Environmental Consultants

PREPARED BY:
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DECLARATION

The observations, conclusions and recommendations made in this report are based on the best available data and on best scientific and professional knowledge of the directors of INDEX (Pty) Ltd. The report is based on GIS programming and utilises satellite tracking to map survey points. Survey points are normally accurate to within 3 metres; which must be considered in the use of the information.

The directors of INDEX (Pty) Ltd exercises due care and diligence in rendering services and preparing documents. However, the company accepts no liability, and the client, by receiving this document, indemnifies INDEX (Pty) Ltd and its directors and employees, by the use of the information contained in this document, against any action, claim, demand, loss, liability, cost, damage and expense arising from or in connection with services rendered.

General declaration:

- INDEX acted as the independent specialist in this application;
- Performed the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- There were no circumstances that may compromise INDEX's objectivity in performing such work;
- INDEX have expertise in conducting the specialist report relevant to this application, including knowledge of NEMA and its regulations and any guidelines that have relevance to the proposed activity;
- Have no and will not engage in conflicting interests in the undertaking of the activity.

The study was undertaken by Dr Andries Gouws. He is a registered member of SACNASP in the category of Soils and Agriculture.

Signature of specialist

for INDEX(PTY) LTD

March 2024

CONTENTS OF THE SPECIALIST REPORT

The contents of this specialist report comply with the legislated requirements as described in the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity (GN R. 320 of 2020).

The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:

2.7.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Refer to DECLARATION
2.7.2	A signed statement of independence by the specialist;	Refer to DECLARATION
2.7.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	The survey took place in March 2024
2.7.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;	Section 6
2.7.5	A description of the assumptions made, any uncertainties or gaps in knowledge or data;	There are no uncertainties
2.7.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;	Section 6 - 7
2.7.7	Additional environmental impacts expected from the proposed development;	Section 7
2.7.8	Any direct, indirect and cumulative impacts of the proposed development on site;	N/A
2.7.9	The degree to which impacts and risks can be mitigated;	N/A
2.7.10	The degree to which the impacts and risks can be reversed;	N/A
2.7.11	The degree to which the impacts and risks can cause loss of irreplaceable resources;	N/A
2.7.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	N/A
2.7.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	N/A
2.7.14	A motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate;	N/A
2.7.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	Section 6
2.7.16	Any conditions to which this statement is subjected.	Section 6
2.8	The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, that are to be included in the EMPr.	N/A
2.9	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report	

CONTENTS

1 BACKGROUND

Index was appointed by Seedcracker Environmental Consultants to do a wetland assessment of Erf 5 and 6 of Sunrella Agricultural Holdings. The erven are located on Middel Road which is just south of Lanseria International Airport.

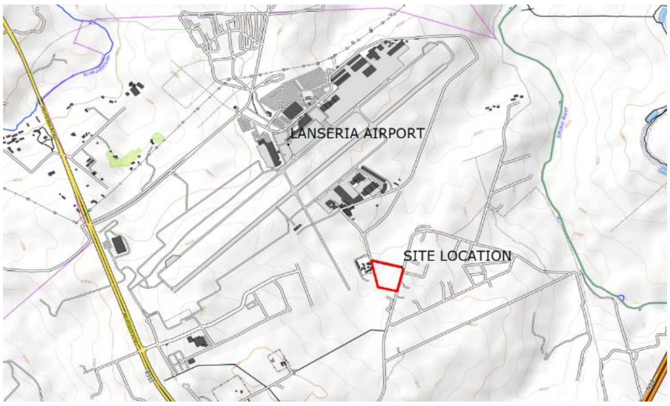


Figure 1. Locality of the site

The brief was twofold, firstly to identify wetlands and environmentally sensitive areas, and then to provide input for a Water use License Application (WULA) for the proposed development. The WULA can only be done once the Site Development Plan has been finalised and the water uses determined in terms of Section 21 c and I of the Water Act.

Recommendations from this study is intended to provide input to the design engineers for the construction of the proposed new road and entrance to the Lanseria airport.

2 HISTORICAL CONDITIONS

Before commencing with a specialist assessment, the historical conditions that prevailed and that influences of the current land uses had on the site must be investigated.

Figure 2. Historical drainage

Prior to the development of the Leachcon Group's earthworks, the drainage of the site was towards the north. **Due to the shallow slope, drainage was in the form of sheet flow with no pronounced drainage line. The soil conditions did not allow for the development of wetlands on the property.**

A dam was constructed on the subject property, within the drainage line, and a trench made to channel the overflow, firstly towards the northwestern corner of the property, and discharge this into the existing water diversion along the road to the Lanseria Permit Office and the houses of the property to the north of the subject site.

Subsequently the dam wall was breached, and a new trench made that diverted the water to the northeastern corner of the subject property where it is flows through a series of holes in the boundary wall and discharged into a concrete channel that runs along the western side of the existing road. The absence of a wetland is confirmed by the investigation of the soil conditions exposed by the excavation.

3 DESCRIPTION OF THE ENVIRONMENT

3.1 TOPOGRAPHY

The site slopes north towards the Jukskei River. The site is a narrow, slightly concave drainage system with sheet flow during high rainfall events.

The kraals left small portions with micro indentations that become water saturated following rain events. Lateral water drainage takes place above the solid granite or ferricrete and then emerges again lower in the landscape.

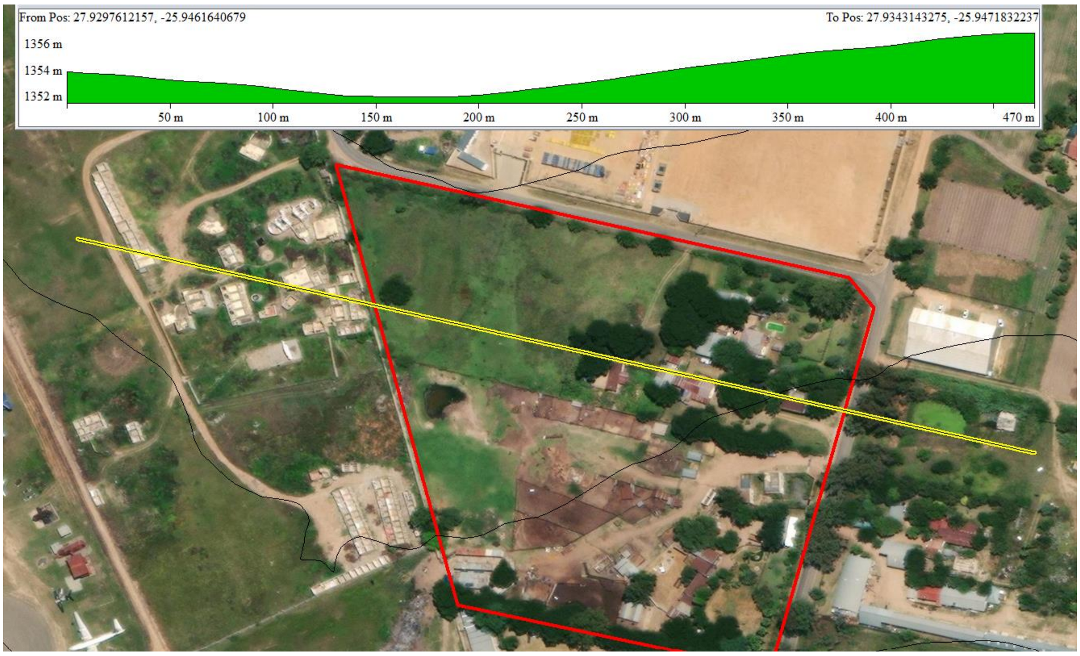


Figure 3. Section of the site to indicate the general topography.

3.2 HYDROLOGY

A surface drainage model was run in Global Mapper to determine the flow path of stormwater. It was found that the lowest point of the landscape is in the western corner of the site (see Figure 4).

A wall was constructed along the southern and western boundary that effectively displaced the normal stormwater to the outside of the site boundary (refer to Figure 5).

A dam was constructed in the lowest part of the previous drainage channel. It captured runoff from within the site boundary. The dam is empty and contains no wetland vegetation.

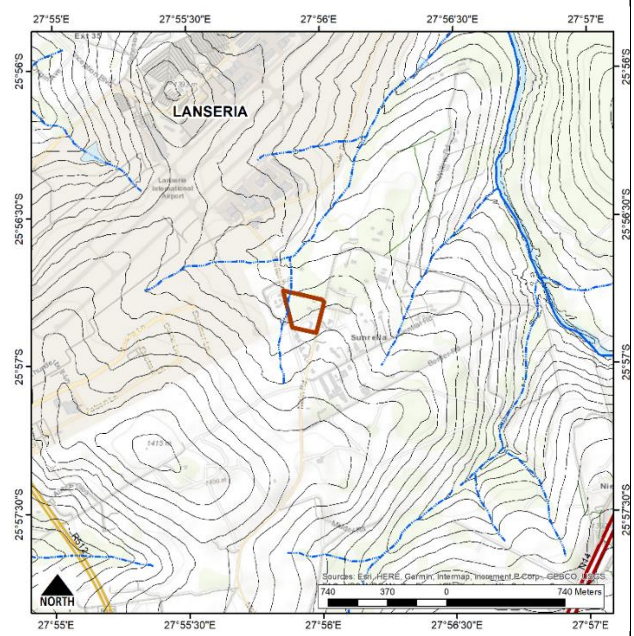


Figure 4. Surface runoff

Figure 5. Surface modifications to the landscape

3.3 SOIL TYPE

The northeastern portion consists of Glenrosa and Dresden soils with lenses of hard plinthite. The average thickness of the colluvial material is around 500 mm. These are generally recharge or deep interflow soils. The soil consists of bleached sand above the lithocutanic subsoil. These are classified as shallow interflow soil.

The soil further downslope, and the western part, is hill wash. These are classified as Oakleaf and Longlands. The general soil depth is more than 500 mm.

Concretions and mottles occur at 500 – 600mm deep but do not have any clear signs of prolonged water saturation. Notwithstanding the greyish brown colour of the mottles, no water table was encountered.

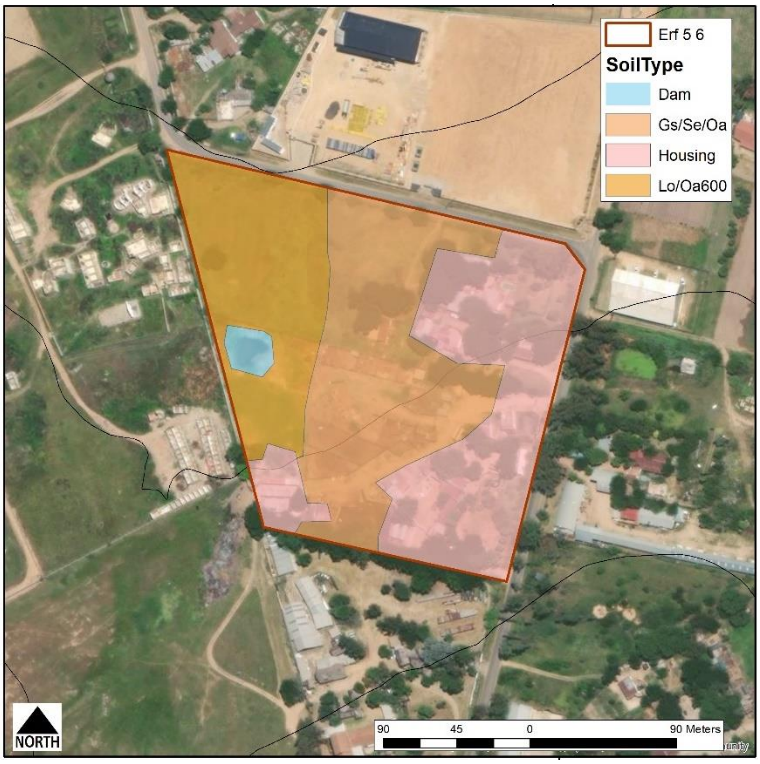


Figure 6. Soil types

Rubble was dumped along the western boundary that effectively stops any surface runoff directly downslope.

Table 1. Soil descriptions of deep profile pits

Form	Description	Depth to water	HP group
Gs/Se/Oa	Dry dark brown silty sand. No mottles or course fragments. The soils are shallow that drains as surface flow when the soil is saturated. There are not wetland soils.	No water	Shallow interflow.
Lo/Oa600	Slightly moist dark brown silty sand. Wet greyish loose mottled sand in the subsoil. Because of the position on the landscape and the soil properties, lateral water movement above the hard plinthite and semi-weathered granite subsoil, these are hydro pedologically sensitive and should only be developed following guidelines of an engineering geology study. While these soils are potentially wetlands, no gleyed conditions or wetland plants were encountered.	No water	Deep interflow/ responsive soil.
Housing	Fill material was deposited on the southern boundary where stormwater would normally enter the site.	No water	

Photo 1. Sepane and Glenrosa soils. Very compacted and with structured subsoil

Photo 2. Deep neocutanic soils classified as Oakleaf

Photo 3. Yellowish brown soils with light grey and yellow mottles

Photo 4. Yellowish brown soils

3.4 HYDROPEDOLOGY

The pediment or footslope on the property has a slope of 5 to 8% towards the north. There are no clear drainage lines from the northern part of the site – all rainwater drains as surface flow towards the drainage line and then along the western boundary.

The soils found on the northwestern part of the site are predominantly of the Glenrosa (orthic A / lithocutanic B) form. The entire site is underlain by variable depth and shallow weathered granite with lenses of ferricrete or ferruginised zones within the saprolite. As such the site acts as a recharge zone for water that seeps laterally downwards through the landscape. The lateral seepage is not sufficient and shallow enough to yield seepage and wetland conditions.

Except for the soils close to the watercourse and within the unchanneled watercourse, no seeps occur. This is because the landscape does not have any concave areas where water flows are expected to accumulate.

Granite, however, poses very specific conditions where patches of saturated soils may occur, especially during the rainy season when the rate of precipitation from rainfall exceeds the soil's infiltration rate. These patches may require very specific engineering solutions. Interpreting water flow in the interflow zones are more complex and may require special management interventions.

Managing lateral soil water in the soil horizons above the saprolite (or ferricrete) is not only important from an ecology perspective but presents specific engineering challenges that needs to be respected and incorporated in planning and construction of facilities and infrastructure.

To sustain the lateral movement of groundwater;

a) the inflow of water into the soil (recharge) must be maintained by limiting or mitigating sealing of the soil surface,
b) flow down-slope (interflow) must be maintained by preserving the flow paths, and

c) discharge into the wetland must be maintained.

These measures will help ensure that development structures will not be affected by excess water in the rainy season. Examples of impacts due to water percolation or obstruction of subsurface water flow are wet basements, creeping damp and cracking roads, and flooding.

CONCLUSIONS AND RECOMMENDATIONS

Specifically on the granites when high intensity rainfall occurs, perched water tables could form because the soil matrix is saturated. This may lead to waterlogged conditions that support wetland vegetation. This waterlogging is temporary and does not always create the gleyed subsoil horizons that are typical of wetland soils according to the classical definition. Notwithstanding the presence of wetland plants, at least temporary, many soil profiles are not classified as a wetland and are used for development. This can adversely impact biodiversity and water quality and may impact on buildings and infrastructure as water may later affect foundations and underground services. This may require something as basic as awareness of these systems and the implications thereof on development.

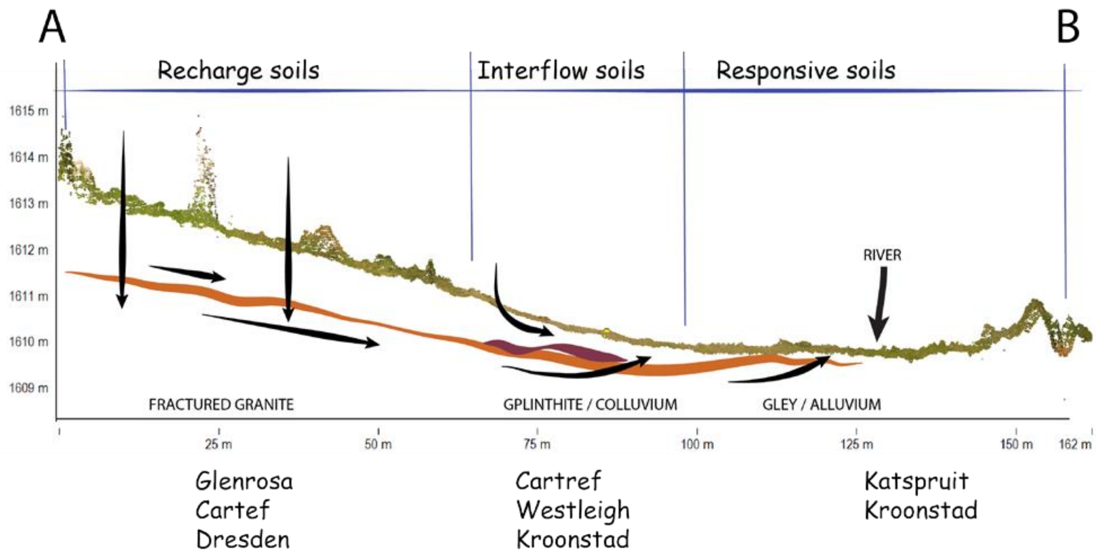


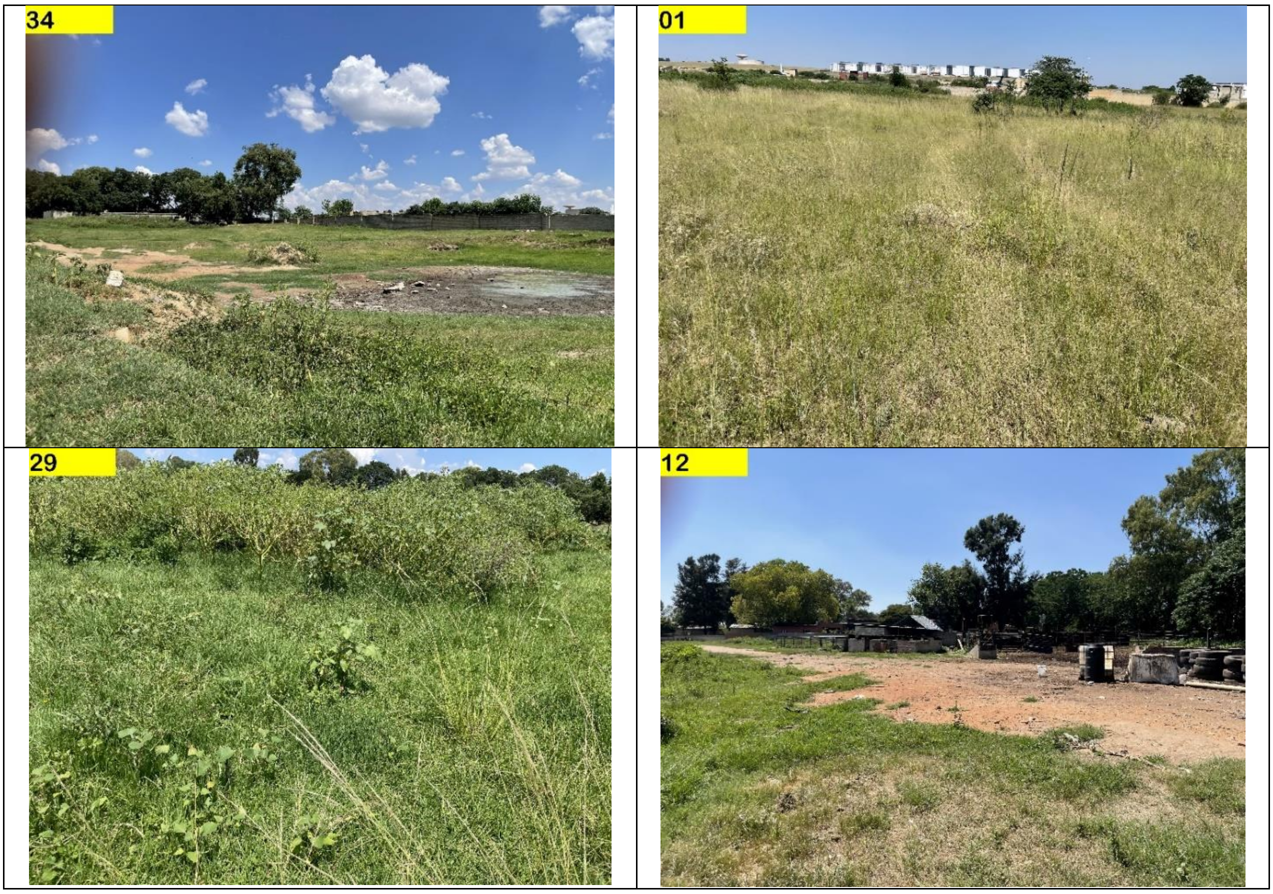
Figure 7. General soils on granites explaining subsurface water flow

4 VEGETATION

According to Musina and Rutherford, the site is within the Egoli Granite Grassland Biome. Terrestrial grasses cover the eastern and western portions of the site. The dominant grass species identified are *Themeda triandra*, *Stipagrostis uniplumis*, *Hyparrhenia hirta*, *Aristida* spp, *Panicum* spp and *Eragrostis*.

Because of the cattle manure that washed into the central valley floor created ideal conditions for *Pennisetum clandestinum*, and also for weeds to proliferated and create dense stands of *Amaranthus hybridus*, *Datura stramonium* and *Ricinus*.

No plants typical of wetland conditions were found on site.



5 NFEPA WETLANDS

National Freshwater Ecosystem Priority Areas for South Africa (or the 'NFEPA project') is a tool developed in 2011 and is now under the administration of Working for Water of DWS to indicate "*wetland ecosystem types and wetland condition on a national scale. The delineations were based largely on remotely sensed imagery and therefore did not include historic wetlands lost through drainage, ploughing and concreting*." (Extracted from SANBI GIS metadata.)

Because of the regional nature, the NFEPA dataset provides a general indication of the status of wetlands.

NFEPA does not identify any wetlands on or around the site.

6 WETLAND DELINEATION

6.1 DEFINITION OF A WETLAND

'Wetland' denotes a variety of ecosystems, ranging from rivers, springs, seeps and mires in the upper catchment, to midlands marshes, pans and floodplains, to coastal lakes, mangrove swamps and estuaries at the bottom of the catchment. In common they experience prolonged water saturated conditions that in turn manifests in specific soil characteristics and plant and animal species composition.

Wetlands is defined by the National Water Act as: 'land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.'

Accordingly, a wetland must have one or more of the following attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water-loving plants (hydrophytes);
- An elevated water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

The object of the delineation procedure is to identify the outer edge of the temporary zone. This outer edge marks the boundary between the wetland and adjacent terrestrial areas. Occurrence of standing water and hydrophilic plants and finally, soil conditions were used as the determinant for this assessment. In more detail, the following:

Soil condition is the primary criterion that signifies waterlogged conditions. These conditions manifest itself through plant communities that can tolerate hydromorphic soils. These plants are hydrophytes that are adapted to stresses imposed on plants through temporary or permanent waterlogged conditions.

The importance of retaining and maintaining functional wetlands are well established - the process of establishing the boundaries less so. The following criteria discussed in *A Practical Field Guide for the Identification and Delineation of Wetlands and Riparian Areas*, published by DWAF are used as baseline information.

According to these guidelines the main indicators are the following:

TERRAIN MORPHOLOGY

Wetlands predominantly occur on valley bottoms and on seep in other terrain forms.

SOIL FORM

Soil that are gleyed or organic soils indicate permanently saturated zones, Forms that are heavily mottled and that have a grey matrix in the subsoil indicate seasonally and temporary waterlogged conditions.

SOIL WETNESS

Soil colour is markedly influenced by the oxidation statues of manganese and iron. Yellow, red and reddish-brown soil form under well-oxidised conditions and greyish colours when aeration is poorer. Prolonged periods of water saturation producing gleysation, where grey and blue mottles are formed and are a condition in which hydrophilic plants flourish.

VEGETATION

- Vegetation is normally a reflection of the soil conditions and is, therefore, an important visual method of finding areas where a wetland can occur;

- Large proportion of hydrophytes; emergent plans: reeds, sedges, and floating or submerged aquatic plants indicate permanently saturated wetlands;
- Hydrophilic sedges and a variety of grass and hydrophilic woody plants are dominant on seasonally waterlogged soils;
- A variety of water tolerant grasses and woody species that may also occur on non-wetland areas can be indicative of temporarily waterlogged conditions.

6.2 PROCESS USED FOR THE DELINEATION OF WETLANDS

The procedure followed was as follows:

- Various temporal satellite and orthophotos were used to determine possible wetlands. These were used as backdrop for digitizing features;
- Identification of hydromorphic (wetland) soils, soil form and wetness indicators are then used to establish permanent, seasonal, and temporary wetland zones;
- Soils are classified in accordance with the Binomial Classification System for Southern Africa (Soil Classification Working Group, 1991, revised 2016). Initial delineation of the soil forms considered the following: vegetation type, terrain form, colour and texture of the soil. The boundaries are then refined through soil auger and or soil probe. All qualifying soil forms are then investigated in more detail;
- Vegetation indicators were used to delineate the wetland boundaries;
- The final boundary of the wetland (if it occurs) is then delineated.

6.3 RESEARCH FINDINGS

A broad valley floor was identified that occurs at the headlands of the drainage system. There are no clear channels that drains the site, all rainwater drains as surface or deep lateral flow.

There are no soils that are gleyed or organic soils that would indicate permanently saturated zones. The soil forms identified on the valley floor were Oakleaf, Dresden and Longlands. No heavily mottled soils or soils that have a grey matrix in the subsoil were found that would indicate seasonally and temporary waterlogged conditions;

No facultative hydrophilic sedges, grasses or woody plants are present that would indicate seasonally waterlogged soils;

The site however, is located topographically on the lowest point of the landscape where wetlands are likely. Before the diversion structures were constructed, surface flow during high intensity rain storms would likely have taken place. The surface drains are now effectively managing runoff, but has created a totally unnatural situation;

A main criterion indicating the boundary of a wetland is the 1:100-year floodline. With the absence of a clear wetland, this boundary should apply;

It is recommended that a comprehensive stormwater plan be in place to guide any future development. The site where development is proposed should be rehabilitated to make the wetland functional.

The overall goal of protecting wetlands is for them to provided ecosystem services to the environment. They include the assessment of several ecosystem services as listed below:

Table 1. Wetland benefits

Flood attenuation	The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream.

Stream flow regulation	Sustaining stream flow during low flow periods.
Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters.
Phosphate assimilation	Removal of phosphates carried by runoff waters.
Nitrate assimilation	Removal of nitrates carried by runoff waters.
Toxicant assimilation	Removal of toxicants (e.g. metals, biocides and salts) carried by runoff waters.
Erosion control	Controlling erosion, principally through the protection provided by vegetation.
Carbon storage	The trapping of carbon by the wetland, principally as soil organic matter.

Runoff from a part of the Lanseria runway is potentially contaminated with chemicals that could ameliorated by these services.

7 SITE SENSITIVITY VERIFICATION

The Department of Forestry, Fisheries & Environment (DFFE) has developed the National Web-based Environmental Screening Tool in order to flag areas of potential environmental sensitivity related to a site as well as a development footprint and produces the screening report required in terms of regulation 16 (1)(v) of the EIA Regulations (2014, as amended). The Notice of the requirement to submit a report generated by the national web-based environmental screening tool in terms of section 24(5)(h) of the NEMA, 1998 (Act No 107 of 1998) and regulation 16(1)(b)(v) of the EIA regulations, 2014, as amended (GN 960 of July 2019) states that the submission of a report generated from the national web-based environmental screening tool, as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations, 2014, as amended, is compulsory when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the EIA Regulations. The requirements are:

- The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.
- The site sensitivity verification must be undertaken through the use of:
  - a desk top analysis, using satellite imagery.
  - a preliminary on-site inspection; and
  - any other available and relevant information.
- The outcome of the site sensitivity verification must be recorded in the form of a report that:
  - confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.
  - contains a motivation and evidence (e.g., photographs) of either the verified or different use of the land and environmental sensitivity; and
  - is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

VERIFICATION

The site sensitivity verification study for Aquatic Biodiversity found that the there is a small portion of land in the north-western corner that is regarded as very highly sensitive. This unit receives sub-surface seep from the adjoining properties to the west and southwest. The eastern portion of the property is not sensitive.

Figure 8. Figure 3. Site sensitivity according to the National environmental screening Tool for aquatic biodiversity

The soil investigation identified the dominant soil family to be Oakleaf with lenses of Longlands. The mid and crest of the topography is predominantly Glenrosa. The pediment on the eastern side of the property consists of moderately deep sand. Although greyish brown in colour, they exhibit no gleyed colours or signs of permanent wetness within the top 600mm.These are not wetland soils.

Historical aerial photographs indicate that Stand 5 was used as rearing pens for livestock even prior to 2001. The impervious nature of the soils of the old cattle kraals produces nutrient enriched water that causes weeds and kikuyu to grow uncontrolled on the property.

Figure 9. Google photo taken in 2018 showing no evidence of drainage channels.

The catchment of the dam on the site consists of compacted gravels and residual granite towards the eastern side and deep sands towards the west. An embankment was constructed along the southern boundary of the property in order to divert water to the dam. A trench was constructed towards the northern boundary, and subsequently a new trench where the dam wall was breached; towards the east of the property. The stormwater now either runs along the western boundary of the property or along the new trench to the northern or eastern boundaries of the property where it is discharged, via a culvert that runs under Side Road into a concrete channel that discharges into a channelled stream.

1) There were no wetland plants identified on either Stand 5 or 6.
2) The soils are not gleyed and is free of grey- or olive-coloured mottles that would indicate prolonged saturated conditions.
3) The granite in general is hydropedologically particularly problematic because of the lateral water movement that could take place above the clay, granite or ferricrete that normally forms due to fluctuating water tables. This is likely also the case on this site.

The conclusion is that, while no wetlands occur on the property, there is a depression on the western boundary of the site, it will have surface flow during high intensity rainfall events and then dry out rapidly. However lateral downslope water movement of subsurface water will continue to take place. This will feed downstream wetlands.

A typical soil profile for the site that indicates the layers of material and the properties that allows subsurface water movement is indicated below.

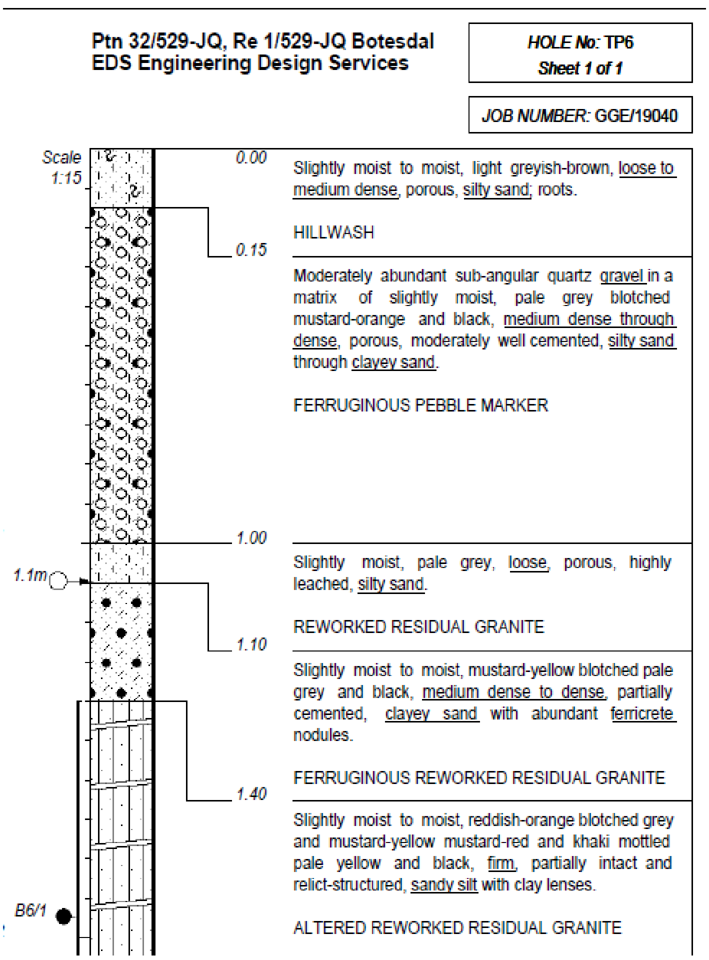


Figure 10. Typical soil profile

8 CONCLUSION & RECOMMENDATIONS

Therefore, no wetlands were identified on site, and no buffer is applicable. However, subsurface water flow takes place that feeds wetlands downslope. Wetlands in general, are ecologically sensitive ecosystems that provide a variety of ecosystem services that support terrestrial and water ecosystems. The subsurface water flow must be maintained.

Due to the shallow slope of the landscape, the natural flow of stormwater is by means of laminar surface flow. Under these conditions, channelled streams seldom form, unless there is a knickpoint or structure that concentrates water movement, such as the two channels that were constructed, or the wall that was built on the boundary. This impacts on subsurface water flow and causes erosion. Subsurface water flow must be maintained otherwise it is likely that wetlands may form on site in the future.

Placing the road on the property should be done with care as the property is subject to laminar water flow and subsurface movement of water. Culverts and rockfill must be used to allow stormwater flow and subsurface water flow.

9 ADDENDA

9.1 REFERENCES

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9.2 CONSIDERATIONS FOR CITY PLANNERS

There is a common understanding among pedologists on the behaviour of soils on the crest of the landscape (reddish and yellow brown soils) and the soil that occur on the valley floor (hydromorphic soils with a perched water table). These soils have properties that's behaviour is predictable.

Interpreting water flow in the interflow zones is more complex especially on the granites and deserves special management interventions.

Managing lateral soil water that occurs in the soil horizons above the saprolite (or ferricrete) is not only important from an ecology perspective, but presents specific engineering challenges. Both the view of ecologists (including soil scientists) and geotechnical engineers need to be respected and incorporated in any planning methodology.

The purpose of a hydropedological investigation is to present hydrological soil flow path and storage mechanism information to engineers and planners.

To sustain the wetland;

- the inflow of water into the soil (recharge) must be maintained by limiting or mitigating sealing of the soil surface,
- flow down slope (interflow) must be maintained by preserving the flow paths, and,
- discharge into the wetland must be preserved.

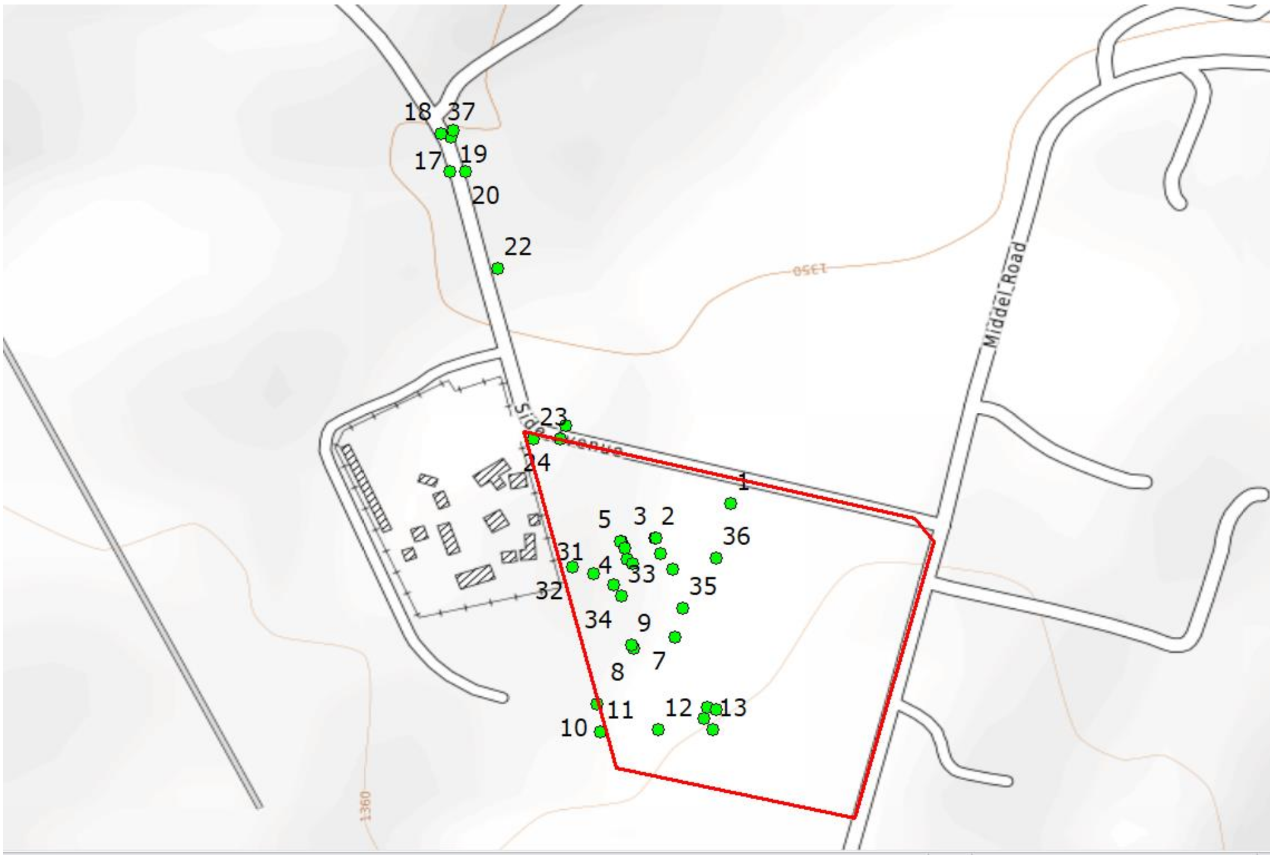
These measures will help ensure that development structures will not be affected by excess water in the rainy season. Examples of impacts due to water percolation or subsurface flow are wet basements, cracking roads and even flooding.

Managing the lateral movement of soil water is not only the specialist field of the ecologist, and lately the domain of soil sciences, but of other specialists as well. Wetland ecologists and soil specialist should ideally provide their insights of lateral water movement and in particular, of hydraulic connectivity to the geotechnical engineer or engineering geologist to address and incorporate any ecological constraints into the site development plan.

Urban development from a soil water hydrology perspective is complex and requires engineering solutions for ecological processes.

Dippenaar (2015), suggests this interdisciplinary approach because urban development notably exacerbates the uncertainty of response in the vadose zone due to, for instance, surface sealing, disruption

9.3 PHOTOS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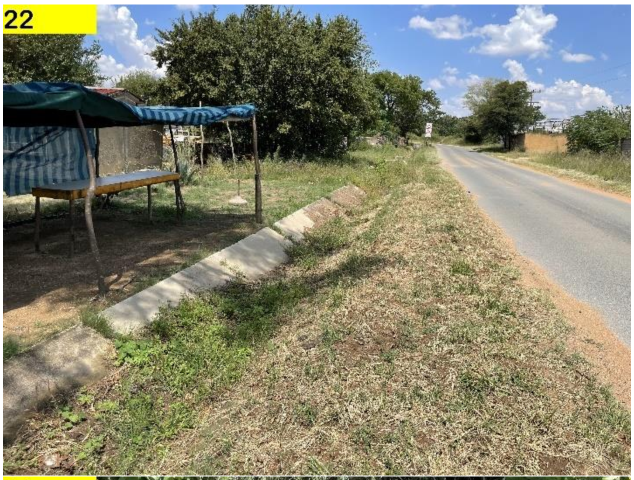
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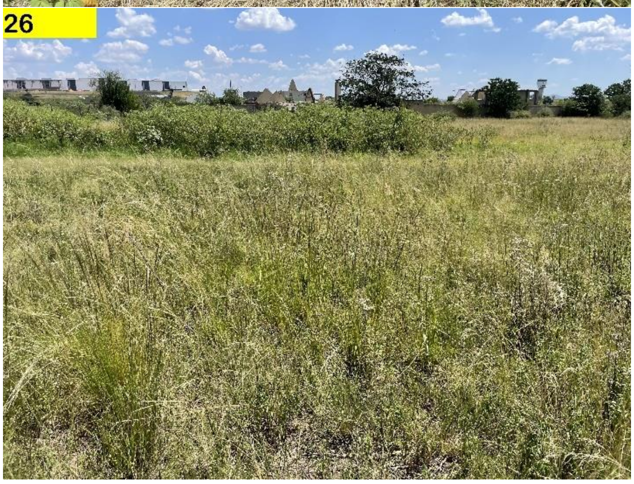
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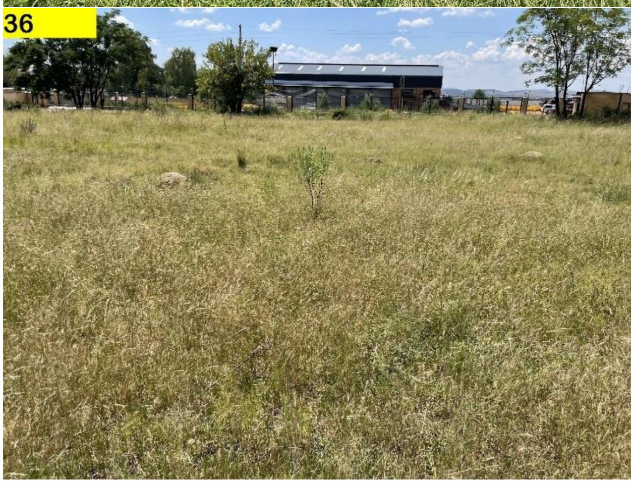
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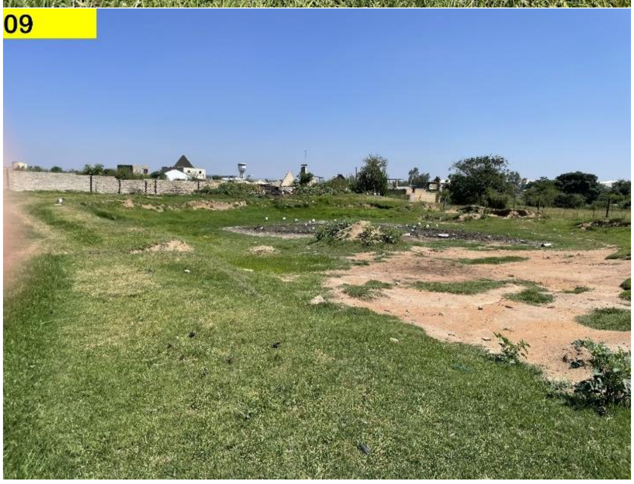
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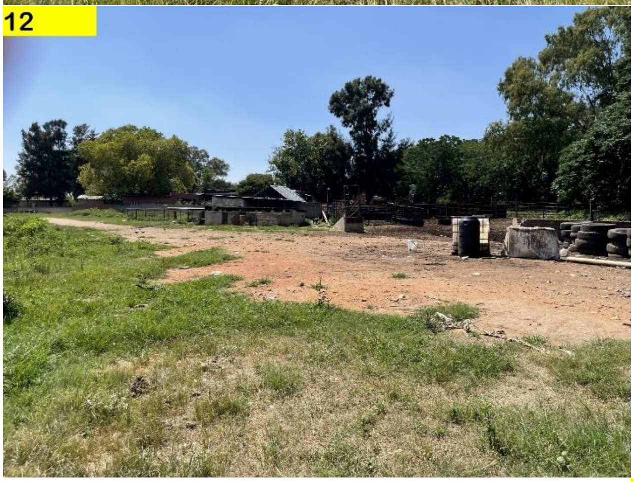
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