Aquatic Biodiversity Impact Asessment for Proposed Multi-use Development on RE/1627, Sedgefield, Western Cape.

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confluent

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• At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;

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• All the particulars furnished by me in this document are true and correct.

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1. INTRODUCTION

1.1 Background

The property RE/1627 is in the town of Sedgefield south of the N2 highway and Transnet railway line. It is one of the largest remaining erven in the town at approximately 26.5 ha. The Perdespruit is an arm of Swartvlei Estuary which crosses a significant portion of the property's eastern extent. The property is bound to the north by the N2 highway and to the south by Dr Malan Drive. Both roads have bridge and culvert type crossings over the Perdespruit which are historical constructions on aquatic habitat and water flows.

The site is low-lying with the Perdespruit ranging between 1-2 m.a.m.s.l. and most of the adjacent area to the west where development is proposed around 2.5 m.a.m.s.l. (Figure 1)

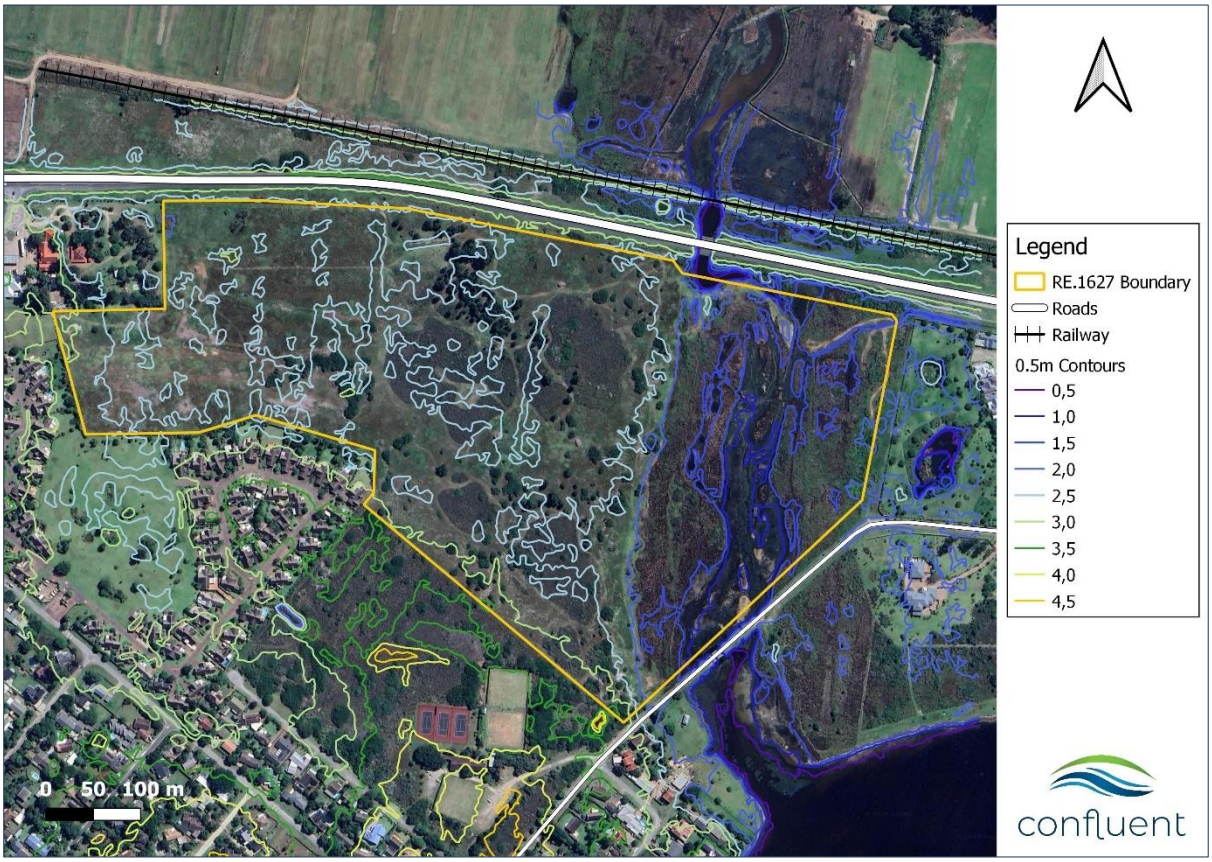


Figure 1. RE/1627 in relation to transport infrastructure (roads and railway) and 0.5m site contours.

Site sensitivities have been previously assessed by an aquatic ecologist in 2006 (Dr. T.G. Bornmann) for a pre-feasibility study by the Knysna Municipality. This report was thoroughly reviewed and provided a helpful comparison of historic conditions at the site 15 years ago. However, much has changed in terms of legislative requirements and methods of wetland assessment since 2006 leading to the requirement of an updated specialist report.

1.2 Proposed Development

1.2.1 Site Development Plans (SDPs)

Three options have been proposed for development at the site and are summarised in Table 1. The accompanying layout for each option is provided in Figure 2, Figure 3, and Figure 4. In each of the three SDPs the Perdespruit is indicated as a wetland area along with a 30m buffer area, both of which were determined and delineated as part of the first version of this aquatic assessment in 2021. For the purposes of this assessment only Plan 7 and Plan 10 will be assessed because Plan 4 has already been rejected due to excessive development in the wetland and adjacent conservation area. The layout is still included here to provide the reader with some perspective on the evolution of the SDP.

Table 1. Comparison of development zone areas for each of three alternative SDPs proposed for RE/1627, Sedgefield.

Development Zones	Plan 4 Rejected Alternative	Plan 7 Alternative	Plan 10 Preferred
Business Zone 1 Tourist facility, restaurants, food markets	1.16 ha	-	-
General Residential Zone II Semi-detached townhouses	3.91 ha 54 units	-	-
General Residential Zone 1 Group housing	4.72 ha 46 units	3.1 ha 61 units	3.65 ha 70 units
Agricultural Zone 2 Smallholding for intensive agriculture / horticulture and renewable energy structures	3.12 ha	6.4 ha	-
Transport Zone 3 Internal roads and parking	1.14 ha	1 ha	1.17 ha
Private Open Space Zone II Tourist and recreation, restaurants and food market	-	1.4 ha	5.43 ha
Open Space Zone III Conservation area including Perdespruit	12.58 ha Accommodation, tourism node, boardwalks and bird hide	14.7 ha	16.34 ha

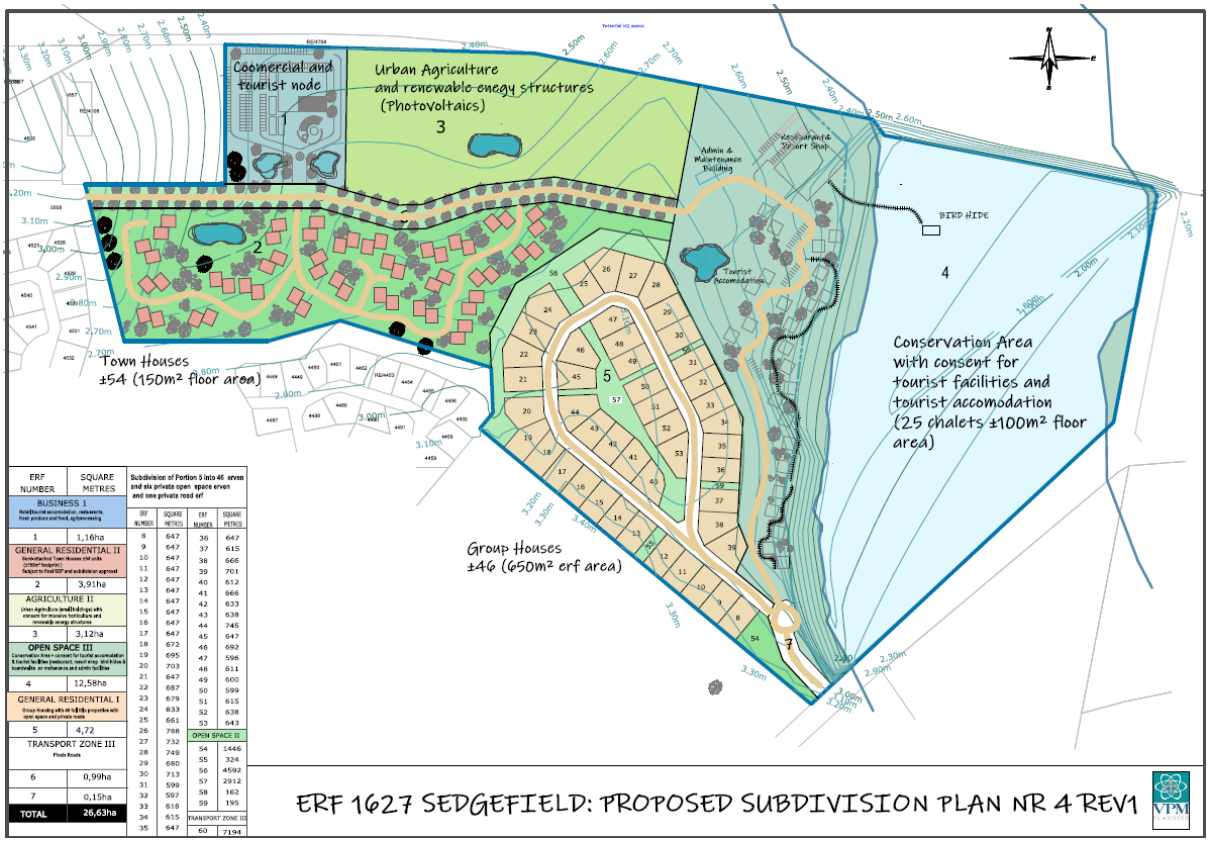


Figure 2. Plan 4 Alternative Site Development Plan.

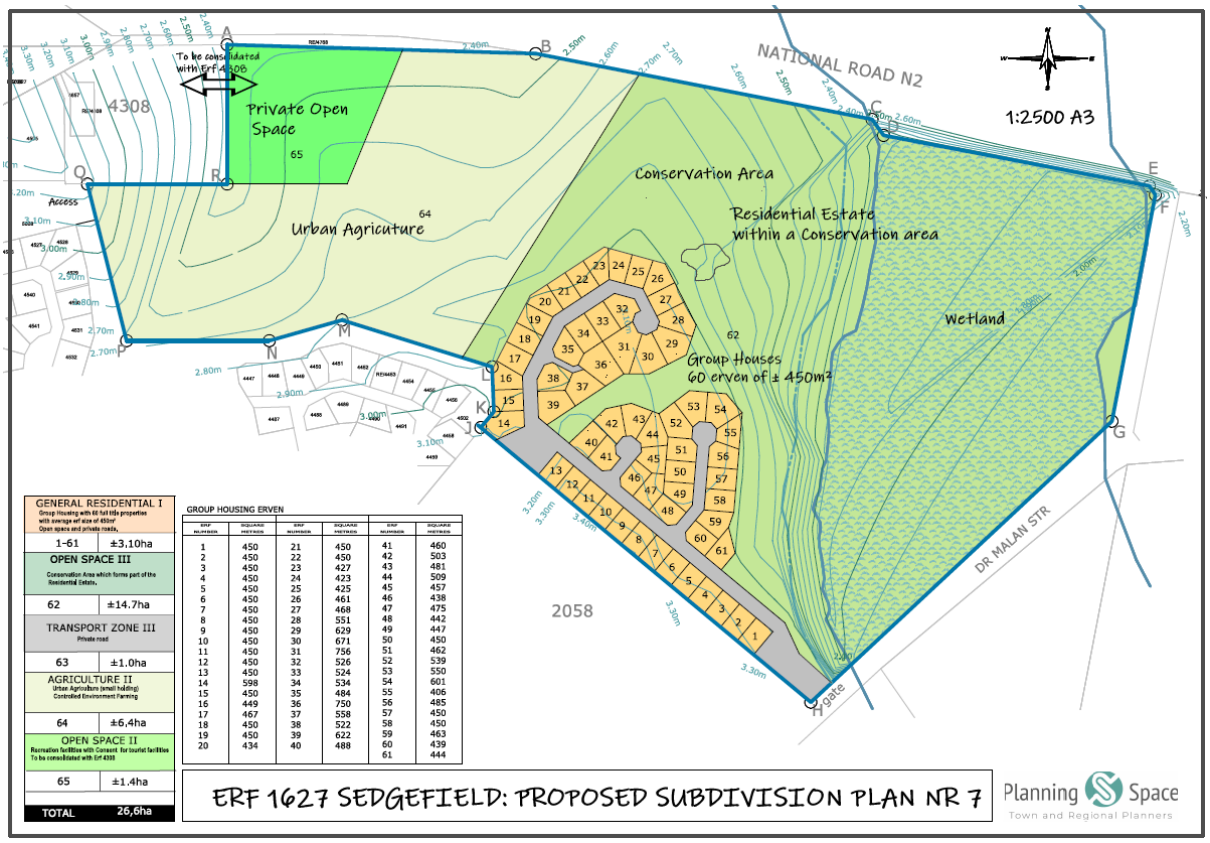


Figure 3. Plan 7 Alternative Site Development Plan.

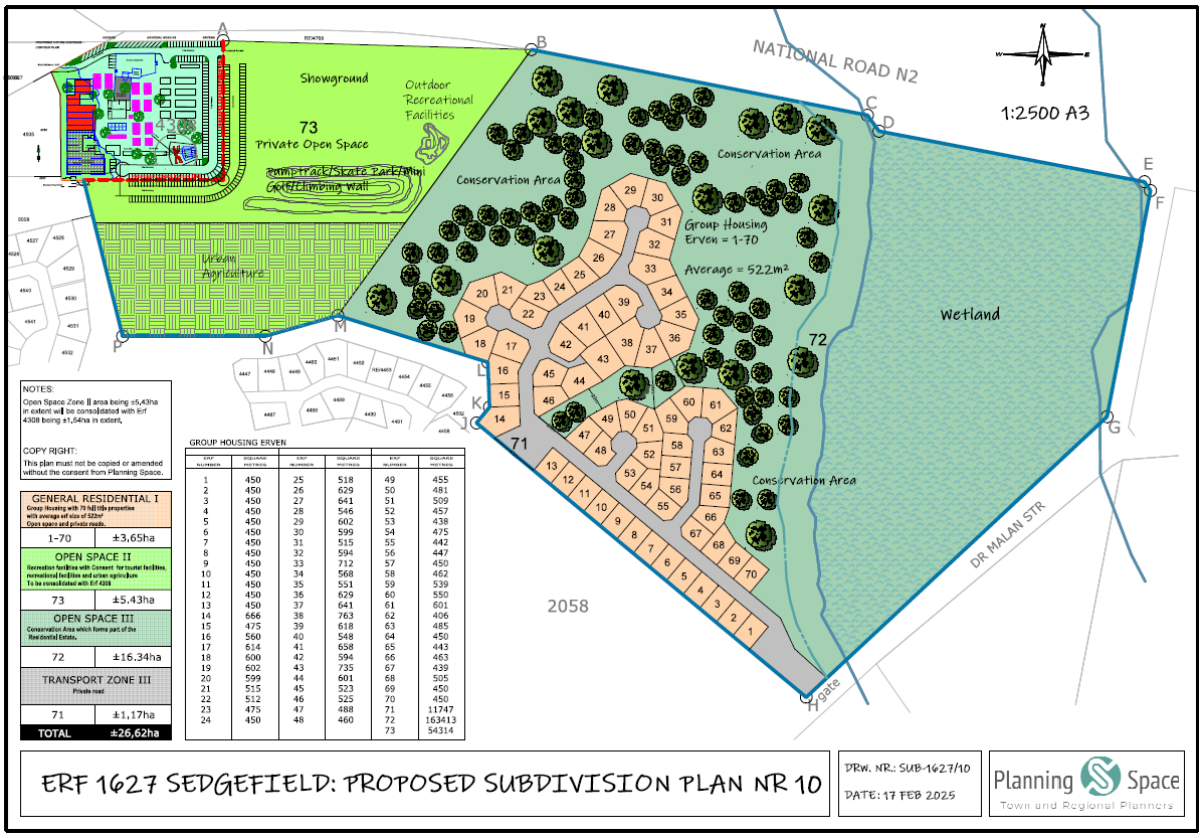


Figure 4. Plan 10 Preferred Site Development Plan.

1.2.2 Flood Management

An assessment to determine flood management zones was undertaken which identified areas of the site that would be subject to flooding under different rainfall intervals including 1:100 and 1:50 year events (Flood Management Study, Fraser 03/22). In Figure 5 pink areas indicate areas above 3.1 m.a.m.s.l. (1:100 year RI) and areas in orange are above 2.8 m.a.m.s.l. (1:50 year RI). Yellow areas are lower lying and most frequently flooded at 2.5 m.a.m.s.l. (1:20 year RI).

To mitigate the flood risk to residential dwellings, the flood management study recommends that floor levels and any power distribution structures be raised to 3.6m amsl as a minimum, as this should accommodate the 100 year RI flood level. All manhole covers to underground services other than stormwater runoff be raised to 3.1m amsl. The report recommends that earthfill is cut to create artificial wetlands as water features and placed between the 3.0 and 3.1m contours.

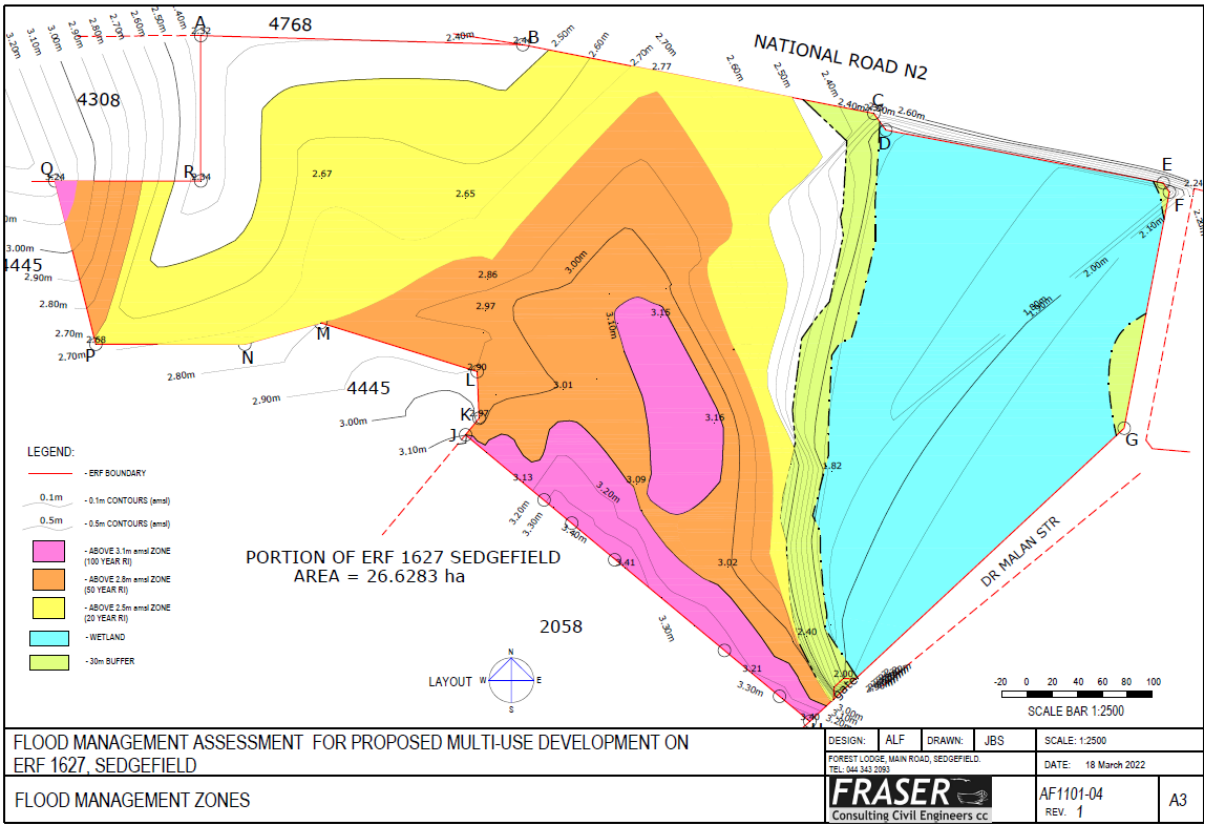


Figure 5. Flood management assessment indicating areas prone to flooding during different rainfall interval periods.

1.2.3 Water Supply, Stormwater and Wastewater

Specific plans for the Preferred layout 10 had not been provided at the time of writing, although detailed plans had been provided for previous versions of the layout which are very similar.

Potable water supply has been confirmed by the Knysna Municipality via the existing pipeline which runs along Dr Malan Street.

According to the engineer (*pers. comm*. A. Fraser 2/05/24) no pipes will be installed for stormwater management across the site due to the high infiltration rates expected from soil at the site. Grassed swales adjacent to roads will retain stormwater during rainfall events. Ponds indicated on the SDP layouts are not intended to function in the management of stormwater, but rather as artificial wetlands following excavation of material required for infilling to raise floor levels of residential dwellings.

The proposed sewerage layout plan for the Preferred Layout is provided in Appendix 1 (Tuiniqua Consulting Engineers). Sewer will gravitate from each stand to a sump with a pump from where it will be pumped to pump station 1 (PS1). From there, sewage will be pumped to the municipal ring main on the causeway. The pump in PS1 will have a float switch to activate the pump on regular intervals during the day. These intervals depend on the inflow and will b shorter during peak hours than for the rest of the day.

Pump stations sumps should have a 48-hour capacity to give some time to replace or repair the pumps (if maintenance or repairs are necessary) or during power outages. The sump is not a conservancy tank.

1.3 Legislative Requirements

1.3.1 NEMA Screening Tool

According to the screening tool the sensitivity for aquatic biodiversity is **Very High** (Figure 6) due to the following features:

- Critical Biodiversity Area 1 (CBA1): Aquatic
- Swartvlei Estuary
- FEPA Subcatchment
- Strategic Water Source Area (SWSA) Outeniqua
- Wetlands, Estuary

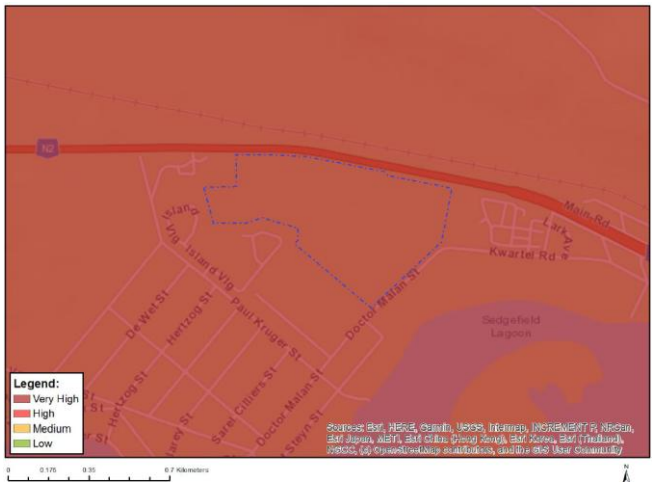


Figure 6. Results of the Aquatic Biodiversity Theme Screening Tool.

According to the protocols specified in GN 1540 (Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool).

The screening tool classified the site as being of **Very High** aquatic biodiversity. According to the protocol, a site sensitivity verification must be undertaken to confirm the sensitivity of the site as indicated by the screening tool:

- Where the information gathered from the site sensitivity verification differs from the screening tool designation of **Very High** aquatic biodiversity sensitivity, and it is found to be of a **Low** sensitivity, an Aquatic Compliance Statement must be submitted.

The determination of the site sensitivity relied upon the following approaches:

- Interrogation of available desktop resources including:
    - DWS spatial layers;
    - National Freshwater Ecosystem Priority Areas (NFEPA) spatial layers (Nel et al., 2011);

  - National Wetland Map 5 and Confidence Map (CSIR, 2018) – the latest national wetland inventory map for South Africa;
  - Western Cape Biodiversity and Spatial Plan (WCBSP) for Mossel Bay (CapeNature, 2017).
- A site visit during which time the following activities were undertaken:
  - Identification and classification of watercourses within the footprint of the site according to methods detailed in Ollis et al. (2013);
  - Soil augering to confirm the presence of soil indicators (DWAF, 2005) that may indicate the presence of a wetland (if applicable); and
  - Identification of hydrophilic plant species that may indicate the presence of wetland plant species (if applicable).

1.3.2 National Water Act

The Department of Water & Sanitation (DWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be watercourse, and
- A reference to a watercourse includes, where relevant, its bed and banks.

The definition of a watercourse excludes estuaries, which are classified as a water resource in the NWA.

Legislative acts in South Africa differ in their definition of estuarine systems. According to the National Environmental Management: Integrated Coastal Management Act (NEMA: ICMA; Act No. 24 of 2008) and listing notices 1 (GN R. 983) and 2 (GN R. 984) published under the National Environmental Management Act (NEMA), Environmental Impact Assessment (EIA) Regulations (2014), which define an estuary as an open body of surface water-

a) that is part of a watercourse that is permanently or periodically open to the sea;
b) in which as rise or fall of the water level as a result of the tides is measurable at spring tides when the watercourse is open to the sea; or
c) in respect of which the salinity is measurably higher as a result of the influence of the sea.

The National Water Act (NWA; Act No. 36 of 1998) defines an estuary as "a partially or fully enclosed body of water-

a) which is open to the sea permanently or periodically; and,
b) within which the sea water can be diluted, to an extent that is measurable, with fresh water derived from land".

The definition of estuarine habitat is more extensive in terms of listing Notice 3 (GN R 985) published under the NEMA EIA regulations (2014), which define an estuary as the Estuarine Functional Zone (EFZ) as defined in the National Biodiversity Assessment: Estuary Component (van Niekerk & Turpie, 2012). The EFZ is delimited by the 5 m topographical contour surrounding an estuary, which is provided as a spatial layer in the South African National Biodiversity Institute's BGIS website (http://bgis.sanbi.org).

2. CHARACTERISTICS OF THE SITE

The entire property, like most of the low-lying areas in Sedgefield, is located within the Estuarine Functional Zone (EFZ; below the 5m contour) of Swartvlei Estuary. The property is in quaternary catchment K40D which drains the southern slopes of the Outeniqua Mountains to the north and extends to the coastline through the Swartvlei Lake and Estuary system. Mean Annual Precipitation for the catchment is 757 mm per annum (Table 2). Rainfall can occur at any time of the year but follows a predominantly bimodal peak in spring (October) and autumn (March; Figure 7). However, climate extremes have occurred in recent decades (flooding and drought) which have exposed vulnerabilities of low-lying areas in the town. In November 2007, 260 mm of rain fell within a period of 48 hrs, causing flooding of most areas within the EFZ including RE/1627 (Figure 8). While above average rainfall with associated flooding occurred across the Garden Route in 2006 and 2007, this was followed by 3 years of below average rainfall and drought between 2008 and 2010. Sedgefield ran very low on water leading to the construction of a desalination plant, and water had to be trucked into the town in tankers. It is essential that any proposed development on the site takes these water-related vulnerabilities into account to ensure its sustainability.

The Perdespruit channel flows across the entire eastern portion of the property where it enters beneath the N2 and exits under Dr Malan Street to the main estuary. The upper portion of the Perdespruit beyond the N2 extends north and then west into Swartvlei Lake. It can be considered an extended arm of the Swartvlei Estuary, but has minor additional freshwater inflows from the dune catchment and stormwater from roads and buildings.

Table 2. Summary of relevant catchment features for RE/1627 Sedgefield

Feature	Description
Quaternary catchment	K40D
Mean Annual Runoff	254 mm
Mean Annual Precipitation	757 mm
Ecoregion Level II	20.02,
Geomorphological Zone	Lowland River
NFEPA area	9165, FEPA (Freshwater Ecosystem Priority Area)
Vegetation Type	Southern Cape Dune Fynbos (Least Concern)

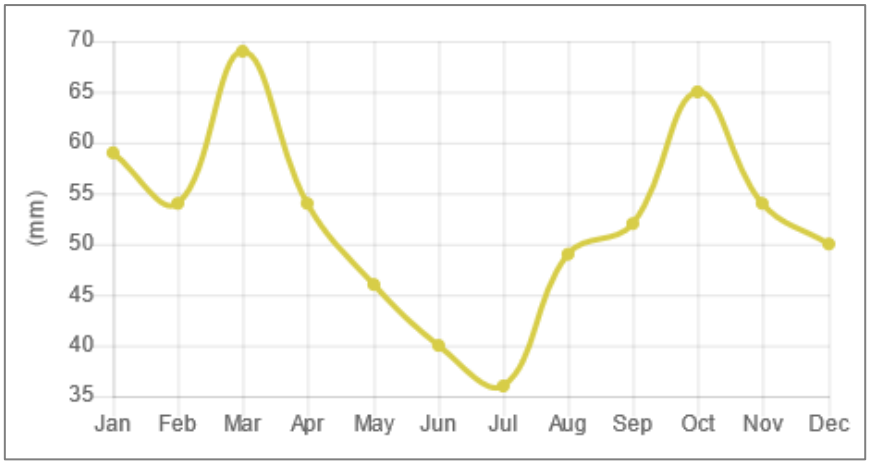


Figure 7. Mean monthly rainfall for Swartvlei.

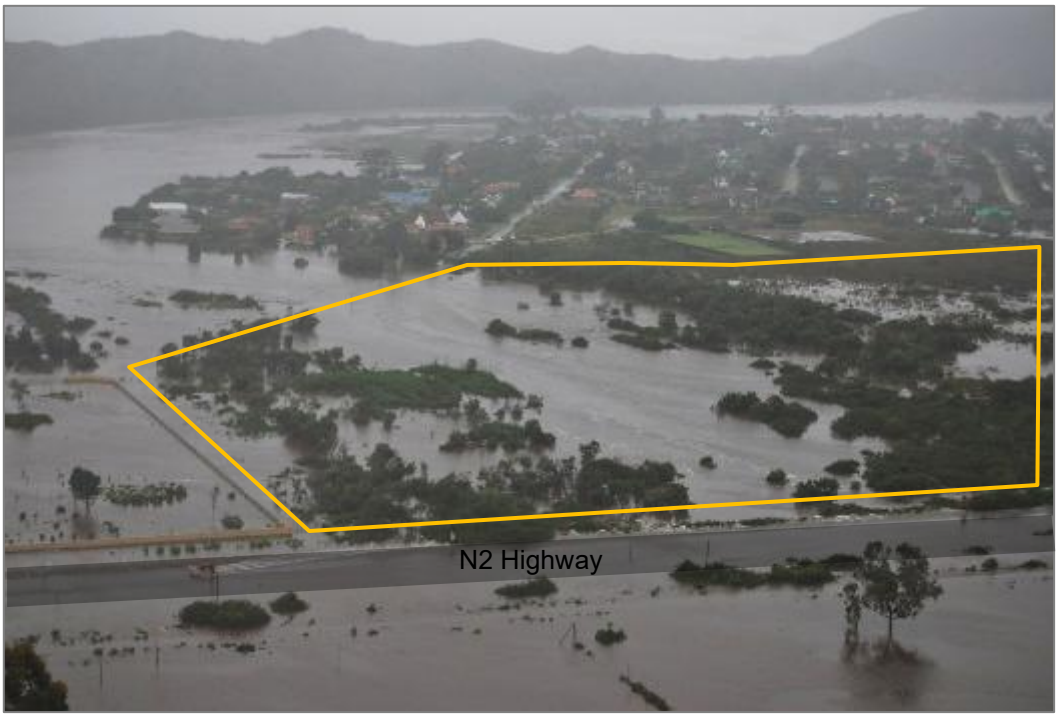


Figure 8. Photo of part of Sedgefield during flooding in 2007. View looking south shows the N2 Highway and the general area of RE/1627 (yellow area).

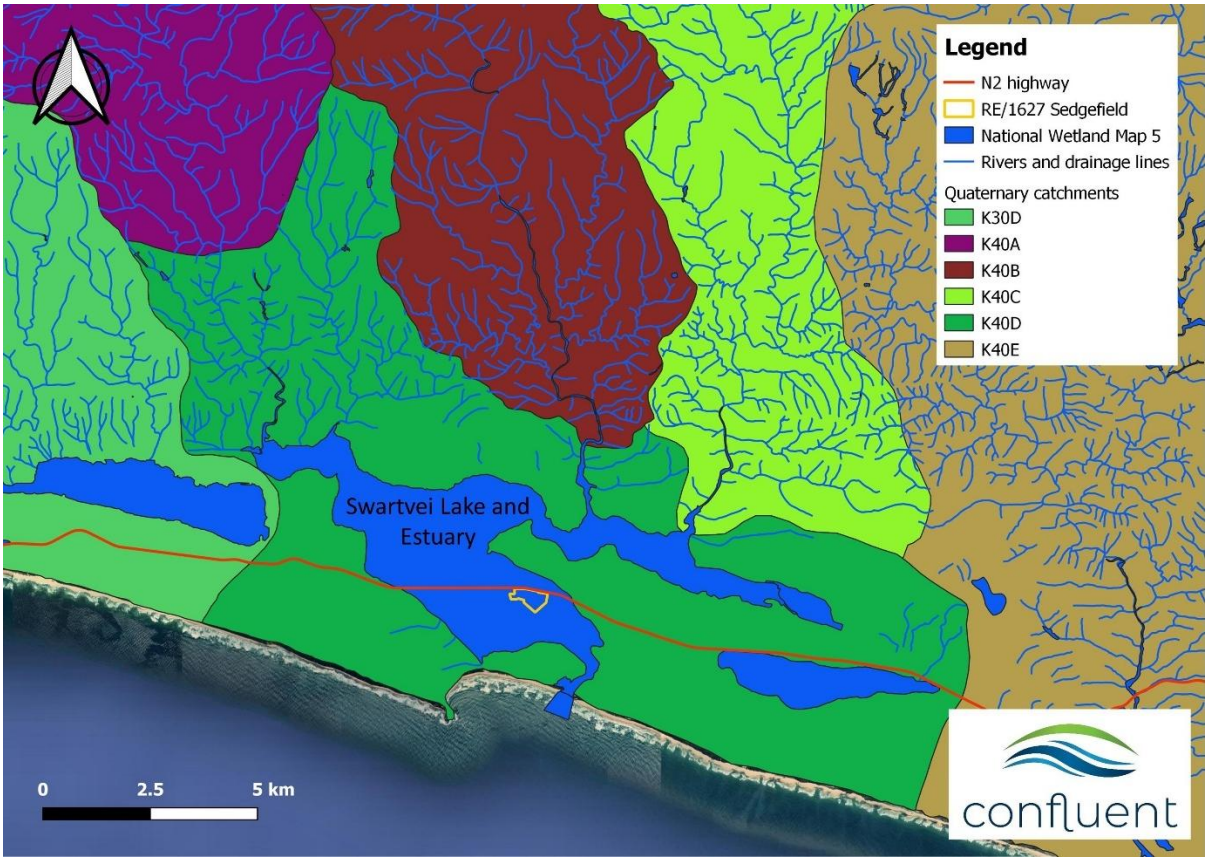


Figure 9. Location of RE/1627 in quaternary catchment K40D.

2.1 Vegetation

According to VegMap (SANBI, 2018) the mapped vegetation at the site consists of **Southern Cape Dune Fynbos (FFd11)**. In conservation terms the mapped vegetation type is described as Least Concern. Within the context of the town of Sedgefield however, there are very few areas of this vegetation type that have not been completely transformed by urban development or agriculture. Invasion by alien plants has also severely depleted the vegetation type locally.

In reality, vegetation on the site is complex and comprised of multiple distinct types which are influenced by aquatic features, historical agriculture, and alien invasion. The latter was dominated by Port Jackson (*Acacia saligna*) 40%, Myrtle (*Leptospermum laevigatum*) 30%, Rooikrans (*Acacia cyclops*) 20% and Inkberry (*Cestrum laevigatum*) 10% (Approximate proportions provided by landowner). The site has recently been cleared of extensive stands of alien vegetation and very little remains thanks to the efforts of the landowner.

2.1.1 Hydrophytic vegetation

Wetland (including estuarine) or hydrophytic vegetation is characterised by plants that are adapted to permanent, seasonal or temporary saturation of soils. Soil saturation with water results in periods of anaerobic (low oxygen) conditions, which are not tolerated by terrestrial plants. Hydrophytic plants have varying tolerance to salinity, leading to further limits on distribution depending on the dominance of fresh or saline water.

Wetland vegetation is dominant on the eastern part of the property where it is associated with the Perdespruit channel and surrounds (Figure 10). It is strongly influenced by the estuary in

this section with water levels rising and falling depending on whether open or closed mouth conditions prevail. Areas of freshwater and estuarine vegetation are present, but the latter is dominant. Vegetation units within this section were well-described by Bornmann (2006) as saltmarsh, brackish marsh, and reeds and sedges (Table 3).

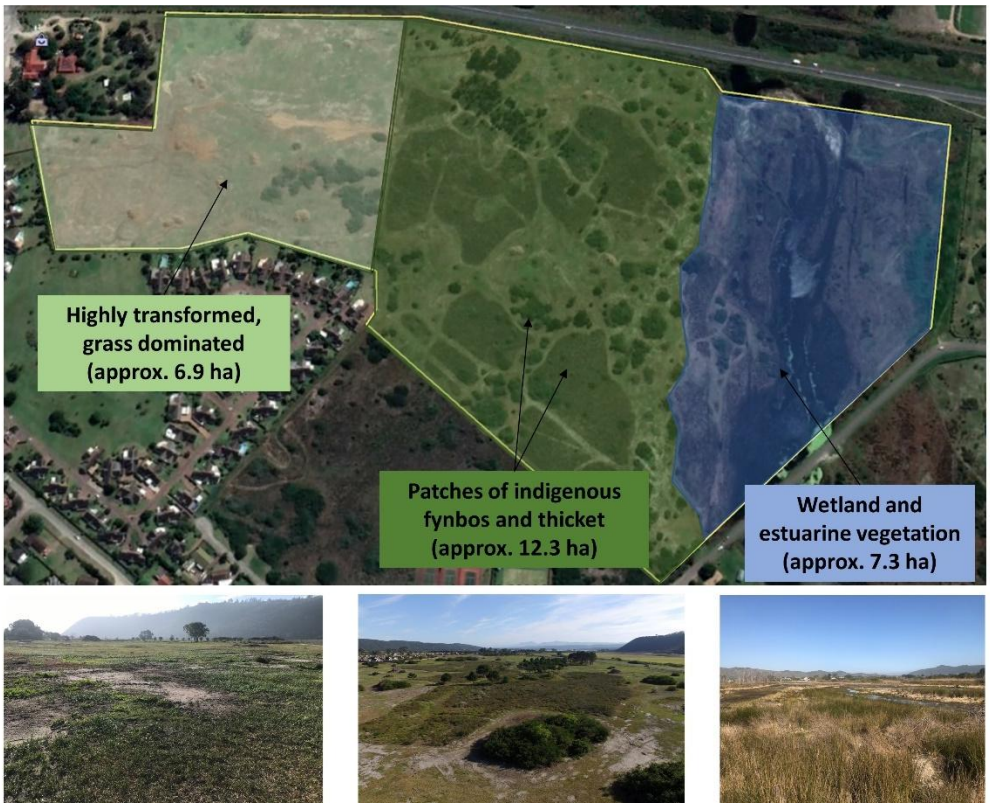


Figure 10. Broad vegetation units on RE/1627 Sedgefield.

2.1.2 Terrestrial vegetation

Three distinct units occur within the terrestrial vegetation. There are numerous patches of indigenous fynbos and thicket which co-occur towards the centre of the property, and totally transformed areas which are covered in grass towards the western extent (Figure 10).

2.2 Conservation status

Most of the property is classified as a **Critical Biodiversity Area1: Estuary** according to the Western Cape Biodiversity Spatial Plan (WCBSP, 2017; Figure 11).

The management objective for this category is to "*maintain the habitat in a natural or near-natural state with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity sensitive land uses are appropriate.*"

The reasons given for classification of the site as CBA1 are summarised in the table below.

BSP 2017 Reasons	Features
Ecological Processes	Water Source Protection - Swartvlei
Estuary	Swartvlei Core Estuary
SA Vegetation Type	Cape Estuarine Salt Marshes (Least Threatened)
Threatened SA Vegetation Type	Southern Cape Dune Fynbos (Vulnerable)
Water Resource Protection	FEPA River Corridor Watercourse protection – Southeast Coastal Belt

CBA1 areas are considered essential for meeting biodiversity targets because there are insufficient other options for meeting biodiversity targets for features associated with the site.

There is a small area to the north-west and a strip along the south-western boundary that are not classified at any level in the WCBSP. From a development perspective, this is the easiest area to justify any development.

Swartvlei Estuary is listed as the 7th most important estuarine system in South Africa (Turpie *et al*., 2002). The estuary is one of three estuaries only where the Near Threatened Knysna seahorse (*Hippocampus capensis*) occurs.

The property is identified as a **FEPA**, which is a Freshwater Ecosystem Priority Area. FEPAs must remain in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This does not mean these areas should be fenced off from humans, rather that they be supported by good planning, decision-making and management to ensure they are not degraded. The recommended condition for all estuary FEPAs is an ecological category of A or B (Nel *et al.,* 2011).

Any work undertaken at the site needs to be carefully implemented to comply with these conservation management objectives.

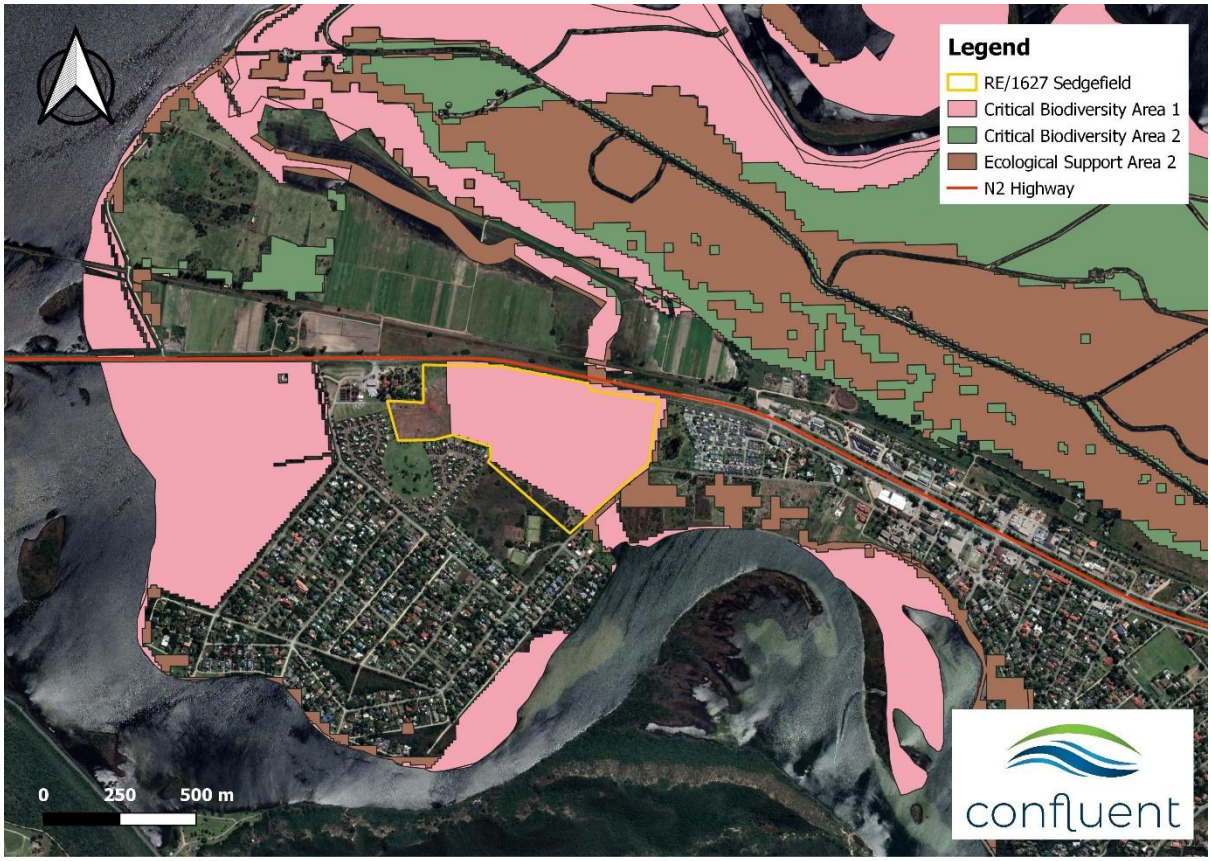


Figure 11. Map of RE/1627 showing Critical Biodiversity Areas on the property as identified in the Western Cape Biodiversity Spatial Plan (2017).

2.3 Historical Assessment

In 1942 little of present-day Sedgefield was developed (Figure 12). The road can be used as reference in this image as the N2 highway is still in this position. The Perdespruit was a far more distinct arm of the estuary in 1942, and minor agricultural fields were the only observable modification. In the following decades natural vegetation at the site was cleared for agricultural activities on either side of the Perdespruit. This is evident in a historical photo from 1973. The fields appear to have been abandoned over a decade later, as the 1989 image shows encroachment by bushy vegetation throughout the fields and into the Perdespruit. The road crossing the Perdespruit to the south of the property (Dr Malan) appears on the 1989 image for the first time. Bush encroachment is further advanced by 2006 and likely consisted of a large proportion of alien vegetation (Figure 12).


1942


1973

Figure 12. Historical aerial photos of the site in 1942,1973, 1989 and 2006.

3. LITERATURE REVIEW

The Swartvlei Lake and Estuarine system was studied in great detail by Whitfield *et al.* (1983). The Perdespruit is mentioned several times in this report, with reference to the following observations:

- There has been progressive drying of low-lying areas between the upper estuary and the Perdespruit channel. This was attributed to the increased frequency of premature artificial mouth breaches which prevent the inundation of these wetland areas.

- The Perdespruit used to be an eastern meander of the estuary, a meandering channel that crossed the floodplain between the lake and the coast.

This observation is confirmed by the 1942 image in Figure 12.

Vegetation at the site was characterised by Bornmann (2006) as saltmarsh, brackish marsh, and reeds and sedges. The species observed were supported by field observations for this study. A list of species identified in each unit is provided in Table 3.

Table 3. List of common hydrophytic vegetation observed by Bornmann (2006) and during the present assessment on RE/1627.

Species	Common name	Freshwater / Estuarine	Alien / Indigenous
Saltmarsh			
Cotula coronipifolia	Brass buttons	Estuarine or freshwater	Indigenous
Triglochin striata	Streaked arrow grass	Estuarine or freshwater	Indigenous
Triglochin bulbosa	Bulb arrow grass	Estuarine	Indigenous
Sporobolus virginicus	Salt couch grass	Estuarine	Indigenous
Samolus parosus	Water pimpernel	Estuarine	Indigenous
Salicornia meyeriana	Glasswort	Estuarine	Indigenous
Brackish Marsh			
Juncus krausii	Salt marsh rush	Estuarine	Indigenous
Juncus acutus	Spiny rush	Estuarine	Alien
Paspalum vaginatum	Seashore paspalum	Estuarine	Indigenous
Stenotaphrum secundatum	Saint Augustine Grass	Estuarine or freshwater	Indigenous
Reeds and Sedges			
Phragmites australis	Common reed	Estuarine or freshwater	Indigenous
Schoenoplectus scirpoides	Club rush	Estuarine	Indigenous
Schoenoplectus lacustris	Softstem bulrush	Estuarine or freshwater	Alien
Ficinia nodosa	Dune slack sedge	Estuarine	Indigenous

4. PRESENT ECOLOGICAL STATE

The Present Ecological State (PES) of the Swartvlei Estuary as a whole system is categorised as **B, in a good state which is largely natural, with few modifications**. Recommended mitigation measures to improve this state are to restore base flows from the catchment, and to improve mouth management practices (Van Niekerk *et al.,* 2015). The current PES of Swartvlei was determined as part of a nationwide assessment of the PES of estuaries conducted by Van Niekerk *et al.* (2015). While this finding provides useful baseline information about the estuary which better informs broad-scale management, it does not provide the resolution required for smaller-scale site assessment, development, and management.

4.1 Classification of the watercourse

Swartvlei is classified as a Temporary Open Closed Estuary (TOCE) which is largely regulated by the amount of river inflow received from the catchment. TOCEs become isolated by a sand berm across the estuary mouth during periods of low river inflow. They remain closed until their basins fill up with sufficient water to breach the berm. However, reduced freshwater

inflows (due to abstraction and damming in the catchment) coupled with extensive development in the EFZ have modified the frequency and water levels at which breaching occurs. Mouth management is now controlled by SANParks and the mouth is artificially breached when water levels exceed 2 m.a.m.s.l.

4.2 Site-specific Impacts

Simplified methods to determine the PES of a section of estuary, or a lake have not been developed in South Africa and are still limited to rivers and wetlands. While the PES has been determined for the estuary as a whole system, site-specific impacts may be present which provide insights into localised factors affecting the ecosystem.

Hydrology of the system is mostly influenced by open / closed mouth conditions, and to a lesser extent by tidal flows in both directions. The site has been assessed during both closed and open mouth conditions (February 2024; Figure 14). During closed mouth conditions, water levels were about as high as they will get under the normal mouth management regime (without flooding) as the mouth was breached by SANParks approximately a week later (June 2021). Hydrology is the parameter most negatively affected with multiple factors resulting in reduced flows, flushing and the gradual drying out of the system. These factors include:

- Reduction in freshwater inflows due to increased abstraction for agriculture in the catchment;
- Major change in flood peaks due to rigorous mouth management, breaching at 2m amsl;
- Modified channel of the Perdespruit due to 2 road crossings and the railway which include infilling of significant areas with small channels through which water can move. Additional infilling for road crossings has occurred in the Perdespruit north of the site.

Geomorphology relates to interaction between the physical structure of the estuary as a result of water and sediment transport. This aspect was considered to be in a moderately modified state, with the major impact being sedimentation and deposition due to reduced movement of water through the system (Figure 13).

Vegetation on the site is moderately modified, having been influenced by historical alien vegetation and clearing for agriculture. The extent and composition of wetland vegetation is also likely reduced due to breaching the mouth at 2m amsl and reduced flushing through this arm of the estuary. This is directly observable as the line of hydrophytic vegetation closely follows the high-water mark at the 2 m contour. While significant efforts have been made to keep the site clear of aliens, come of the cleared debris has been stacked in piles in estuarine habitat (Figure 15).Ongoing maintenance of and follow up control of alien invasive plant species at the site is necessary as emergent small trees were observed (Figure 16). While not numerous, the planting of exotic palm trees in the estuarine buffer should be discontinued and all exotic plants removed from the site.

Water quality is strongly influenced by the state of the mouth. In open conditions it is more saline than in closed mouth conditions. Salinity is variable which is to be expected and is tolerated by estuarine organisms. Reduced flushing rates related to lower freshwater inflows can lead to more extended periods of water stagnation resulting in lower oxygen levels which could kill off fish fry and other organisms. In addition, stormwater runoff from the N2 and Dr Malan Drive introduces pollutants such as oil and grease, heavy metals and nutrients along

with macro pollutants such as cigarettes, plastic and packaging (Robertson *et al*., 2019). While a comprehensive physico-chemical assessment of the site is beyond the scope of this report, it is assumed that water quality is moderately to largely modified at the site. Conditions worsen when water levels and dilution rates are low.

Figure 13. Flow restriction point at Dr Malan Street crossing. Note the difference in sedimentation upstream compared to downstream of the bridge.

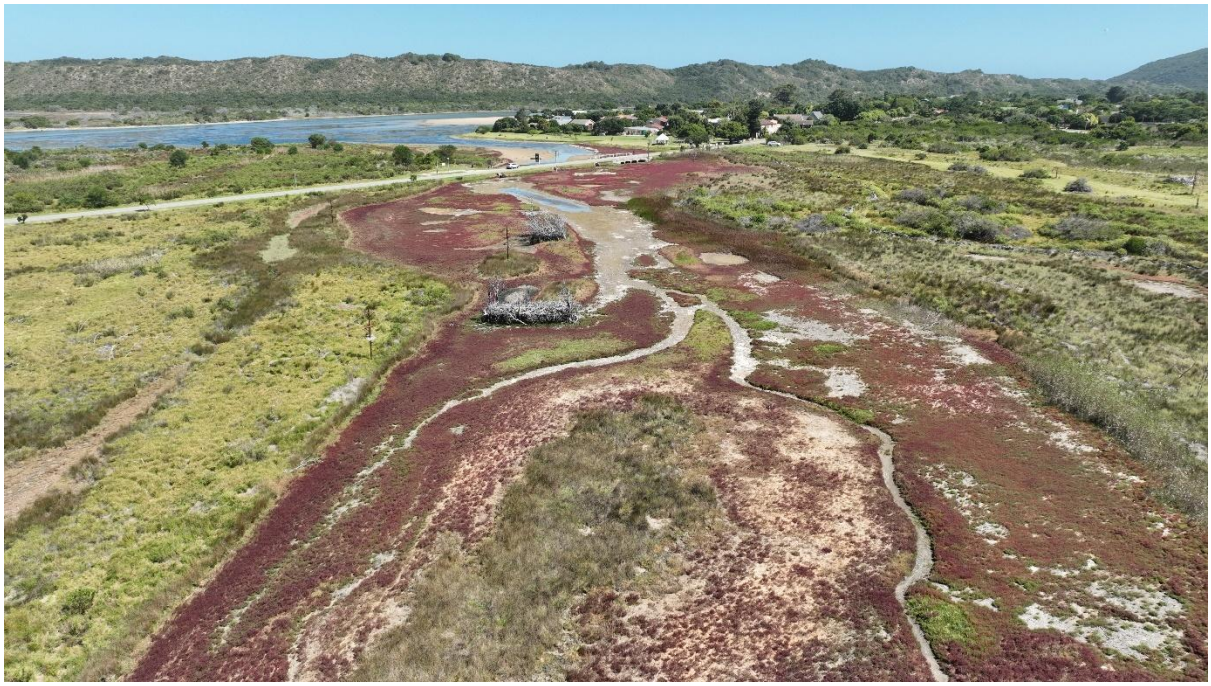


Figure 14. Perdespruit during open mouth conditions with low water levels showing distinct red colour of *Salicornia* sp. dominated areas of salt marsh.

Figure 15. Woody debris from alien clearing piled in estuarine habitat.

Figure 16. Exotic palm trees planted in estuarine buffer area (left) and emergent alien pine trees in fynbos (right).

5. ESTUARY DELINEATION AND BUFFERS

The estuarine area was delineated using methods prescribed by DWAF (2005) which are primarily for the delineation of wetlands but are also applicable to estuarine systems. The delineation relied heavily on the presence of hydrophytic plants because sandy soil present at the site does not reliably show typical indicators of saturation such as mottling. The buffer area was determined using the detailed site-based model for estuaries developed by Macfarlane & Bredin (2017) which is the more detailed of the two available models. The buffers are then mapped from the edge of the delineated estuarine area.

The recommended buffer is **30 m** from the delineated edge of the wetland / estuarine area which is indicated in Figure 17. This buffer is applicable in both the construction and operational phase of development.

Figure 17. Delineated wetland area and associated 30 m buffer for RE/1627 Sedgefield.

6. IMPACT ASSESSMENT

The impact assessment is fundamentally guided by the mitigation hierarchy which seeks to avoid and minimise impacts as the first priority (Figure 18). Every effort must be made to avoid and minimise impacts and rehabilitate affected areas. Offsets are the final option in the mitigation hierarchy. The impact assessment includes not only direct and indirect impacts, but also cumulative impacts which are additive. Cumulative impacts in this instance must not cause irreversible decline to the conservation status of species and the presence of special habitats or cause a significant loss in ecosystem services. Residual impacts are negative impacts that remain after all reasonable and practical changes have been made to location, siting, scale, layout, technology, and design of the proposed development. Provided the residual impacts are Very Low or Low, no offset is required. However, if the residual impacts are Medium or High, then an offset is required. Very High residual impacts cannot be offset and are unlikely to be authorised.

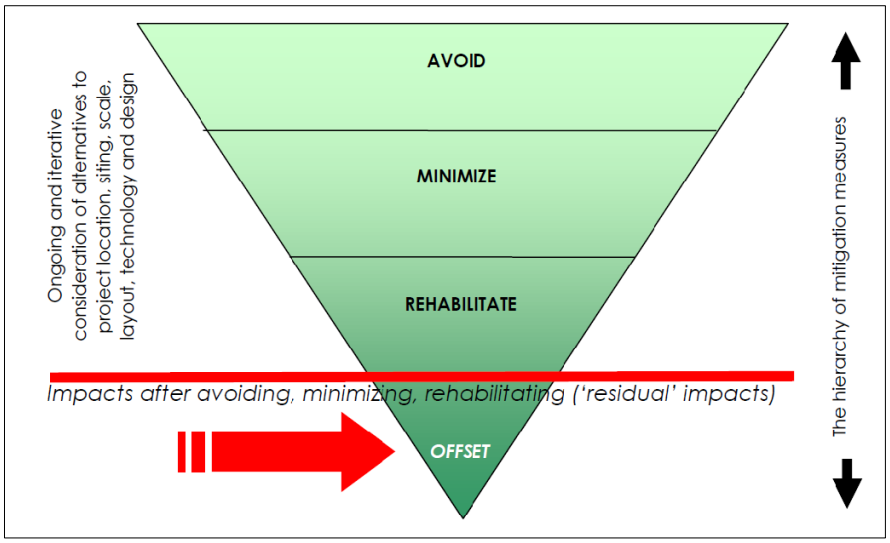


Figure 18. Mitigation hierarchy applied in the assessment of impacts.

6.1 Design and Layout Phase

Significant inputs have been made to the planning and development team regarding aquatic biodiversity and sensitivity of the site. As a result, the two proposed layouts are located well away from the Perdespruit and associated 30m buffer. Except for the access road which is off Dr Swart Street and is adjacent to the buffer. The first layout (Plan 4) proposed included chalets and walkways along the buffer edge, as well a bird hide and walkway into the Perdespruit. As this option was rejected, Plan 7 (alternative) and Plan 10 (preferred) are being compared.

The eastern portion of the property is zoned for General Residential Zone 1. Plan 7 has 3.1 ha of development with 61 units, while Plan 10 has 3.65 ha of development with 70 units. Plan 10, which is preferred, therefore has a slightly higher density and footprint (Figure 19).

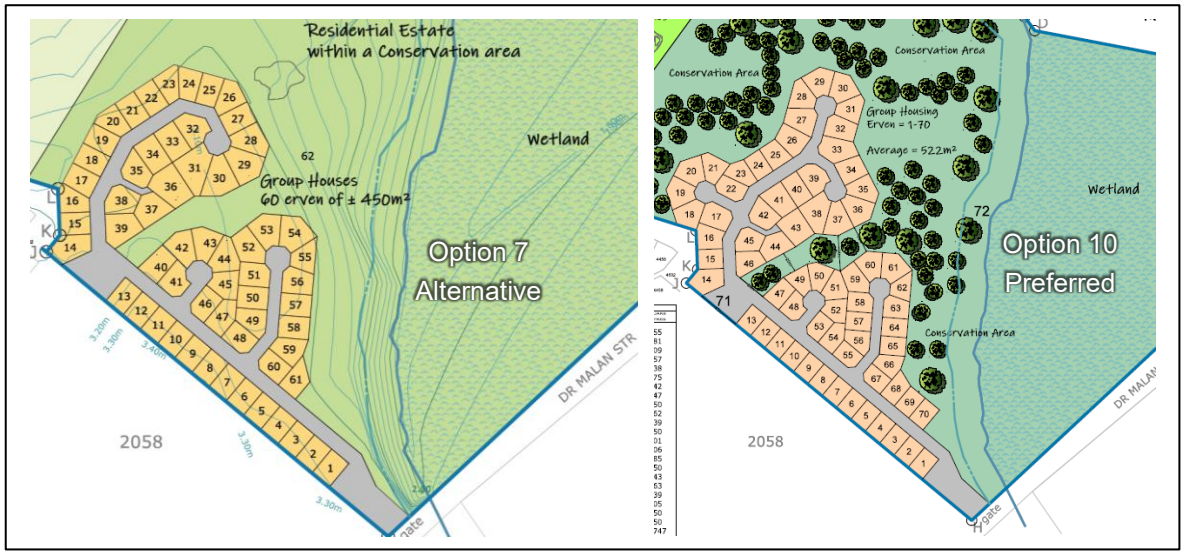


Figure 19. Comparison of Residential Zone 1 housing section between Option 7 and Option 10 SDPs.

6.1.1 Habitat Connectivity

'The Island' (as it's known) of Sedgefield is undergoing increasing development which is reducing the extent of remaining natural areas and connections between them. Terrestrial animals unable to fly or swim already have a significant barrier to their dispersal in the form of the N2 highway (Figure 20).

Figure 20. Dead bushbuck next to the N2 Highway on the western extent of Sedgefield as the road enters the town, taken on 24 March 2024.

Currently the full extent of the property has been fenced using a plastic-coated diamond mesh fence with wooden posts. This type of fencing is highly restrictive in terms of animal movement (Figure 22) but easily overcome by humans with criminal intent. The current fencing thus represents a significant barrier to movement around the Perdespruit, compounding the impacts of existing barriers such as minor and major roads.

To better understand the cumulative impacts of habitat fragmentation presented by the proposed development a basic map of the remaining 'untransformed areas' which are in a mostly natural vegetated state was compiled. These are presented in Figure 21. What is not depicted at a fine scale are all the existing fences and roads which intersect these areas creating barriers to wildlife movement. This picture must therefore be interpreted in the context of RE/1627 only. As can be seen there are a few larger fragments of untransformed land interspersed with a few smaller, isolated fragments on the Sedgefield 'island'. While animals such as tortoises and birds may still be present on smaller fragments, the priority should be to maintain connections between larger fragments. RE/1627 is one of the largest fragments, and development on this site will significantly increase habitat fragmentation and restrict access by wildlife to the Perdespruit. But there are some opportunities to mitigate this to an extent which are highlighted by encircled red areas in Figure 21 and discussed in the following section.

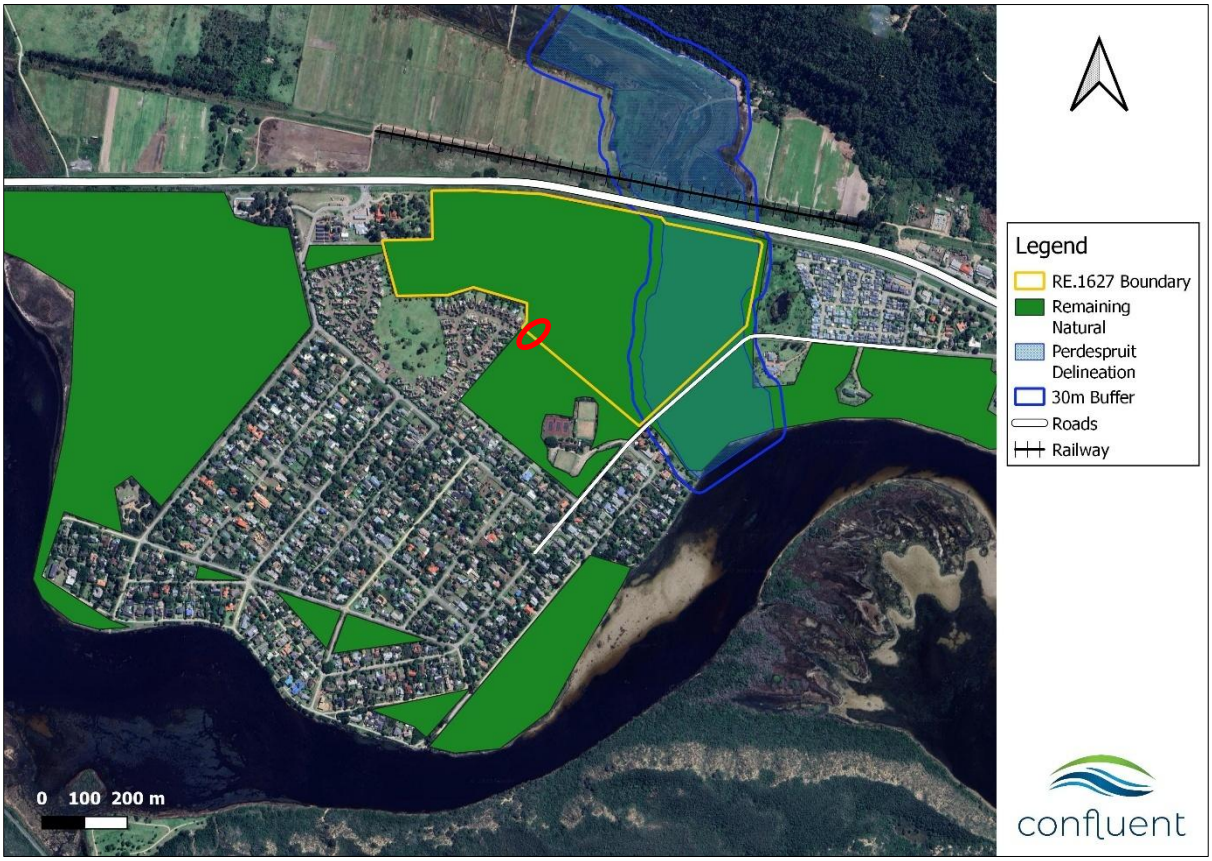


Figure 21. Relatively untransformed areas remaining on 'The Island' of Sedgefield. Red oval indicates the proposed location of a wildlife corridor to restore and maintain connectivity between RE/1627 and the neighbouring municipal Erf 2058, the tennis club.

Both SDP options have a line of almost continuous units along the southwestern boundary with neighbouring Sedgefield Tennis Club on Erf 2058. This is highlighted because Erf 2058 has a substantial area of natural vegetation and associated wildlife which should ideally be able to continue movement into RE/1627 to gain access to the Perdespruit habitat in spite of the proposed development. A gap in housing has been provided and leads to the 'conservation area' and the Perdespruit, but currently a parking lot is planned adjacent to the boundary at this point along with the road crossing. It would be preferable from a design and layout perspective to capitalise on this gap as a green corridor with the following recommendations:

- Retain the 'green corridor linking RE/1627 and Erf 2058 but mitigate the danger of the road crossing for wildlife by installing broad culverts under the road section indicated (Figure 22) to raise the road above ground level and allow small animals to cross beneath the road.
- Following recommendations in a previous report, the corridor width in Layout 10 was increased to a minimum width of 20m, with some areas wider (Figure 22). An ideal corridor width for maintained movement of larger buck is 100m. This corridor is therefore a pinch-point within their range, but at quieter times they will likely become habituated and utilise the corridor given the lack of alternatives.
- Ensure Erf 71 remains open space as a functional part of the wildlife corridor (Figure 22.

- The fenceline between Erf 71 and the neighbouring property should be permeable to wildlife movement. Palisade fencing could be a workable as it allows smaller buck access as well as tortoises and small mammals like mongoose. BUT, buck have been observed with hip injuries from jumping through palisade in a hurry (e.g. running away from cars or dogs), so gaps would need to be created which allow movement through the fence for larger buck. Dense vegetation around the gaps would contribute to security which could be further enhanced with CCTV cameras. Currently diamond mesh fencing has been used which is already causing tortoise mortalities despite there being gaps in several sections (Figure 22).
- The remainder of the boundary wall should either be impermeable like a brick wall or clear vu-type fencing to prevent animal movement anywhere else except through the green corridor. This essentially 'funnels' animals towards the green corridor where safer conditions for movement should be maintained.
- Traffic slowing measures such as speed humps either side of the corridor along with signage and low-level bollard type lighting with sensors can ensure wildlife collisions both with fencing and cars are kept to a minimum.

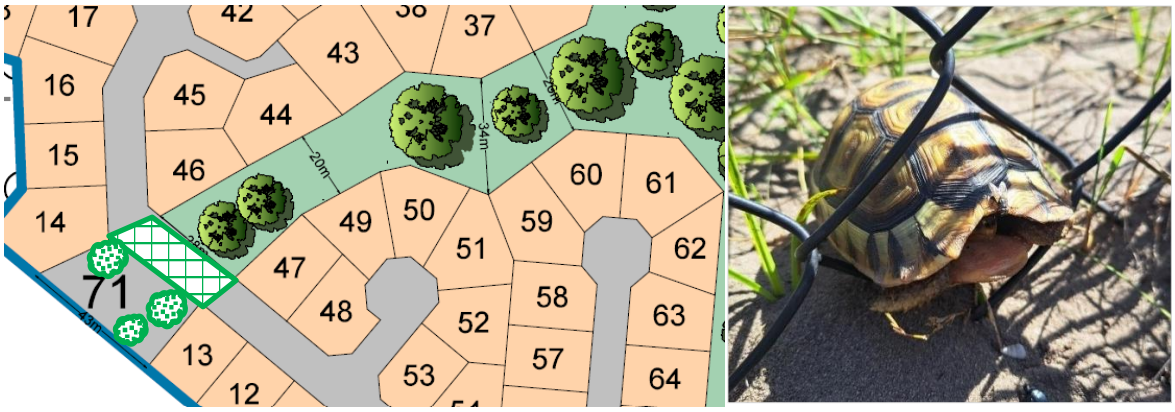


Figure 22. Road crossing section (hashed green) to be raised to allow safe passage of animals under the road (left) and dead tortoise in diamond mesh fencing (right; pictured 24 March 2024).

6.1.2 Domestic Pets

- During the operational phase of the development when the complex is populated by residents, it will be necessary for the homeowners association to set enforcable rules about domestic pets. Pets are not consistent with the conservation goals of protecting the birds and wildlife associated with the Perdespruit. If every homeowner had one cat and one dog, that would represent a large influx of predators to the environment and would likely lead to serious mortalities of wildlife. Ideally, the HOA should not allow cats at all, and limit ownership of dogs which must be walked elsewhere (ie. Not in the open space or wildlife corridor earmarked for conservation). It would be preferable to dedicate an area of public open space for the purpose of dog walking / recreation which is fenced to protect wildlife. This should be located well away from the Perdespruit and potentially shown upfront in the development layout.

The above mitigation measures apply to both SDP layouts (Plans 7 and 10) and are recommended as mitigation steps for the fragmentation of habitat associated with the Perdespruit, which is largely an unavoidable consequence of some development on the site.

6.1.3 Comparison of Plan 7 and Plan 10

The remainder of the SDP west of the residential zone 1 area differs significantly between Plans 7 and 10 with urban agriculture mostly proposed for the former, and a mix of urban agriculture and recreational facilities on the latter (Figure 23). Both proposed SDPs carry potential impacts to the Perdespruit and associated conservation/open space areas. Details of the urban agriculture proposed for either plan have not been refined, and therefore the degree to which soils on site would need to be ameliorated or improved for a range of agricultural produce is unknown. The addition of inorganic and organic fertilisers, mulch, liming agents, and minerals on sandy soil with a high-water table could result in altered and possibly reduced water quality in the Perdespruit. Furthermore, the use of pesticides could potentially pose a risk. This type of impact is already occurring north of the N2 Highway at Eden Lawns instant lawns, although the land use in that case is immediately adjacent to the Perdespruit and therefore higher risk. Plan 10 proposes recreational facilities such as a cycling pump track, rock-climbing wall, skate park or mini golf. A showground and general outdoor recreational facilities are also indicated.

The impacts associated with the layout, construction and operational phases of either plan are difficult to determine without knowledge of the type of agriculture proposed. One positive impact however, is that it seems likely that a lot less vehicle and foot traffic would be entering the property for Plan 7 than for the periodic busy periods anticipated with facilities proposed in Plan 10 (Figure 23). More people mean more cars, waste, recreational areas, noise, lights, and disturbance in general. This could negate some of the positive impacts intended by the inclusion of green corridors.

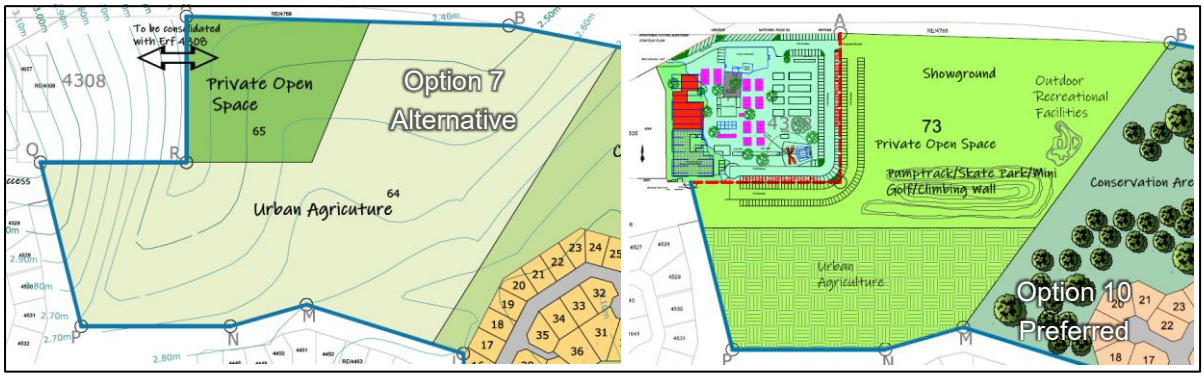


Figure 23. Comparison of remaining development proposal between Option 7 (left) and Option 10 (right) SDPs.

6.1.4 Artificial Wetland Ponds

A few small dams are indicated as elliptical blue features in both the preferred and alternative SDPs. These are associated with excavations for material needed to raise the residential area to a uniform height of 3m amsl. These features are not meant to be stormwater detention ponds, as there is no serious stormwater management anticipated on the site from a runoff perspective, given how well drained and flat it is (this scenario excludes major flood events of course). These features could become naturalised if shaped and revegetated carefully, providing additional water, habitat and foraging opportunities on the site. The following recommendations are made from a design and layout perspective:

- It is preferable to excavate artificial wetlands for soil as opposed to clearing a shallower depth of soil over a larger area. This will spread the impact, leaving a larger footprint for rehabilitation, remove large quantities of topsoil, and possibly injure or displace mole rats and tortoises unnecessarily.
- The precise quantities of soil required must be calculated so that the area, depth, and number of artificial wetlands / ponds can be determined.
- Excavations should be in areas of very low terrestrial biodiversity sensitivity, confirmed by the faunal and botanical specialist.
- It is worth noting that the ponds may not hold water for very long and at times water levels could be very low making the feature appear less attractive and allowing weeds to colonise the area. Maintenance will be important.
- Design-wise, they should be limited to 1 – 1.5 m depth at their deepest point with gently sloping sides, and a 'shallow' end where fringing wetland vegetation can establish.
- A buffer of indigenous vegetation around 5 m wide should be planted in an almost continuous collar around each pond to encourage use by wildlife. Select plants for both the wetland and surrounding collar from the list provided in this report (Table 1).

Once further detail on the precise area parameters and potential location of each pond is known these features can be further assessed if necessary.

6.2 Planning for Flooding

The site is entirely located below the 5m amsl contour within the EFZ. As previously discussed, it is highly sensitive to flooding and most of the proposed development area is around the 2.5m contour. The following recommendations apply:

- It is recommended that infrastructure below the 2.5 m contour be reserved to roads, walkways, and structures that can withstand being fully inundated and do not impede floodwaters (are porous/permeable).
- The largest area of the property outside of the watercourse is between the 2.5 and 3.0 m contour. It is recommended that any infrastructure in this area be constructed on a raised foundation to bring it above the 3 m contour. A suitable approach would be to construct buildings on stilts, platforms, or on elevated strip foundations. Buildings above the 3 m contour can take a more conventional approach but should nonetheless consider that rising sea level and increased frequency of severe climatic events due to climate change can increase the frequency and severity of flooding across the entire property.
- No infill should extend beyond the residential area into the buffer. Infill should be kept to a minimum in the housing area only, which is anticipated in any event due to costs.
- The access road to the estate of Dr Malan Street should be moved further west, even if it means clearance of some vegetation. This is to reduce the impact and risk of flooding to the main access point. Infilling to raise the road beyond conventional layering is not recommended as this could increase flooding pressure on the road crossing at Dr Swart Street.
- In all areas, materials should strive to minimise the extent of impervious surfaces (e.g paving and concrete) as this exacerbates the damage during heavy rainfall. Reducing the amount of runoff from impervious surfaces also protects water resources and aquatic biota (e.g. fish and frogs) from pollutants present in runoff from roads etc. A

range of suggested products are provided in as an example of methods to improve water infiltration instead of runoff. The use of pervious materials such as bark, gravel or grass pavers is recommended on as many parking areas, roads, and pathways (Figure 24).

Figure 24. Examples of permeable surface which should be used as an alternative to impermeable paving or road surfaces wherever possible.

6.3 Construction Phase

Note that it is essential that an Environmental Control Officer (ECO) be appointed for the full duration of the construction phase to ensure the stipulated control measures are fully implemented.

The construction phase impacts for the development of residential buildings whether for Option 7 or Option 10 are considered very similar. Albeit at a slightly wider scale for Option 10.

6.3.1 Monitoring and Setback Lines

Prior to commencement of construction, it is necessary to set the clear buffer extent and establish baseline monitoring protocols and values. With mitigation this impact is rated a Negligible Negative (Table 4).

Table 4. Construction: Establishment of Wetland Buffer, Wildlife Corridor and Monitoring

Project phase	**Construction**			
Impact	**Establishment of Wetland Buffer and Wildlife Corridor, and Monitoring**			
Description of impact	**If baseline conditions are not clear and the limit of disturbance established then habitat could be impacted without detection or consequence**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• The Perdespruit Buffer should be delineated by the site surveyor and clearly marked with temporary fencing which still allows the movement of animals through the remainder fo the site and maintains access to the Perdespruit. • The wildlife corridor (except the road section) should be delineated with shade netting by the the site surveyer and no indigenous vegetation should be disturbed in th corridor for the duration of the construction phase. This must be indicated as a No-Go area for all staff and vehicles. • The ECO should conduct a baseline assessment and then weekly monitoring for the duration of earthworks on the site to confirm there is no disturbance to the buffer area. The full extent of the buffer must be walked to establish this. • The ECO must take a weekly water clarity reading using a clarity meter from the Dr Swart Street bridge including a baseline value which can then be used for comparison throughout the earthworks phase of construction. This provides a measure of suspended sediment in the water. The aim is to detect the discharge of any water from the site with a high sediment load.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Likely	The impact may occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	High	The resource is irreparably damaged and is not represented elsewhere
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts				

6.3.2 Excavations and Stormwater Management

Excavations for foundations, sewage sumps sewer lines or water lines could become inundated with water due to a high-water table, or to heavy rainfall during construction. Pumping to remove this water so work can continue is standard in construction, but if discharged to the Perdespruit, this water could cause serious impacts and must not be permitted under any circumstances.

Table 5. Construction: Pumping sediment-laden water out of excavations.

Project phase	**Construction**			
Impact	**Pumping sediment water out of excavations**			
Description of impact	**If discharged to the Perdespruit or nearby stormwater drains it will impact water quality and habitat**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Have materials avilable at the site office for such an event which include bidim fabric and sandbags or similar. • In the event of needing to pump out dirty water, create a nearby temporary coffer dam out of sandbags lined with bidim. Pump the water into the coffer dam allowing the water to drain / evaporate while retaining the silt in the bidim / filter fabric. • Place coffer dams well away from the Perdespruit and on areas of low terrestrial biodiversity. • Under no circumstances can this water be pumped to stormwater drains as they lead to the estuary, or into the Perdespruit itself. • Ensure the Resident Engineer and Construction Manager are fully aware of these mitigation measures.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environment will be able to recover from the impact	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts				

6.3.3 Construction Vehicles Working Near the Perdespruit

This impact relates to the operation of heavy vehicles in close proximity to sensitive habitat of the Perdespruit. Provided all mitigation measures are fully implemented, this is considered to be a Negligible Negative impact (Table 6).

Table 6. Construction: Construction vehicles working near the Perdespruit.

Project phase	**Construction**			
Impact	**Construction vehicles may pollute or damage habtiat in the Perdespruit or adjacent buffer**			
Description of impact	**Pollution of water with petro-chemicals and destruction of plants**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Before construction begins, clearly fence off the Perdespruit buffer area with high visibility, durable material such as posts with orange shade-cloth supported by wire. Shade cloth must leave a significant gap for wildlife movement beneath at apprximately 40 cm high. Signs must be erected indicating this area as a 'No-Go' area. • Construction work must be stopped during and immediately following rainfall. • Vehicle refuelling must take place at the site offices in an area with sandbags and spill kits immediately available to contain spills should they occur. • All construction vehicles must be checked daily for leaks. Should leaks be detected, the vehicle must be removed from the site until it has been repaired. • Consider a fining system for any sub-contractors involved in careless transgressions.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts				

6.3.4 Construction Staff on Site

This impact is related to the presence of large groups of workers where it is often assumed that all staff are aware of the site protocols in terms of Safety, Health, Environment and Quality (SHEQ). From an environmental perspective it is critical that all permanent and casual staff members are made aware of environmental issues. Many of the construction phase mitigation measures are applicable to all personnel working on the site, and site induction meetings are therefore necessary to introduce and orientate all staff to the site's environmental sensitivity.

Table 7. Construction: Construction staff on site.

Project phase	Construction			
Impact	Construction staff on site			
Description of impact	Litter, accidental damage, human waste disposal			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• Clean and adquate toilet facilities (at least 1 toilet per 10 workers) must be provided for all staff working on site, and must be emptied on a regular basis. • Rest areas to be designated for break and lunch times and must include waste disposal (bins) to be cleaned out regularly. • Staff to be briefed that no animal may be deliberately harmed on the site. Protocols must be implemented by the ECO regarding the protection, capture and / or relocation of wildlife affected by construction. • All staff to be informed that no waste disposal of litter or construction materials is permitted on the site. • All staff to be briefed about designated 'no-go' area in the Perdespruit or green corridor areas. • Staff operating heavy earth moving equipment must be informed that vehicles may not enter 'no-go' areas under any circumstances. • New / casual staff must be briefed as above.			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Short term	Impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Low	Natural and/ or social functions and/ or processes are somewhat altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	High	The affected environment will be able to recover from the impact	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	Minor - negative		Negligible - negative	
Comment on significance	These impacts can be easily mitigated through effective communication and regular follow ups from the construction team and foreman on site.			
Cumulative impacts	Not applicable.			

6.3.5 Post-construction Rehabilitation

Any bare areas of soil, as well as gardens should aim to be revegetated with plants that naturally occur on the site and in the area associated with the mapped vegetation type. This will ensure that wildlife (birds, insects and other animals) have a continued source of habitat for feeding and breeding. These plants are also adapted to the sandy soils of the site, whereas many other species require serious improvement of the soil to survive and will likely never thrive. These plants will prove an attractive, low maintenance and sustainable solution to landscaping and rehabilitation. A list of plants recommended for this purpose is provided in Table 8.

The impact of not using these plants and revegetating bare areas is a Moderate Negative, but if active rehabilitation and gardening / landscaping utilises this list of plants, then the impact will be a Negligible Negative.

Table 8. Indigenous plants local to the site and surrounds which are recommended for planting and rehabilitation in terrestrial or wetland areas (artificial wetlands).

Species	Common Name	Growth Form	Terrestrial	Wetland
Aloe arborescens	Candelabra aloe	Shrubby aloe	✓	
Brunsvigia orientalis	Candelabra lily	Low growing bulb	✓	
Carprobrotus edulis	Edible sourfig	Succulent ground cover	✓	
Diospyros dichrophylla	Poison starapple	Shrub	✓	
Ekebergia capensis	Cape Ash	Tree	✓	
Elegia tectorum	Cape thatching reed	Medium shrub	✓	
Falkia repens	Pink ear	Ground cover	✓	✓
Felicia echinate	Dune felicia	Small shrub	✓	
Gnidia anthylloides	Brandbossie	Small shrub	✓	
Grewia occidentalis	Crossberry	Shrub	✓	
Helichrysum cymosum	Fume everlasting	Small, spreading shrub	✓	✓
Helichrysum petiolare	Licorice plant	Sprawling low shrub	✓	
Juncus krausii	Brak rush	Small shrub		✓
Leonotis Leonurus	Common lionspaw	Large shrub	✓	
Metalasia muricata	White bristle bush	Small shrub	✓	
Osteospermum monoliferum	Bietou	Small tree	✓	
Passerina corymbosa	Common gonna	Shrub	✓	
Pelargonium capitatum	Common storksbill	Small shrub	✓	
Phylica ericoides	Hardebos	Small shrub	✓	
Pittosporum viridiflorum	Cheesewood	Tree	✓	
Polygala myrtifolia	September bush	Large shrub	✓	
Salvia aurea	Brown sage	Small shrub	✓	
Searsia crenata	Crowberry	Large shrub	✓	
Searsia glauca	Blue kunibush	Shrub	✓	
Searsia laevigata	Dune currantrhus	Large shrub	✓	
Stenotaphrum secondatum	Buffalo Grass	Grass	✓	✓
Virgilia divaricata	Keurboom	Tree	✓	
Wachendorfia paniculata	Butterfly lily	Small shrub		✓
Zantedeschia aethiopica	Arum lily	Small shrub		✓

Table 9. Construction: Post-construction Rehabilitation

Project phase	Construction			
Impact	Post Construction Rehabilitation			
Description of impact	Alien vegetation may spread through disturbed areas and there is a high likelihood of extensive planting of exotic plants inconsistent with support required by the conservation areas.			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	• Anywhere with exposed soil surfaces that were disturbed due to construction should undergo active rehabilitation using plants recommended in this report. • the list of plants provided should be given to all new landowners are the baseline planting guide. At least 70% of gardens should aim to incorporate these species. • Ensure the green corridors are well vegetated and offer adequate cover and food for wildlife.			
Assessment	Without mitigation		With mitigation	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	Impact will last between 1 and 5 years
Extent	Limited	Limited to the site and its immediate surroundings	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	Moderate - negative		Negligible - negative	
Comment on significance				
Cumulative impacts				

6.4 Operational Phase

6.4.1 Management of the Perdespruit and Buffer

The Perdespruit and buffer area require a mix of active and passive management approaches. Various proposals have been discussed regarding the recreational use of this area, and previous layouts included a bird hide, tea garden and walkway in the buffer and extending into the wetland (on the eastern side of the Perdespruit). These types of development are not supported given the CBA1 status of the Perdespruit, and the impact assessment assumes this type of development as the 'without mitigation' scenario presented in Table 10. With mitigation measures, the impacts are anticipated to be a Negligible Negative.

Table 10. Operation: Disturbance to wetland through excessive recreation and poor management

Project phase	**Operation**			
Impact	**Disturbance to the wetland through recreation or management actions**			
Description of impact	**Habitat degradation resulting from excessive human disturbance and poor vegetation management in the wetland.**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**• The buffer should be marked out as soon as possible to ensure the delineation of this important setback line is clear. Periodic fence poles along the line, with a single rope running between poles could suffice. • Continue follow up alien vegetation control along the Perdespruit and buffer, but do not pile cut alien trees in the wetland as this smothers habitat. • Remove alien vegetation in the wetland and buffer by hand, (saws, tree poppers, clippers). No heavy vehicles may enter the buffer or Perdespruit area. • No structures (bird hides or walkways can be built in the Perdespruit. There is already a heronry, but no further structures would be recommended. • One bird hide and a walkway could be built within the buffer area provided the footprint is not covering sensitive vegetation. Choose a route that creates the lowest disturbance footprint possible. • The boardwalk / walkway cannot run along the buffer for a signficant distance or it will create a disturbance that fragments habitat, creating a barrier between the Perdespruit and adjacent areas. A length along the buffer of approximately 100m is recommended. • It is strongly encouraged that interpretive information boards about the Perdespruit and estuarine habitat be included. • An often-overlooked impact is the abundance of lights that accompany development. It is important that the entire buffer and wetland area remain free of lighting, and the development in general minimises the use of unnecessary lighting.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Short term	Impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts				

6.4.2 Landscaping and Private Gardens

Given the site is one of the last remaining areas of low transformation in Sedgefield, the complete loss of indigenous vegetation that occurs on the site would be undesirable and unsustainable. Indigenous vegetation to the area provides food for a host of insects (many have species-specific associations), birds and other wildlife. Other areas along the Perdespruit have been completely transformed and are now only covered by grass which does very little in terms of biodiversity support (Figure 25). Transformation of areas beyond individual gardens to the degree indicated in Figure 25 would create significant fragmentation of habitat and biodiversity loss and should not be considered. The opposite bank provides a comparative example of vegetation maintained in a natural state which supports a much higher degree of complexity and diversity. This should be the primary aim and is consistent with labelling the open space areas as 'conservation areas.'

The impact assessment indicates a Moderate High negative impact if no landscaping and gardening guidelines are followed. Whereas if mitigation measures are fully implemented as per Table 11 the risk is reduced to a Negligible Negative impact.

Table 11. Operation: Landscaping and Gardening

Project phase	**Operation**			
Impact	**Landscaping and gardens intorduce replace biodiversity with alien and exotic vegetation**			
Description of impact	**Loss of biodiversity and habitat, possible introduction of alien invasive species**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**• Write into the terms and coditions of ownership that at leaset 70% of gardens should represent indigenous plants indicated on the list provided in this report. • Any landscaped areas in the estate should use primarily rescued plants from other disturbed areas of the site, or purchased from nurseries if they are on the list provided in this report. • Landscaped areas should not extend to more than 10 m beyond the residential boundary. Beyond this there should be no planting of vegetation unless it is only lis provided, and even then it is preferable to leave the vegetation in a natural and undisturbed state. • The main management required for the conservation area and along the Perdespruit is the removal of alien vegetation such as Port Jackson. When removed, this must not be discarded into the Perdespruit or left to die in situ where it smothers other vegetation. It must be chipped, cut smaller and scattered, or removed from the site.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	Very high	Natural and/ or social functions and/ or processes are majorly altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Rare / improbable	Conceivable, but only in extreme circumstances, and/or might occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Moderate - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts				

Figure 25. Vegetation abundance and biodiversity along opposite banks of the Perdespruit downstream of Dr Malan St.

6.5 Preferred Layout Plan

Without knowing the details of the agricultural activities proposed in Plan 7 and Plan 10 a comprehensive and objective comparison between layouts is not possible. While on the surface it may appear to be less of an impact as there may be less permanent transformation of the land, the prospective use of herbicides, soil disturbance and other chemical inputs could represent a high impact. This is all very much dependent on the type of activities.

Both plans require the preservation and maintenance of functional green corridors and the buffer along the Perdespruit. Landscaping and gardening will need to be carefully considered to maintain biodiversity at the site. This is considered feasible but will need professional landscaping inputs underpinned by advice from the aquatic and terrestrial ecologist.

In the absence of knowledge of more specific details for Plan 7, the preferred Plan 10 is considered preferable. If the density of units could be som what reduced or rearranged within the space to create larger corridors that would be positive, but the current layout is acceptable.

7. WATER USE AUTHORISATION

The full extent of RE/1627 is located below the 5 m topographical contour and is therefore defined as part of the estuary because it is located within the Estuarine Functional Zone.

The NWA defines a watercourse as:

a) a river or spring;
b) a natural channel in which water flows regularly or intermittently;
c) a wetland, lake or dam into which, or from which, water flows; and
d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Estuaries are excluded from the definition of a watercourse, unless there is the presence of significant areas of freshwater habitat associated with the site. This is not the case with the Perdespruit which is strongly estuarine in character.

This means that Section 21 c) and i) water uses are excluded from further assessment given that they apply to developments within the regulated area of a watercourse.

An estuary is however, defined as a Water Resource in terms of the NWA. GN 665 (2013) provides limits of the General Authorisation for Section 21g) water use classified as 'Disposing of waste in a manner which may detrimentally impact on a water resource.' Therefore, the disposal of waste could trigger a Section 21g) water use that requires authorisation. This will be confirmed with the Breede-Olifants Catchment Management Agency during the Pre-Application meeting.

8. CONCLUSIONS

This report provides a preliminary assessment of two alternative development layouts proposed for RE/1627. Of the two proposed layouts, Option 10 (the Preferred Layout) is supported. However, this preference is of a low confidence given that the specific agricultural activities proposed in both of the layouts are unknown. Given that both the Preferred and Alternative layouts have a similar footprint of Residential Zone 1 housing near the main aquatic feature (the Perdespruit), their direct impacts to the aquatic ecosystem are considered very similar.

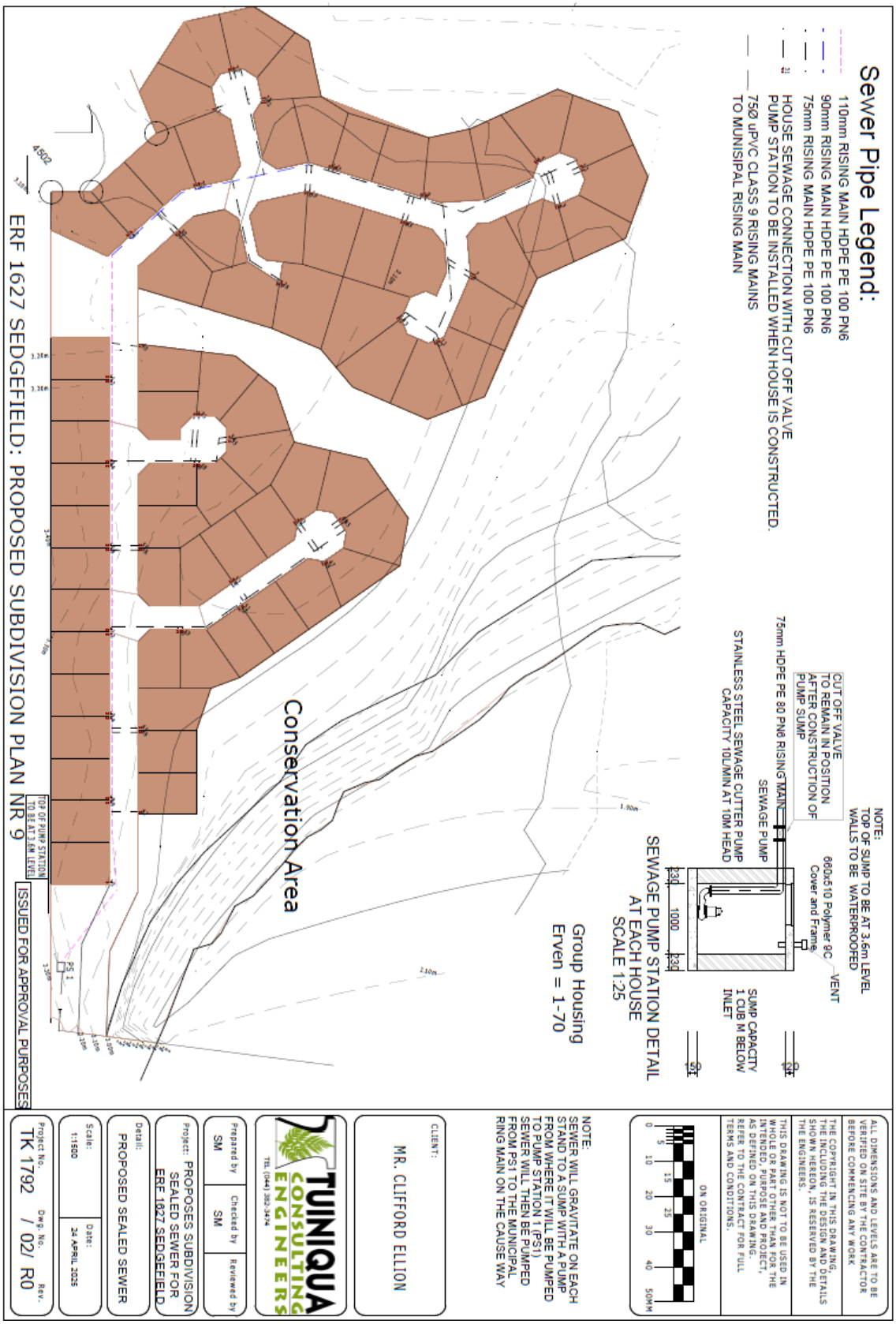
The history of disturbance to terrestrial areas, with decreasing sensitivity in a westerly direction (away from the Perdespruit) lends the site to development. However, as a large remaining fragment of relatively untransformed land linked to the Perdespruit which is of high conservation value, corridors and connections must be carefully considered in the design and layout of the proposed development. Several suggestions to this effect have been made in the impact assessment of this report.

Most anticipated impacts relating to the construction and operational phase of the development can be mitigated to a negligible negative level provided mitigation measures are fully implemented.

Ideally the long-term protection of the Perdespruit should be established through a conservancy of sorts to which all adjacent landowners are participants. There is currently a great divergence in how the Perdespruit is managed. Long-term protection of this important habitat and significant natural space in Sedgefield should be informed by a dedicated Environmental Management Plan. The 30m buffer for instance, should be included throughout the Perdespruit and be implemented by all land-owners.

9. APPENDICES

9.1 Appendix 1: Sewerage Layout Plan



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