

FINAL REPORT

PROJECT TITLE: LAKE DE LA VIEW GUESTROOMS

PROJECT LOCATION: REMAINDER PORTION 78 OF THE FARM
CRAGGA KAMMA NO. 23, NELSON MANDELA BAY METROPOLITAN
MUNICIPALITY, EASTERN CAPE

PROJECT ASSESSMENT TYPE: BOTANICAL & AQUATIC SURVEY AND
ASSESSMENT



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SPECIALIST STATEMENT DETAIL

This statement has been prepared with the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (107 of 1998), any subsequent amendments and any other relevant National and / or Provincial Policies related to ecological or biodiversity assessments in mind, such as the National Environmental Management: Biodiversity Act (10 of 2004) and National Water Act (36 of 1998).

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I, **Ms Deborah Vromans**, declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs.

Signed:



Date: 3 October 2017 (Draft) / 9 August 2018 (Final)

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Thanks are also extended to **Dr Brian Colloty** (SACNASP Reg. no. Ecologist 400268/07) for reviewing the aquatic findings and risk matrix for the large wetland system (Lake de la Vie).

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EXECUTIVE SUMMARY

The proposed development is comprised of three guesthouse units, parking space and two vehicular/parking bypasses, with associated services, measuring ~1,900 m² (0.19 ha), and situated on Remainder Portion 78 of the Farm Cragga Kamma No. 23 (Seaview, Port Elizabeth, Nelson Mandela Bay Metropolitan Municipality, Eastern Cape Province). Three alternative sites or layouts were investigated. Alternative 3 was designed based on input from DEDEAT and DAFF to avoid alternative 1 (see Figure 19 below).

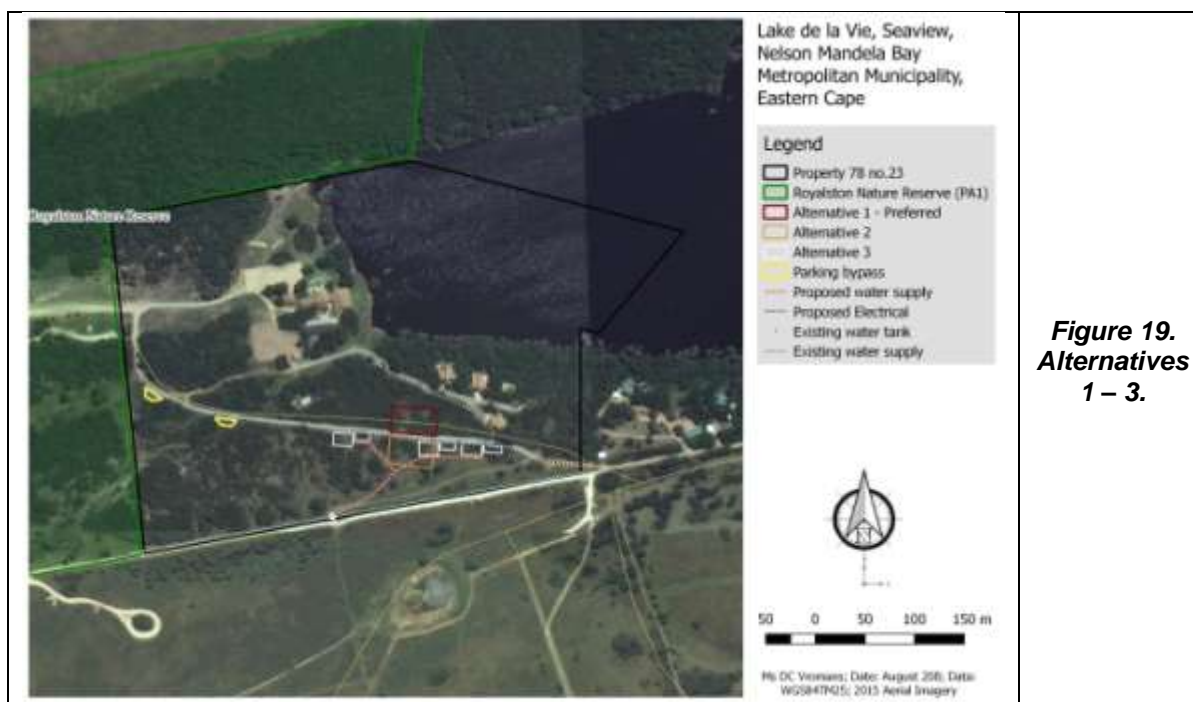


Figure 19.
Alternatives
1 – 3.

Aquatic Resources – Site Assessment Results (Section 4.2)

Lake de la Vie: The extensive natural wetland or lake, referred to locally as Lake de la Vie, is situated approximately 67 m to 102 m horizontally; and 15 m - 30 m vertically from Alternative 1 and Alternative 2 & 3 sites respectively. The wetland 'Present Ecological State' is moderately modified, while the ecological importance is moderate-high (Score 2.8), ecological sensitivity is moderate (Score 2) and the combined ecological importance and sensitivity rating is high (Score 3) (Table 7). The wetland hydro-functional importance is moderate (Score 2) (Table 8). The wetland will not be impacted on by the proposed development due to the vertical and horizontal distances afforded.

Dam: A dam with wetland habitat lies to the south of the property, on adjacent land, approximately 91 m to 117 m from the proposed footprints. The proposed development does not fall within the dam's catchment due to topography; and will not be impacted on. The dam (with wetland habitat) could not be surveyed and assessed as access was not possible. The dam was excavated around 2009, confirmed via historical Google Earth imagery. It is thus not a natural wetland.

Water use application: A water use application to the Department of Water and Sanitation (DWS) for the wetland, Lake de la Vie, as the proposed development is situated within the 500 m regulated area of a watercourse. A general authorisation is likely to be required based on the risk assessment, low post mitigation (Section 4.2.5), however the DWS should be consulted. *It is the assessor's opinion that, because the dam (noted above) was excavated in 2009 and because it will not be impacted on in any way, a water use application should not apply to the dam, however feedback from DWS should be acquired.*

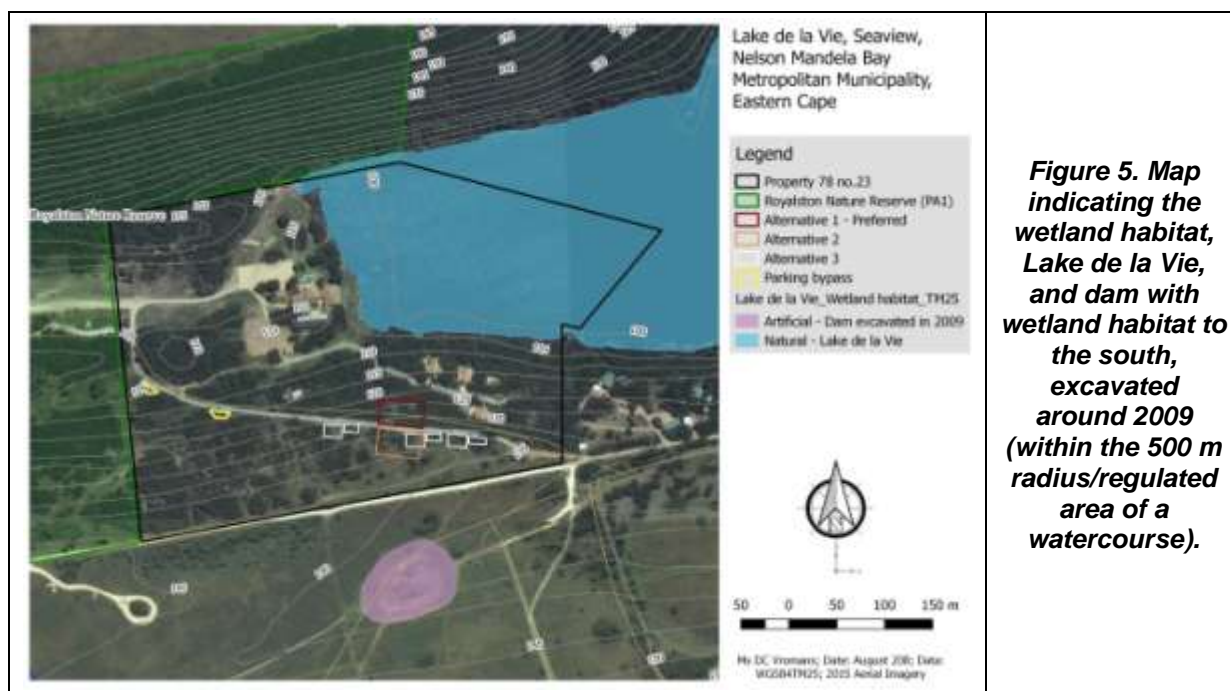


Figure 5. Map indicating the wetland habitat, Lake de la Vie, and dam with wetland habitat to the south, excavated around 2009 (within the 500 m radius/regulated area of a watercourse).

Terrestrial Habitat – Site Assessment Results (Section 5.2)

The alternative sites are situated within Vulnerable Algoa Dune Thicket (Vlok and Euston-Brown, 2002). According to the Nelson Mandela Bay Bioregional Plan's vegetation map classification (SRK, 2009/2014), this is likely to represent Critically Endangered Chelsea Forest Thicket Mosaic, as Algoa Dune Thicket occurs as a mosaic thicket with forest on northern facing slopes (while noting that it was mapped by the bioregional plan as Bushy Park Indian Ocean Forest, which occurs on south facing slopes – refer Section 5.1.1). Alternative 1 site is natural to near-natural, whereas Alternative 2 and 3 sites are degraded (Refer Figure 10).

Species of Special Concern: Protected Species

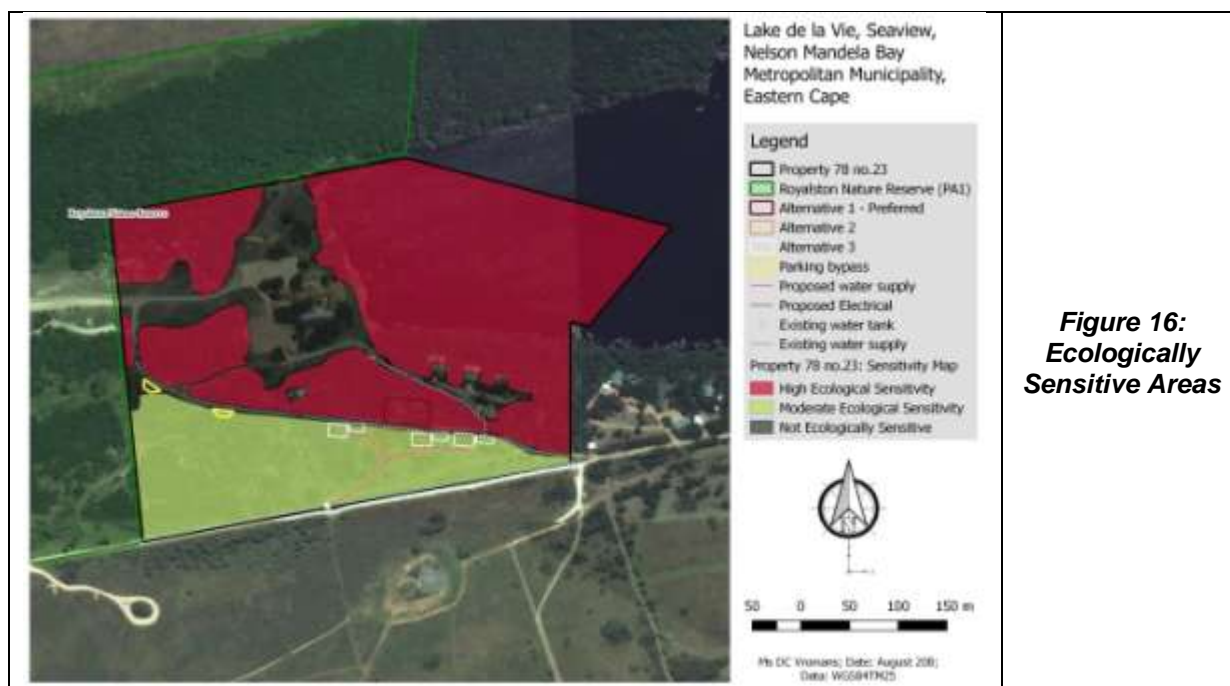
Species	Family	Red Data Listing	Protected By
1. <i>Aizoon rigidum</i> (<i>Galenia pubescens</i>)	AIZOACEAE	Least Concern	PNCO
2. <i>Brunsvigia gregaria</i>	AMARYLLIDACEAE	Least Concern	PNCO
3. <i>Carpobrotus edulis</i>	AIZOACEAE	Least Concern	PNCO
4. <i>Acrolophia capensis</i>	ORCHIDACEAE	Least Concern	PNCO
5. <i>Moraea britteniae</i>	IRIDACEAE	Least Concern	PNCO
6. <i>Pittosporum viridiflorum</i>	APOCYNACEAE	Least Concern	NFA
7. <i>Sideroxylon inerme</i>	SAPOTACEA	Least Concern	NFA
8. <i>Ruschia</i> sp.	AIZOACEAE	Least Concern	PNCO

Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) (Section 7)

Based on the site survey and assessment results (Section 4 - 6), the areas on which the alternatives are positioned should be classed as Critical Biodiversity Area (Alternative 1) and Ecological Support Area 1 (Alternative 2 and 3). This is based on the condition of the vegetation and proximity to the large wetland (Lake de la Vie) given that most of the land is natural/ near-natural and degraded (Section 6).

Ecologically Sensitive Areas (Section 8)

These were identified based on both the vegetation assessment (Section 5.2) and the aquatic assessment (Section 4.2), including the critical evaluation of the CBA Map (Section 7.2).



**Figure 16:
Ecologically
Sensitive Areas**

Impact Assessment and Recommendation regarding Alternatives (Section 10.2 – 10.4)

All post mitigation impacts are equivalent for both alternatives 1 and 3. Alternative 1 has a slightly higher rating for the removal of vegetation and CBA but still retains a moderate post mitigation impact (Table 24). This is largely due to the small scale nature of the proposed development (and existing development) which allows for the remaining near-natural areas to be retained, while the recommended biodiversity offset, to compensate for the loss of CBA and ESA, would involve rehabilitation of the degraded and modified areas (see Figure 11).

Alternative 1 on the one hand encourages nodal development or clustering as it is proximate to the existing development, which is a generic recommendation in order to reduce impacts on the natural environment. Alternative 2 and 3 are both positioned within degraded areas, but which is not significantly degraded and can be viewed as “secondary vegetation”, representing ESA (according to this site assessment/ site verification of the CBA Map). It was cleared for intensive cultivation in the past, as indicated in the 1939 aerial imagery (Figure 12, Section 6.1). Both alternatives 2 and 3 are positioned further from the existing development, and therefore do not encourage nodal development.

Alternative 1 could potentially be developed if rehabilitation of the degraded areas (Figure 11) is implemented. This can be in the form of planting small clusters (groups) of indigenous trees (which should include the protected trees) in order to encourage natural restoration over time in the degraded areas. This is the recommended biodiversity offset for permitting development on Alternative 1 site (but only on approval from the relevant Authorities); and is encouraged for the Alternative 2 and 3 as well.

This recommendation is also supported by the fact that the applicant owns the ‘Royalston Estate and Private Wildlife Reserve’; as well as the Royalston Nature Reserve (currently measuring 413.244 ha), which lies adjacent to the property. The Royalston Nature Reserve is largely natural, with some modified land (approximately 8.8 %); and is largely classified as CBA and ESA. The Royalston Nature Reserve, combined with the Cragga Kamma property thus promotes conservation under the current landownership. In addition, the applicant is undertaking rehabilitation in the Royalston Estate & Private Wildlife Reserve (also owned by the Applicant) by planting indigenous trees.

The loss of approximately 1,900m² of vegetation within this context is not deemed a fatal flaw for permitting Alternative 1 (but only on approval from the relevant Authorities).

However, due to the recommendations received from the DEDEAT and DAFF, which is not in favour of Alternative 1 from being developed, Alternative 1 is likely not feasible. In order to comply with the recommendations from the DAFF, the Applicant has proposed the Alternative 3 layout (Figure 19). According to this assessment, Alternative 3 is feasible from an ecological perspective given the reasons stated above.

Summary of impacts pre- and post-mitigation (Table 24, Section 10.5.2)

ENVIRONMENTAL IMPACT	DEVELOPMENT PHASE	PRE- MITIGATION			POST MITIGATION		
		Alternative 1	Alternative 2	Alternative 3	Alternative 1	Alternative 2	Alternative 3
PROJECT SPECIFIC IMPACTS							
IMPACT 1: Loss of vegetation due to clearing	Construction	Moderate (-70)	Moderate (-65)	Moderate (-65)	Moderate (-60)	Moderate (-50)	Moderate (-50)
		<u>Electrical reticulation</u> Moderate (-60)			<u>Electrical reticulation</u> Low (-)		
IMPACT 2: Loss of species of special concern due to clearing	Construction	Moderate (-50)	Moderate (-50)	Moderate (-50)	Low (-)	Low (-)	Low (-)
IMPACT 3: Loss of Critical Biodiversity Area and Ecological Support Area due to clearing	Construction	Moderate (-70)	Moderate (-65)	Moderate (-65)	Moderate (-)	Moderate (-)	Moderate (-)
		<u>Electrical reticulation</u> Moderate (-60)			<u>Electrical reticulation</u> Low (-)		
IMPACT 4: Spread of alien invasive plant species due to clearing	Construction & operations	Moderate (-65)	Moderate (-65)	Moderate (-65)	Low (-)	Low (-)	Low (-)
IMPACT 5: Loss of vegetation due to erosion as a result of increased stormwater run-off from hardened surfaces	Operations	Moderate (-55)	Moderate (-55)	Moderate (-55)	Low (-)	Low (-)	Low (-)
CUMULATIVE IMPACTS							
ENVIRONMENTAL IMPACT	DEVELOPMENT PHASE	<u>Property</u>	<u>Sub-quaternary catchment M20A</u>	<u>Property</u>	<u>Sub-quaternary catchment M20A</u>		
IMPACT 1: Loss of vegetation due to clearing	Construction	Moderate (-60)	Very High (-85)	Low (-)	Moderate (-)		
IMPACT 2: Loss of species of special concern due to clearing	Construction	Low (-42)	Moderate (-64)	Low (-)	Low (-)		
IMPACT 3: Loss of Critical Biodiversity Area and Ecological Support Area due to	Construction	Low (-42)	Very High (-85)	Low (-)	Low to Moderate (-)		

clearing					
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Summary of recommended mitigation measures per impact (Section 10.4)

Compile an Environmental Management Programme which provides the following specifications for implementation by the Environmental Control Officer:
CONSTRUCTION PHASE
IMPACT 1 - Loss of Vegetation due to Clearing
<ul style="list-style-type: none"> • Limit vegetation removal to the disturbance footprint only. This can be improved by fencing in the area with danger tape so as to prevent encroachment into the surrounding areas. • Appropriate preventative measures to be implemented to prevent erosion due to increased stormwater run-off from the construction footprint (due to site clearance that could lead to vegetation loss beyond the footprint). • Rehabilitate any disturbance areas (although these should not occur if construction remains within the footprint, as indicated in bullet 1 above) with indigenous grasses, bulbs and trees, as well as protected species (as indicated in Section 10.3.2) (refer below). • The applicant, Mr Watson, also the landowner of the adjacent properties on Royalston Estate and Private Wildlife Reserve, owns an indigenous tree nursery. Planting indigenous trees within the degraded areas (Figure 11) is also encouraged as a biodiversity offset. Trees can be planted in small clumps, scattered in these areas, to encourage natural restoration over time. Refer impact below in this regard. • 80 % - 90 % vegetation cover should be achieved in areas that are re-vegetated, which should determine the rehabilitation period (including maintenance or establishment period). • The Contractor to provide detailed method statements for rehabilitation / re-vegetation. • An Environmental Management Programme to indicate the above specifications. • An Environmental Control Officer to oversee the implementation of the Environmental Management Programme at strategic intervals.
IMPACT 2 - Loss of Protected Species (Biodiversity Loss)
<ul style="list-style-type: none"> • As many of the herbaceous, succulent or bulbous species should be rescued and translocated to the degraded area (Figure 11). It should be noted that some of the species are weedy, pioneers which establish very easily where disturbance has occurred, especially <i>Aizoon rigidum</i> and <i>Carpobrotus edulis</i> species. Focus should therefore be on the other species. • Purchase as many indigenous trees removed and plant in the degraded area (Figure 11), without disturbing other protected species). The applicant, Mr Watson, also the landowner of the adjacent properties on Royalston Estate and Private Wildlife Reserve, owns an indigenous tree nursery. Planting indigenous trees within the degraded areas is also encouraged as a biodiversity offset. Trees can be planted in small clumps, scattered in these areas, to encourage natural restoration over time. • 100 % survival rate of planted trees is recommended. • License application to the Department of Economic Development, Environmental Affairs and Tourism for the protected species. • License application to the Department of Forestry (of Department of Agriculture, Forestry & Fisheries) for the removal of <i>Pittosporum viridiflorum</i> and <i>Sideroxylon inerme</i> trees. • Rehabilitation of disturbed areas with these species, as soon as possible. • The Contractor to provide detailed method statements for rehabilitation / re-vegetation. • Audit reporting by the Environmental Control Officer to ensure rehabilitation.
IMPACT 3 - Loss of Critical Biodiversity Area due to clearing of vegetation (biodiversity and hydrological process loss)
<ul style="list-style-type: none"> • As per impact 1 and 2. <u>Including:</u> • Retain all other natural areas (including degraded areas that are retaining indigenous vegetation) on the property as CBA or ESA. • Where the vegetation is cleared for the electrical reticulation, rehabilitation must be undertaken (as per impact 1).
IMPACT 4: Spread of alien invasive plants (biodiversity and hydrological process loss)
<ul style="list-style-type: none"> • The contractor will be responsible for clearing and destroying any newly emerging alien invasive plants. • Hand removal is recommended.
OPERATIONS PHASE
IMPACT 4: Spread of alien invasive plants (biodiversity and hydrological process loss)
<ul style="list-style-type: none"> • The applicant is encouraged to prevent the spread of alien invasive plants, as required in terms of the NEMBA alien invasive species regulations (see Section 9).
IMPACT 5: Loss of vegetation due to erosion as a result of increased stormwater run-off from hardened surfaces (biodiversity and hydrological process loss)
<ul style="list-style-type: none"> • Design and construct effective stormwater management and erosion control infrastructure to prevent long term erosion. • The developer should consider permeable parking surfaces and paving areas. \

Compile an Environmental Management Programme which provides the following specifications for implementation by the Environmental Control Officer:

- Rainfall harvesting is encouraged, which should also contribute to reducing the intensity of stormwater run-off from buildings.

1. THE PROPOSED DEVELOPMENT: BRIEF INTRODUCTION, LOCATION AND DESCRIPTION

1.1. INTRODUCTION

Habitat Link Consulting is implementing a Basic Assessment in terms of Section 24(5) of the National Environmental Management Act (107 of 1998) on behalf of the Applicant, East Cape Game Properties (Pty) Ltd (Mr V. Watson).

This botanical and aquatic assessment report will provide input into the Basic Assessment process. Refer to the Basic Assessment report for more detail regarding the listed activities. The aquatic assessment will also provide input into the requirement for a Section 21(c) and 21(i) water use license application (WULA) regarding the General Authorisation in terms of Section 39 of the National Water Act (36 of 1998) (Notice No. 509 of 26 August 2016). Refer to Section 9 for the legislative context.

In terms of the National Water Act (36 of 1998), the following definitions apply to aquatic features:

“Watercourse” means (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 or declare to be a watercourse, and reference to a watercourse includes, where relevant, its bed and banks.

“Wetland” means 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.

Wetlands and dams are therefore included in the definition of a watercourse within the National Water Act. This implies that whatever legislation refers to watercourses will also be applicable to wetlands and dams, where relevant and as indicated by the Authority.

“Riparian habitat” includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

1.2. PROPERTY, LOCATION AND DEVELOPMENT DETAILS

Location

The proposed development is located in Seaview on Remainder Portion 78 of the Farm Cragga Kamma No. 23, which is situated west of Port Elizabeth’s Central Business District (Nelson Mandela Bay Metropolitan Municipality, Eastern Cape Province, 3325CD) (Figure 1).

The property lies adjacent to the Royalston Nature Reserve, which was declared in March 2014; and which is owned by the Applicant. The Royalston Nature Reserve measures approximately 413.244 ha in extent (Refer Figure 1).

Size of Property: Remainder Portion 78 of the Farm Cragga Kamma No. 23

- Approximately 15.95 ha (WGS84 TM25 calculation).

Proposed Development

- Three guesthouse units, parking space and two vehicular/ parking bypasses, with associated electrical and water reticulation and conservancy tanks (closed system where the contents will be periodically pumped out and trucked to the municipal sewage treatment facility).

Size of Development Footprint

- Approximately 1 900 m² (0.19 ha).

Alternative Sites Proposed

Two alternatives were initially proposed, namely: Alternative 1 (preferred) and Alternative 2. A third alternative was then recommended subsequent to consultations with the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) and the Department of Forestry - of the Department of Agriculture, Forestry and Fisheries (DAFF):

- Alternative 1 is preferred by the applicant as the proposed guest units will be positioned outside of the wind and are closer to the existing services infrastructure, north of the existing tar road.
- Alternative 2 is positioned near the crest of the slope in the wind, at a greater distance from existing services infrastructure, south of the existing tar road.
- Alternative 3 was designed to accommodate recommendations from the DEDEAT and the Department of Forestry - to avoid clearing forest-thicket vegetation within the preferred alternative 1 and to develop south of the existing tar road. Refer to Section 10.2, Figure 19, for a close up of the alternatives.

From both a tourism value perspective and an ecological perspective, these alternatives are considered more feasible than placing the units elsewhere on the property, due to enhanced views of Lake de la Vie and the opposing (intact) vegetated slopes. Alternative 1 and 2 promote nodal development to reduce ecological impacts.

Refer to Table 19, Section 6, for the land cover statistics indicating degree of natural versus modified land cover, pre- and post-development.

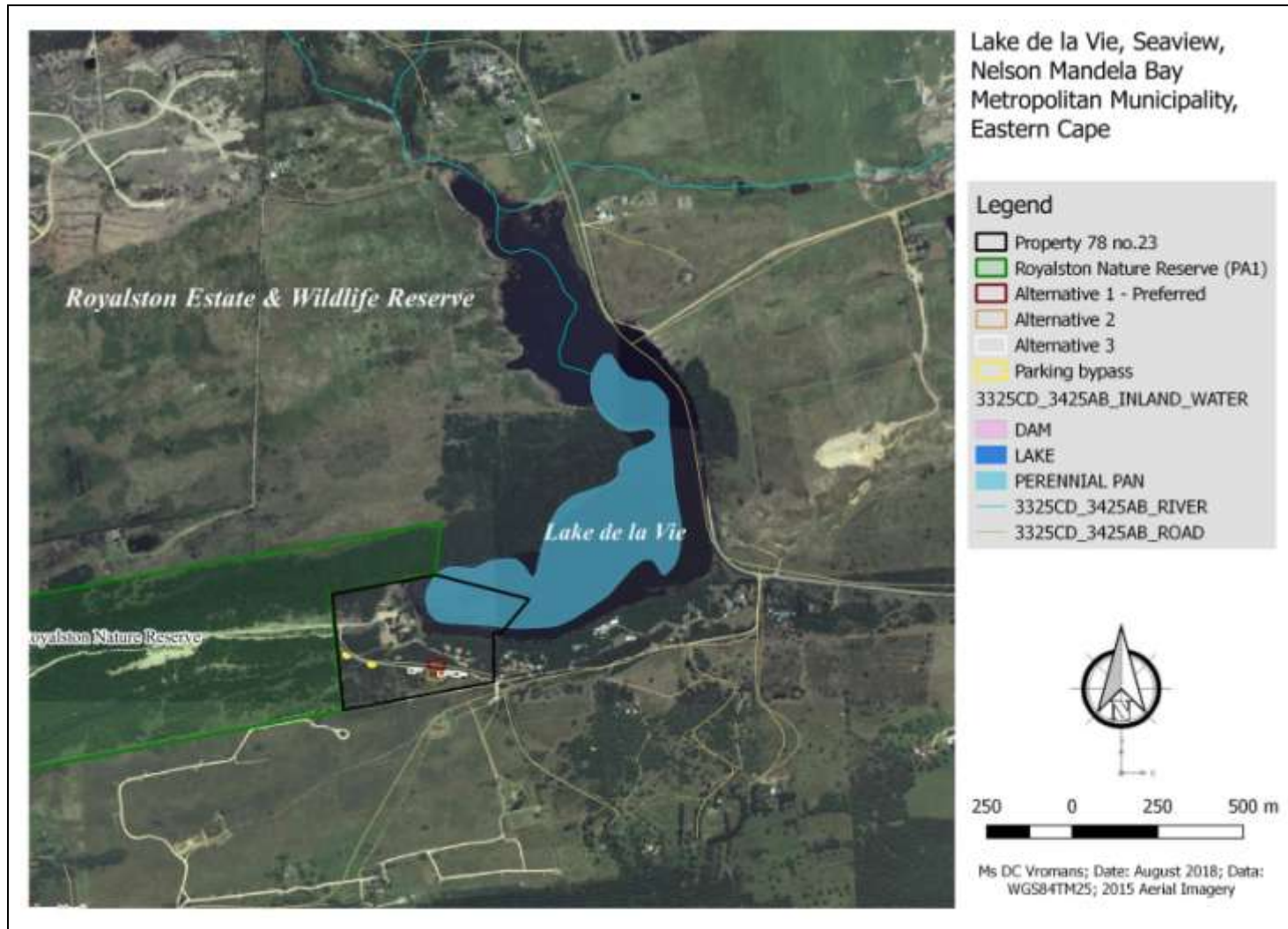


Figure 1. Map indicating the proposed development on Remainder Portion 78 of the Farm Cragga Kamma No. 23 (Nelson Mandela Bay Metropolitan Municipality, Eastern Cape).

2. STUDY METHODOLOGY

A field survey and assessment was conducted on 1 September 2017 in order to assess the vegetation on site, with the objective to determine vegetation type(s) or habitat(s), plant species composition (key species, protected and threatened species) and to determine if any wetlands or drainage lines (watercourses) occur on the site. Sample areas were limited by impenetrable thicket vegetation (Figure 2).

Aerial imagery (2012 aerials, Google Earth 2016 and historical Google Earth imagery) and the National Freshwater Ecosystem Priority Assessment (Nel et al., 2011) wetland data was used to identify wetlands or dams on site and within 500 m of the proposed development footprints, prior to the site assessment. The National Freshwater Ecosystems Priority Areas (NFEPA) Map was also consulted to determine if the catchment is classified as a priority, referred to as Freshwater Ecosystem Priority Area (FEPA).

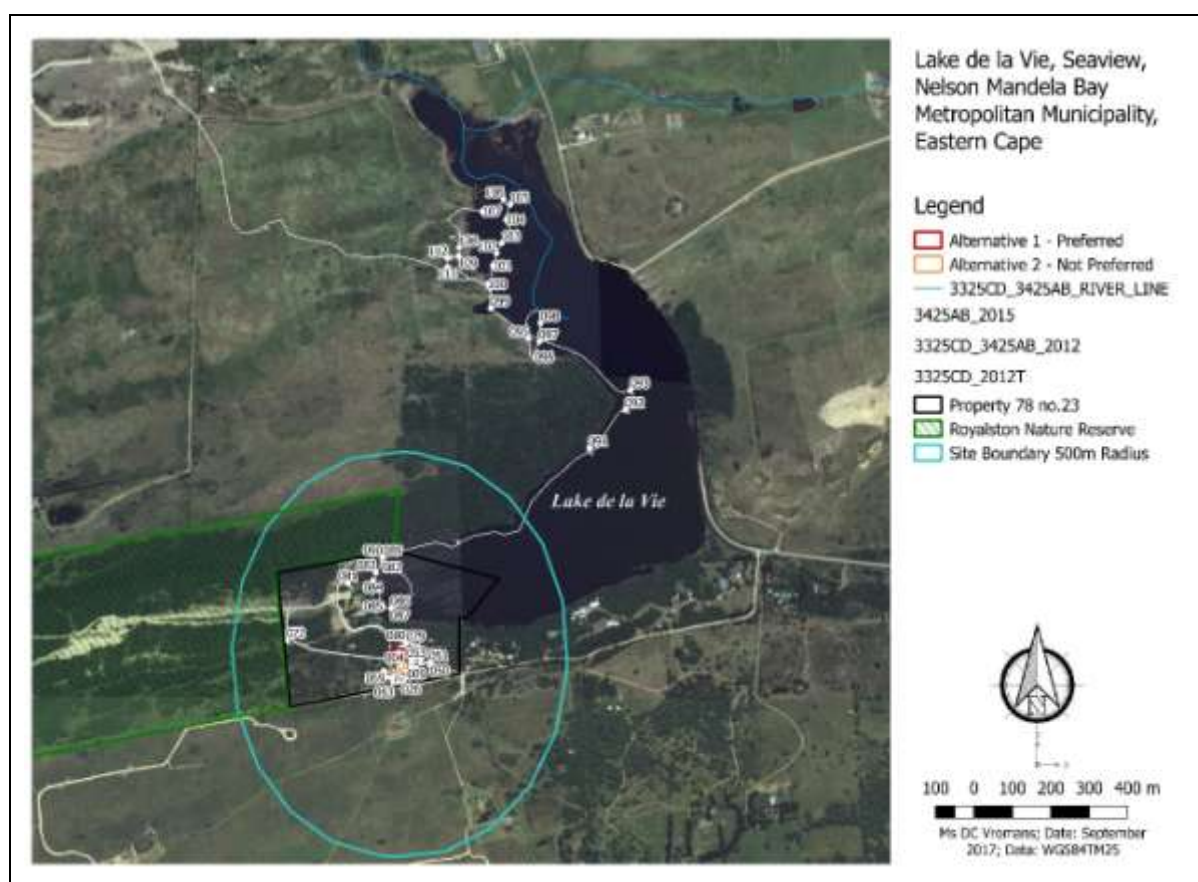


Figure 2. Areas surveyed (waypoints and tracks) during the field assessment.

Available literature was consulted to determine vegetation type (correlated to that identified on site), presence of special habitats and ecosystem status, including potential presence of species of conservation concern. The distribution of species of conservation concern in the region has been mapped by the Maputoland-Pondoland-Albany Hotspot study (SANParks metadata, 2010) according to their location in a Quarter Degree Square (i.e. an area of approximately 30 km by 30 km covered by one 1:50 000 South African topographical map), as well as by the Nelson Mandela Bay Critical Biodiversity Areas (CBA) Map or Bioregional Plan (SRK, 2014) and the South African National Biodiversity Institute (SANBI) plant database (<http://posa.sanbi.org>), quarter degree grid 3325CD. These biodiversity features were mapped with Quantum GIS (Version 2.14), as well as level of degradation or sensitivity of the study site noted.

The Nelson Mandela Bay Critical Biodiversity Areas Map or Bioregional Plan (SRK, 2009, 2014) was consulted. The recommended transformation thresholds of the Eastern Cape Biodiversity Conservation Plan (ECBCP) aquatic CBA map (Section 7.2) was consulted for additional support to the Nelson Mandela Bay CBA Map, although it should be noted that the NFEPA data has superseded the ECBCP aquatic data. The ECBCP CBA Map and the Subtropical Thicket Ecosystem Programme (STEP) biodiversity map are superseded by the Nelson Mandela Bay CBA Map and were therefore not utilized in the assessment.

Wetland Delineation and Assessment

Wetland delineation was directed by the occurrence of typical wetland species adapted to wet conditions (i.e. hydrophytes and obligates¹), including the identification of typical wetland soils (i.e. hydromorphic soils) and the presence of surface water. Generally, a grey soil matrix and/or mottles must be present in the soil horizon to qualify as a wetland (temporary or seasonal), while anoxic conditions reflect a permanent wetland. The methodology described by 'A practical field procedure for identification and delineation of wetlands and riparian areas' (DWAF, 2005) was followed, for the most part i.e. although soil samples were taken, it was evident where the wetland boundary was, while, due to the sandy soils, mottling would not be observed to guide the wetland boundary. Furthermore, the extensive size of the wetland system would require extensive sampling which would make the exercise impractical. A botanical assessment was conducted to identify the presence of key wetland plant species, and species of conservation concern (i.e. protected or threatened species).

GPS coordinates or tracks of the wetland habitat were recorded in the field, coupled with consultation of aerial (2008/12), Google Earth imagery (2004 - 2016) and the 1:50 000 Topographical Data. GIS software (Quantum GIS version 2.14) was used to delineate the aquatic features. Consequently, some error with regards to the accuracy of the boundaries should be expected, especially given the extent of the wetland habitat, as the focus was largely on the boundary within the 500 m radius.

The National Wetland Classification System (SANBI, 2009) methodology was followed, in order to classify natural wetland habitat (Section 4.2.2). **Present Ecological State** (PES) was determined for the natural wetland via the DWAF unpublished methodology worksheets (Section 4.2.3). Refer to Table 1 for the PES categories. The **ecological importance and ecological sensitivity** of the wetland habitat was determined using the DWAF unpublished methodology, which is adapted from Kleynhans (1999). The WET-Eco Services methodology by Kotze et al. (2008) was consulted for additional support, and only ecological services assessed (Section 4.2.4). Data from the vegetation assessment (Section 5) and land cover (Section 6) was consulted to aid in the assessment of wetland ecological importance, namely presence of threatened vegetation types and intactness of vegetation. The SANBI PRECIS database was consulted to determine if any wetland species of special concern occur, as well as the summary data of the Frogs of South Africa, Lesotho and Swaziland (ADU, 2017) and SA Red Data Book of butterflies (Henning et al., 2009).

Dr Brian Colloty (SACNASP Reg. no. Ecologist 400268/07) was also consulted regarding the aquatic findings and risk matrix for the large wetland system (Lake de la Vie).

Table 1. Descriptions of the A-F ecological categories (adapted from Kleynhans, 1996, Kleynhans, 1999; cited in DWAF, 2007 and Kleynhans et al., 2008)

CATEGORY	BIOTIC INTEGRITY	DESCRIPTION OF GENERALLY EXPECTED CONDITIONS	SCORE (% OF TOTAL)
A	Excellent	Natural. Unmodified, or approximates natural conditions closely. The biotic assemblages compares to that expected	90-100%

¹ Grow in wetland or water saturated areas for more than 99 % of the time.

CATEGORY	BIOTIC INTEGRITY	DESCRIPTION OF GENERALLY EXPECTED CONDITIONS	SCORE (% OF TOTAL)
		under natural, unperturbed conditions.	
B	Good	Largely natural. Largely natural with few modifications. A change in community characteristics may have taken place but species richness and presence of intolerant species indicate little modifications. Most aspects of the biotic assemblage as expected under natural unperturbed conditions.	80-89%
C	Fair	Moderately modified. A lower than expected species richness and presence of most intolerant species. Most of the characteristics of the biotic assemblages have been moderately modified from its naturally expected condition. Some impairment of health may be evident at the lower end of this class.	60-79%
D	Poor	Largely modified. A clearly lower than expected species richness and absence or much lowered presence of intolerant and moderately intolerant species. Most characteristics of the biotic assemblages have been largely modified from its naturally expected condition. Impairment of health may become evident at the lower end of this class.	40-59%
E	Very Poor	Seriously modified. A strikingly lower than expected species richness and general absence of intolerant and moderately tolerant species. Most of the characteristics of the biotic assemblages have been seriously modified from its naturally expected condition. Impairment of health may become very evident.	20-39%
F	Critical	Critically modified. Extremely lowered species richness and an absence of intolerant and moderately tolerant species. Only intolerant species may be present with complete loss of species at the lower end of the class. Most of the characteristics of the biotic assemblages have been critically modified from its naturally expected conditions. Impairment of health generally very evident.	0-19%

Limitations of the assessment:

1. One baseline assessment or field visit was conducted, which limits the amount of floral biota identified on site. Plant identification is improved with fertile specimens, which are not present for all species.
2. One baseline assessment or field visit was conducted to identify wetlands, this limits wetland verification i.e. missing seasonal, intermittent or temporary inundation cycles. However, this assessment is considered to have a high confidence.
3. The impenetrable thicket vegetation limited access on Alternative 1, however, the field survey areas are considered to be representative of the site.
4. Some inaccuracy in the hand-held Global Positioning System and Geographical Information System (GIS) is expected.
5. All calculations (distance and area) were done in GIS (WGS 84 TM25).
6. Heads up digitizing on out-dated aerial imagery to assist with mapping boundaries, although Google Earth imagery (2004 - 2016) and field work improved accuracy. The 2012 aerial imagery also improved accuracy as it indicated the high-water mark during high flood events (i.e. under flood conditions).
7. Soil types according to the South African Soil Classification system, which are indicative of wetland soils e.g. Katberg, Willowbrook or Rensburg, would need to be determined by a soil expert. However, it should be noted that according to a discussion in 2013 with the Institute for Soil, Climate and Water, this is in dispute, and therefore mottling and gleying are the most important criteria in determining hydrophitic/wetland soils. A recent discussion (July 2016) has indicated that soil form is important, however, it requires refinement when delineating wetlands (Pers. Comm. Professor P. Le Roux).

8. The depth to groundwater is unknown.

3. THE BIO-PHYSICAL ENVIRONMENT: GENERAL CLIMATE, TOPOGRAPHY AND GEOLOGY

Port Elizabeth is classed as a subtropical climate with light rainfall year round. The Köppen climate classification system, classifies Port Elizabeth as an oceanic climate (Cfb). The area lies between the winter rainfall, Mediterranean climate zones of the Western Cape and the summer rainfall regions of Eastern Cape of South Africa. The average rainfall per annum is 561 mm, and the average annual temperature is 17.4 °C. According to MacFarlane et al. (2008), the M20A catchment receives approximately 695 mm.

The topography of the proposed development area is on a slope. The larger property is undulating with valleys and spurs, including the large lake known as Lake de la Vie.

The predominant geology of the study site is the Nanaga Formation, with Aeolianite (1:250 000 Geological Series Map, Port Elizabeth), also referred to as dune limestone or aeolian calcarenite. The soils on site were sandy.

4. AQUATIC ECOSYSTEMS: RIVERS, WETLANDS AND ASSOCIATED CATCHMENT

The proposed development is situated within quaternary catchments M20A (Mzimvubu-Tsitsikamma Water Management Area) (Figure 3).

An un-named non-perennial river system drains to the north of the property, terminating in a large wetland system, referred to as Lake de la Vie.

4.1. AVAILABLE DATA: NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS (NFEP) MAP

In terms of the National Freshwater Ecosystem Priority Areas (NFEP) Map (Nel et al., 2011), the catchment is not a priority Freshwater Ecosystem Priority Area (Figure 3). A large wetland system, referred to as Lake de la Vie, is positioned to the north of the proposed development, approximately 67 m to 102 m away from the alternatives. It is classed as a natural, depression wetland and is not a priority or FEPA wetland.

Refer to Section 4.2 below for the survey assessment results.

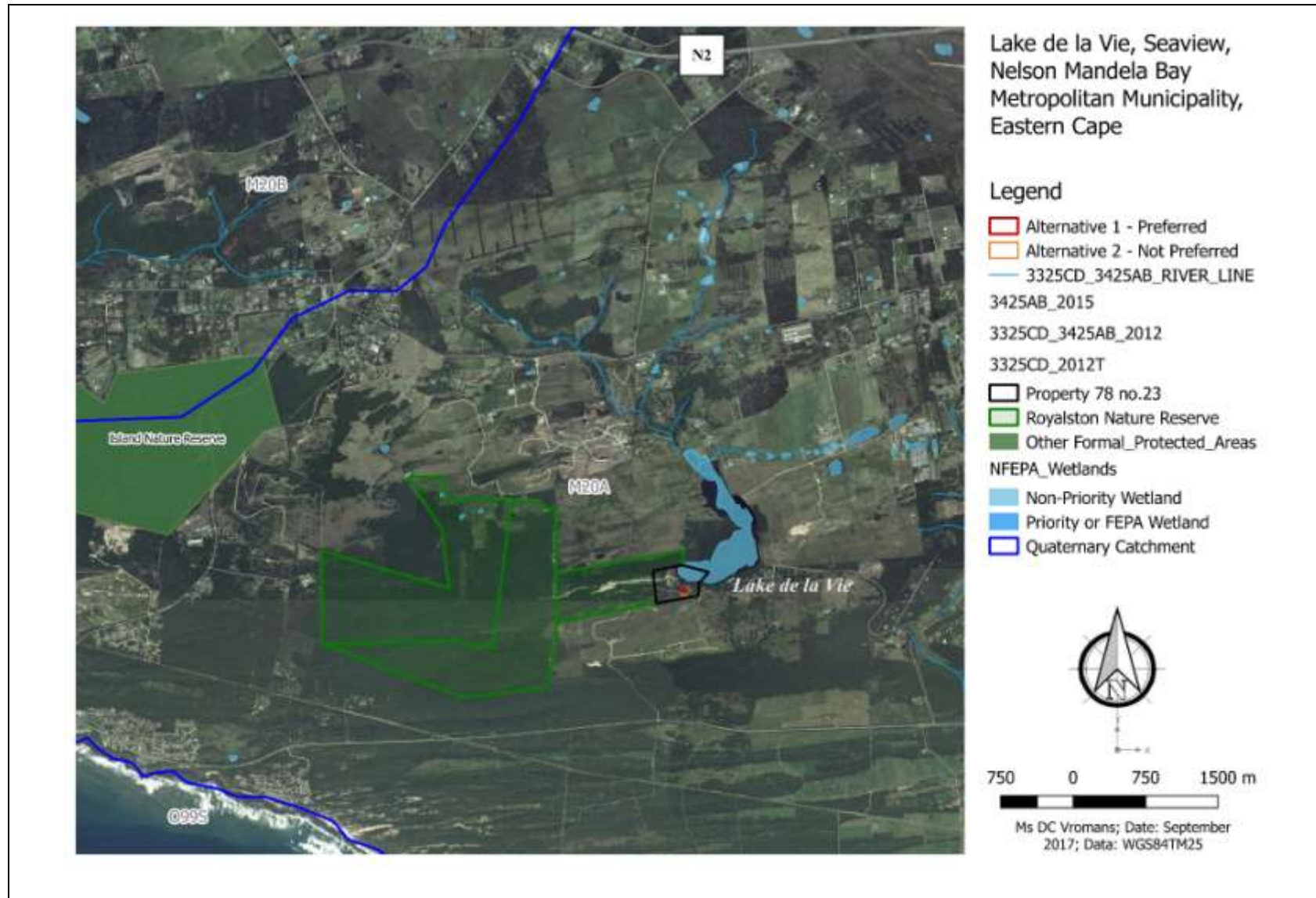


Figure 3. The surrounding catchment, associated rivers and wetland habitat.

4.2. AQUATIC RESULTS - SITE ASSESSMENT OBSERVATIONS

4.2.1. Wetland Delineation and Characterisation

A large natural lake or wetland system is positioned within the 500 m regulated area of a watercourse (Figure 4 and 5). The 1939 historical aerial image (Figure 12, Section 6.1) also shows the presence and extent of the wetland system. As indicated above, it is referred to as Lake de la Vie. It is located approximately 67 m to 102 m horizontally and 15 m - 30 m vertically from Alternative 1 and Alternative 2 & 3 sites respectively. It is approximately 51.5 ha in extent. Refer to Section 4.2.2 for the wetland classification.

A dam with wetland habitat lies to the south of the property, on adjacent land, approximately 91 m to 117 m from Alternative 2 and Alternative 1 sites respectively. The proposed development does not fall within its catchment due to topography; and will not be impacted on. The wetland habitat could not be surveyed as access was not possible. The dam was established around 2009. This is confirmed via the historical Google Earth imagery (Plate 1.5). Also refer to the 1939 historical aerial image (Figure 12, Section 6.1).

Wetland Vegetation

The wetland plants that were supported in the wetland system included *Cyperus durus*, *Cyperus crassipes*, *Cyperus sphaerospermus*, *Cyperus dives*, *Isolepis cernua*, *Eleocharis limosa*, *Eriochrysis pallida*, *Ficinia nodosa*, *Hydrocotyle bonariensis*, *Juncus lomatophyllus*, *Leersia hexandra*, *Paspallum distichum*, *Phragmites australis*, *Pycreus polystachyos* and *Typha capensis*. *Stenotaphrum secundatum* and *Cynodon dactylon* also occurred, along with *Centella asiatica* and *Conyza scabrida*.

Wetland Fauna

The wetland provides habitat for numerous water birds. Plover, yellow-billed ducks, African spoonbills and white-breasted cormorant were observed during the field survey. According to the SANBI Bird Atlas project, several threatened bird species occur within the quadrat (Table 2). According to the Nelson Mandela Bay systematic conservation plan (SRK, 2009, 2014), wetlands provide habitat for the near threatened African bullfrog (*Pyxicephalus adspersus*), which has also been recorded in 3325CD (Animal Demography Unit, UCT; <http://www.adu.uct.ac.za>). A predator bird was observed hunting above the lake during the field survey.

Table 2. Threatened species

Common Name	Scientific Name	Red data Listing / Conservation Status	Likelihood of presence
Tern, Caspian	<i>Sterna caspia</i>	Vulnerable	Yes. Islands, estuaries, inland lagoons.
Bustard, Denham's	<i>Neotis denhami</i>	Vulnerable	Possible, but not aquatic dependent.
Cormorant, Cape	<i>Phalacrocorax capensis</i>	Endangered	Although a coastal bird, possible as recorded at this distance from the coastline.
Crane, Blue	<i>Anthropoides paradiseus</i>	Near Threatened	Possible, although not an aquatic bird it tends to frequent grassland areas with wetlands.
Eagle, African Crowned	<i>Stephanoaetus coronatus</i>	Vulnerable	Yes, but not aquatic dependent. Forest, woodland and tall riverine growth.
Duck, Maccoa	<i>Oxyura maccoa</i>	Vulnerable	Yes
Kingfisher, Half-collared	<i>Alcedo semitorquata</i>	Near Threatened	Yes
African bullfrog	<i>Pyxicephalus adspersus</i>	Near Threatened	Yes

Plate 1. Photographic images of the wetland habitat (Lake de la Vie)

Photographic images of the wetland habitat (Lake de la Vie)



1.1. Looking eastward towards Lake de la Vie, wetland habitat, at the closest part of the wetland to the proposed development (approximately 67 m to 102 m).



1.2. Looking southwards, towards the proposed development (circled area), located behind existing housing units. In the foreground lies the wetland system, with *Ficinia nodosa* and *Cyperus durus*, representing areas that are inundated during flood conditions.

Photographic images of the wetland habitat (Lake de la Vie)



1.3. Wetland areas further northwards, looking in a generally northerly direction.



1.4. Channel visible in upper portion of wetland, looking southwards, beyond the 500 m regulated area of a watercourse.

Photographic images of the wetland habitat (Lake de la Vie)



1.5. The dam or artificial wetland habitat (arrow) established around 2009 on the neighbours property, approximately 91 m to 117 m from Alternative 2 -3 and Alternative 1 sites respectively.

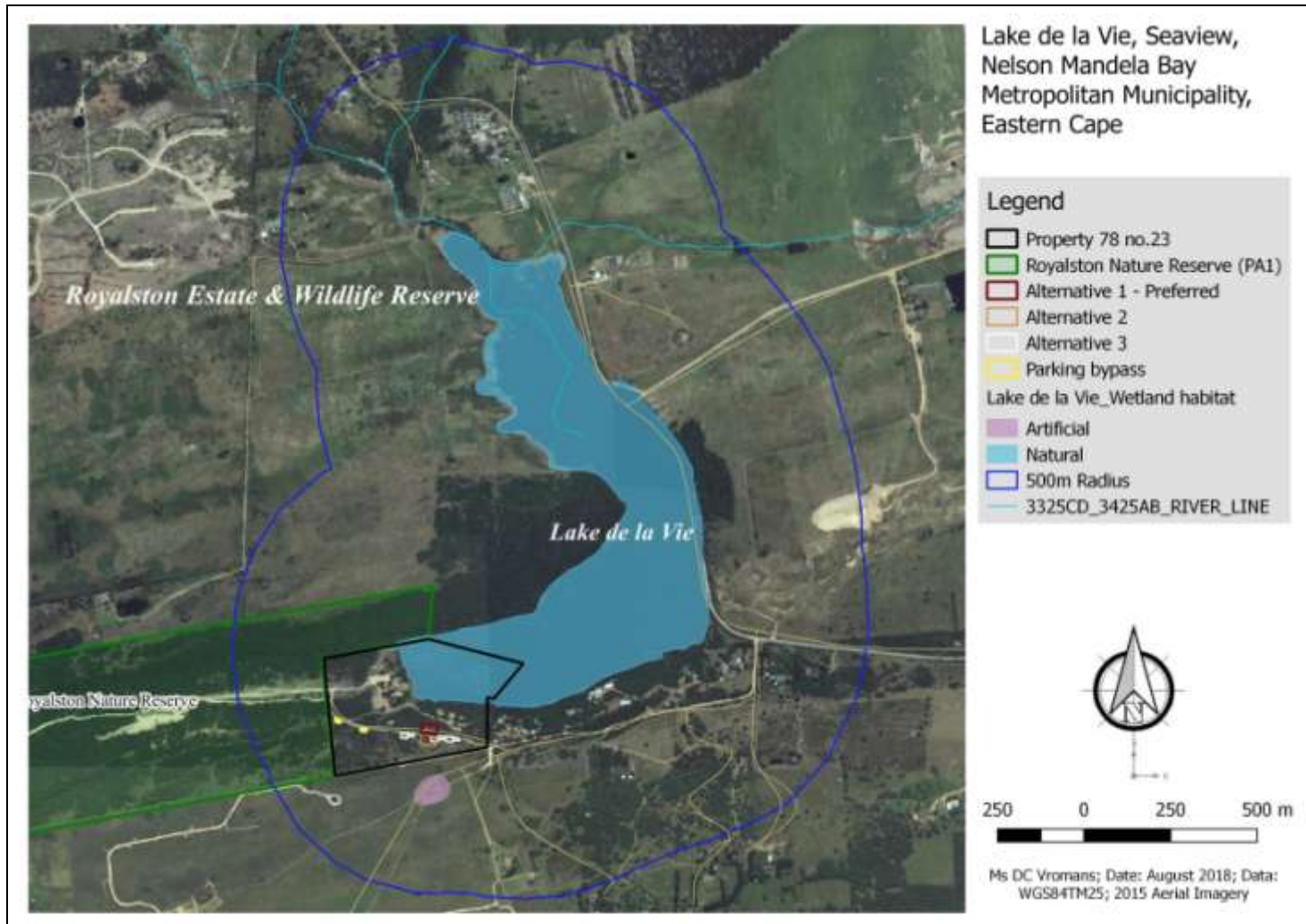


Figure 4. Map indicating the large wetland system, referred to as Lake de la Vie, and associated 500 m regulated area of a watercourse. The artificial wetland or dam, which was established around 2009, to the south, is also indicated. (The delineation is for the flooded condition).

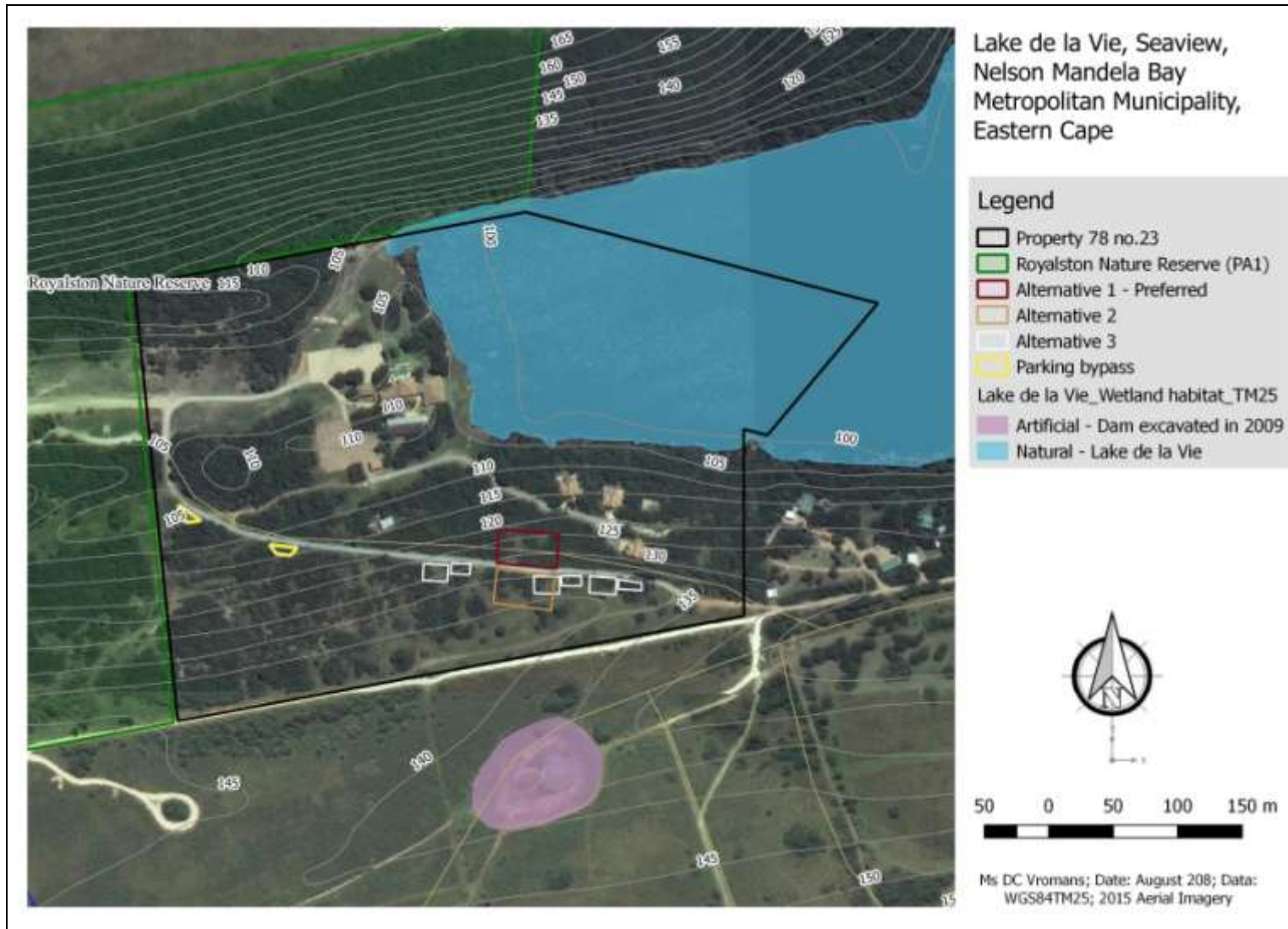


Figure 5. Close up of wetland boundary closest to the proposed development, with contours showing the height above the wetland, Lake de la Vie. (The delineation is for the flooded condition).

4.2.2. Wetland Classification

The national wetland classification system was used to classify the natural wetland, referred to as Lake de la Vie. The wetland classification is provided in Table 3 below.

Based on the classification system, the natural wetland, Lake de la Vie, is a lake, or inter-dune lake system which is likely to be the result of the shifting of sand dunes in the distant past. It has channel inflow via upstream watercourses.

Table 3. Summary table of the classification of the natural wetland (Lake de la Vie) according to the national wetland classification system (SANBI, 2009; Ollis *et al.*, 2013)

CRITERIA		WETLAND – LAKE DE LA VIE	
LEVEL 1: SYSTEM	CONNECTIVITY TO OPEN OCEAN	Inland	
LEVEL 2: REGIONAL SETTING	ECO-REGION	South Eastern Coastal Belt	
LEVEL 3: LANDSCAPE UNIT	LANDSCAPE SETTING	Valley floor	
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT²	HGM TYPE	A	Inter-dune lake (depression)
	LONGITUDINAL ZONATION / LANDFORM	B	Not applicable
	DRAINAGE - UTFLOW*	C	Endorheic
	DRAINAGE - INFLOW*	D	With channel inflow
LEVEL 5: HYDROLOGICAL REGIME (& DEPTH OF INUNDATION)	5A: DEPTH OF INUNDATION: Permanent /Seasonal/ Intermittent/ Unknown		Permanent inundation
	5B: SATURATION PERIODICITY Permanent /Seasonal /Intermittent/ Unknown		Permanently waterlogged
LEVEL 6: WETLAND CHARACTERISTICS (DESCRIPTORS)	GEOLOGY/SOILS:		Sand, dune sand, and/or dune rock
	NATURAL / ARTIFICIAL		Natural
	VEGETATION		Reeds, sedges, grasses
	SUBSTRATUM		Sand. High organic matter in places. Alkaline.
Dominant hydrological characteristics for the HGM unit (SANBI, 2009)			
Inputs	Precipitation, concentrated and (possibly) diffuse surface flow, interflow, groundwater		
Through- puts	Containment and storage of water		
Outputs	Evaporation, infiltration		
Dominant hydrodynamics for the HGM unit (SANBI, 2009)			
Dominant hydrodynamics	Vertical: bidirectional.		

4.2.3. Wetland Present Ecological State

The Present Ecological State (PES) was determined and based on the DWAF methodology (DWAF, 2007) and professional opinion, with input from Macfarlane *et al.* (2008). Water use licensing or authorisation processes usually only require the determination of PES for natural wetlands, whereas

² The hydro-geomorphic (HGM) unit, which is defined on the basis of the geomorphic setting (e.g. hillslope or valley-bottom; whether drainage is open or closed), water source (surface or sub-surface water dominated) and pattern of water flow through the wetland (i.e. diffuse or channelled) (McFarlane *et al.*, 2008).

ecological importance and ecological sensitivity are usually important for all wetland habitats (artificial or natural) (as per previous liaison with the Department of Water and Sanitation, Port Elizabeth).

Land Use Activity Impacts

Land use activities that are potentially impacting on the wetland includes clearing in the catchment (for housing accommodation and access roads), past clearing due to cultivation, increased stormwater due to access roads and the quarry system to the east, alien invasive plants (e.g. *Sesbania punicea*) (within the wetland vegetation), recreational fishing (observed during the field trip) and upstream dams and access road crossings. The quarry to the east results in increased stormwater run-off into the lake, resulting in flooding of the main road along the lakes eastern boundary. Fairly extensive areas of the wetlands catchment were previously cultivated, as indicated in the land cover data (Figure 11). Although this represents a large change in the vegetation cover, it has not likely impacted on the potential for high levels of erosion and sedimentation, as this was not observed in the field.

Refer to Section 6 for a more detailed assessment of land cover on the property, and the larger catchment.

Wetland PES Results

The Present Ecological State is B/C or Moderately Modified (Score 78.3) (Table 4).

Table 4. Present Ecological State of the wetland (Lake de la Vie)

OVERALL PRESENT ECOLOGICAL STATE (PES) SCORE					
	Ranking	Weighting	Score	Confidence Rating	PES Category
DRIVING PROCESSES:	1	100	1.5		
Hydrology	2	80	1.6	3.0	C
Geomorphology	3	30	0.1	3.0	A
Water Quality		80	0.8	4.0	
WETLAND LANDUSE ACTIVITIES:	1	100	0.8	4.0	B
Vegetation Alteration Score	1	100	1.5	3.0	C
OVERALL SCORE:			1.1	Confidence Rating	
	PES %		78.3		
	PES Category:		B/C		
				1.8	

4.2.4. Wetland Conservation Value: Ecological Importance and Ecological Sensitivity

4.2.4.1. Introductory Comments on Methodology

Ecological importance and ecological sensitivity determinations are usually a standard requirement for water use authorisations in terms of Section 21c and Section 21i of the National Water Act (36 of 1998). It also assists with determining buffers and rating impact significance.

Ecological importance, ecological sensitivity and hydro-functional importance was determined only for Lake de la Vie, and not for the artificial wetland that was excavated around 2009 (according to historical Google Earth imagery).

A summary of the hydrological benefits usually derived from the various wetland hydro-geomorphic units (Kotze et al., 2008) is indicated in Table 5, whereas Table 6 indicates the functional or ecological

importance of a wetland relative to its size (Kotze et al., 2008). Table 7 presents factors that contribute to wetland sensitivity (Macfarlane et al., 2006).

All these criteria assist with guiding the importance and sensitivity of the wetland.

Table 5. Preliminary rating of the hydrological benefits likely to be provided by a wetland given its particular hydro-geomorphic type (Kotze et al., 2008)

WETLAND HYDRO-GEOMORPHIC TYPE	HYDROLOGICAL BENEFITS POTENTIALLY PROVIDED BY WETLAND TYPES							
	Flood attenuation		Stream flow regulation	Erosion control	Enhancement of water quality			
					Sediment trapping	Phosphates	Nitrates	Toxicants
Early wet season	Late wet season							
1. Floodplain	++	+	0	++	++	++	+	+
2. Valley bottom - channelled	+	0	0	++	+	+	+	+
3. Valley bottom - unchannelled	+	+	+?	++	++	+	+	++
4. Hillslope seepage: feeding a stream channel	+	0	+	++	0	0	++	++
5. Hillslope seepage not feeding a stream	+	0	0	++	0	0	++	+
7. Pan/Depression	+	+	0	0	0	0	+	+

Rating:

- 0 Benefit unlikely to be provided to any significant extent.
 + Benefit likely to be present at least to some degree.
 ++ Benefit very likely to be present (and often supplied to a high level).

Table 6. Importance of wetland size in contributing to the provision of particular benefits (Kotze et al., 2008)

ECOSYSTEM SERVICES	IMPORTANCE OF SIZE	ECOSYSTEM SERVICES	IMPORTANCE OF SIZE
Flood attenuation	****	Biodiversity maintenance	**
Streamflow regulation	**	Carbon storage	***
Sediment trapping	****	Water supply	**
Phosphate assimilation	****	Harvestable resources	**
Nitrate assimilation	***	Cultural significance	*
Toxicant assimilation	***	Tourism & recreation	**
Erosion control	***	Education & research	*

Key: Size is seldom important*; Size is usually very important***; Size is usually moderately important**; Size is always very important****

Table 7. Examples of key factors determining the sensitivity of wetlands to imported solutes (e.g. pollution, high nutrient loads) relative to the wetland on site (Macfarlane et al., 2008)

POTENTIAL HIGH SENSITIVITY	POTENTIAL LOW SENSITIVITY	WETLAND ON SITE – Lake de la Vie (only)
Naturally nutrient-poor catchments (e.g. sandstone)	Naturally intermediate or high in solutes catchment	Sandy, naturally poor nutrient levels

POTENTIAL HIGH SENSITIVITY	POTENTIAL LOW SENSITIVITY	WETLAND ON SITE – Lake de la Vie (only)
Short, heterogenous vegetation	Tall dense stands of <i>Phragmites</i> , <i>Typha</i> or <i>Cyperus</i> spp.	Mix of short heterogenous vegetation, but with Cyperaceae plants and patch of <i>Phragmites</i> on northern end where adjoined to the streams.
Open water areas	Lacking open water areas	Large open water area
Undisturbed, natural wetland	Disturbed wetland dominated by aliens	Natural
Mean Annual Precipitation : Potential Evapo-transpiration ratio is high	Mean Annual Precipitation : Potential Evapo-transpiration ratio is low	695 mm:1013.8 mm = 1:1.5 = Low
Closed drainage system (endorheic)	Open drainage system (exorheic)	Closed
HIGH	LOW	POTENTIALLY MODERATE TO HIGH (see results)

4.2.4.2. Assessment Results

According to the DWAF unpublished methodology, the wetland ecological importance is moderate-high (Score 2.8), ecological sensitivity is moderate (Score 2) and the combined ecological importance and sensitivity rating is high (Score 3) for Lake de la Vie (only) (Table 8). The wetland hydro-functional importance is moderate (Score 2) (Table 9). Table 10 provides a summary of the important biodiversity features and processes that were utilized to reach the results.

Table 8. Ecological importance and ecological sensitivity (DWAF unpublished methodology)

ECOLOGICAL IMPORTANCE AND SENSITIVITY	Score (0-4)	Confidence (1-5)
Biodiversity support	3.00	4.33
<i>Presence of Red Data species</i>	3.00	3.00
<i>Populations of unique species</i>	3.00	5.00
<i>Migration/breeding/feeding sites</i>	3.00	5.00
Landscape scale	2.60	3.80
<i>Protection status of the wetland</i>	3.00	5.00
<i>Protection status of the vegetation type</i>	2.00	5.00
<i>Regional context of the ecological integrity</i>	3.00	3.00
<i>Size and rarity of the wetland type/s present</i>	3.00	3.00
<i>Diversity of habitat types</i>	2.00	3.00
Ecological Importance of the wetland	2.80	4.07
Sensitivity of the wetland	2.00	3.67
<i>Sensitivity to changes in floods</i>	2.00	4.00
<i>Sensitivity to changes in low flows/dry season</i>	1.00	4.00
<i>Sensitivity to changes in water quality</i>	3.00	3.00
ECOLOGICAL IMPORTANCE & SENSITIVITY	3	3.9

Table 9. Hydro-functional importance (DWAF unpublished methodology)

HYDRO-FUNCTIONAL IMPORTANCE		Score (0-4)	Confidence (1-5)	
Regulating & supporting benefits	Flood attenuation	3	3	
	Streamflow regulation	0	3	
	Water Quality Enhancement	Sediment trapping	4	3
		Phosphate assimilation	2	3

HYDRO-FUNCTIONAL IMPORTANCE		Score (0-4)	Confidence (1-5)
	Nitrate assimilation	2	3
	Toxicant assimilation	1	3
	Erosion control	2	3
	Carbon storage	2	3
HYDRO-FUNCTIONAL IMPORTANCE		2.0	3.0

Table 10 below indicates the results for the methodology proposed by Kotze et al. (2008) for determining ecological importance as it relates to ecosystem services. The assessment for biodiversity related services (not cultural, agricultural or research) indicates a high importance for the maintenance of biodiversity and erosion control.

Table 10. Ecological importance based on Kotze et al. (2008) methodology

Ecosystem Service / Benefit	Overall score	Class for determining likely extent to which a benefit is being supplied
Flood attenuation	1.7	Intermediate
Streamflow regulation	1.3	Intermediate
Sediment trapping	1.0	Moderately Low
Phosphate trapping	1.6	Intermediate
Nitrate removal	2.0	Intermediate
Toxicant removal	2.2	Moderately High
Erosion control	3.0	High
Carbon storage	2.7	Moderately High
Maintenance of biodiversity	2.9	High

Key biodiversity criteria used to determine high ecological importance

Table 11 below presents a summary of the key biodiversity criteria used to determine high ecological importance, as adapted from Kleynhans (1999), and which were utilized in the DWAF (unpublished methodology) for determining ecological importance and ecological sensitivity (as presented in Table 11 below).

Table 11. Summary of key biodiversity criteria used to determine ecological importance

BIODIVERSITY FEATURE / CRITERIA	ON SITE OBSERVATIONS / ASSESSMENT
1. Presence of red data or Threatened species.	<ul style="list-style-type: none"> No threatened plant species recorded. However, a number of water birds have been recorded by the SANBI Bird Atlas Project, which are threatened (Section 4.2.1, Table 2).
2. High species diversity.	<ul style="list-style-type: none"> Species diversity moderate.
3. Presence of unique populations/large populations.	<ul style="list-style-type: none"> Population uniqueness relatively high due to large wetland size and high biodiversity.
4. An important site for breeding, feeding or migration.	<ul style="list-style-type: none"> Local importance for breeding and feeding.
5. Identified as a Ramsar wetland.	<ul style="list-style-type: none"> Not identified as RAMSAR wetland.
6. A rare or unique system, based on wetland vegetation type and wetland type ecosystem threat status (Nel and Driver, 2012).	<u>Ecosystem status of Eastern Fynbos – Renosterveld Sandstone Fynbos (correlates with SA Vegetation Types):</u> <ul style="list-style-type: none"> Depressions: Endangered (Nel and Driver, 2012).
7. High conservation status of surrounding vegetation, namely Critically Endangered, Endangered, Vulnerable.	<ul style="list-style-type: none"> Bushy Park Indian Ocean Forest, Chelsea Forest Thicket Mosaic and Cragga Kamma Indian Ocean Forest, which are mapped around the wetland by the

BIODIVERSITY FEATURE / CRITERIA	ON SITE OBSERVATIONS / ASSESSMENT
	<p>Nelson Mandela Bay Bioregional Plan, of which large areas are modified, are all Critically Endangered.</p> <ul style="list-style-type: none"> Algoa Dune Thicket, mapped on the proposed development footprint(s), is a Vulnerable vegetation type according to the STEP biodiversity targets.
8. Sited in an area of near-natural and untransformed vegetation cover (and is threatened, if not included in a CBA).	<ul style="list-style-type: none"> Largely near natural, with disturbances, mostly within CBA.
9. Identified as a wetland Freshwater Ecosystem Priority Area (priority FEPA wetland) (Nel et al., 2011) or as a Critical Biodiversity Area (includes surrounding vegetation); and a priority PA expansion area.	<ul style="list-style-type: none"> Not classified as a FEPA. However, the wetland falls largely within a CBA; and The assessment concluded a combined ecological importance and sensitivity rating of high (Score 3).

4.2.5. Risk Assessment Matrix

The risks are assessed as low (Table 12).

It is the opinion of the assessor that the wetland habitats will not be impacted on by the development due to both horizontal and vertical distances, whereas the artificial wetland habitat created due to the establishment of a dam around 2009, to the south of the property, will not be impacted on as its catchment does not fall within the footprints of the proposed development (Alternative 1 - 3). The risk is thus low.

The Department of Water and Sanitation risk matrix results are provided in Table 12.

Table 12. Risk assessment matrix required in terms of Section 21c and 21i of the National Water Act (36 of 1998)

NAME & REGISTRATION No of SACNASP Professional member: Reviewed By - Dr Brian Colloty (Reg no. Ecologist 400268/07)														
No	Phases	Activity	Aspect	Impact					Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	
1	Construction phase	Clearing of vegetation for proposed development	Clearing vegetation close to wetland, localized hydrological changes	<p><u>Sedimentation and Erosion:</u> Clearing of vegetation to establish the units will create bare exposed soils that are susceptible to erosion due to bare exposed soils/hardened surfaces, but this is not likely to result in sedimentation or erosion in the wetland habitat due to distances etc.</p> <p>Lake de la Vie is 67m - 102m away horizontally and 15m - 30m away vertically, whereas the dam wetland habitat is 91m to 117m away and not in the same catchment.</p>					1	1	1	1	1	
Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES AND EIS OF WATERCOURSE	
1	1	1	3	1	1	5	1	8	24	LOW	90-100	Construction EMP, Stormwater Management. Adequate Buffer of natural vegetation in place.	Lake de la Vie = High EIS, A/B = PES	

No	Phases	Activity	Aspect	Impact					Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	
2	Operational phase	Hardened, impermeable surfaces established	Clearing vegetation close to wetland, localized hydrological changes	<p><u>Sedimentation and Erosion:</u> The creation of hardened, impermeable surfaces increases stormwater run-off from these areas, but this is not likely to result in sedimentation or erosion of the wetland habitat due to distances etc. Refer above for distances etc.</p>					1	1	1	1	1	
Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES AND EIS OF WATERCOURSE	
1	1	1	3	1	1	5	1	8	24	LOW	90-100	Construction & Design EMP, Stormwater Management. Adequate Buffer of natural vegetation in place.	Lake de la Vie = High EIS, A/B = PES	

No	Phases	Activity	Aspect	Impact					Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph + Vegetation)	Biota	Severity	
3	Construction phase	Accidental spillages of fuel and oils from construction vehicles or sewage from portable ablutions	Localized water quality degradation (surface water)	<p><u>Pollution:</u> Accidental spillages not likely to result in pollution of the wetland habitat. Refer above for distances etc.</p>					0	1	1	1	0,75	
Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES AND EIS OF WATERCOURSE	
1	1	1	2,75	1	1	5	1	8	22	LOW	90-100	Construction EMP, Stormwater Management. Adequate Buffer of natural vegetation in place.	Lake de la Vie = High EIS, A/B = PES	

4.2.6. Wetland Recommendations – Mitigation Measures

Generic Buffers indicated for the Province and other

According to the National Environmental Management Act (107 of 1998) regulations (December 2016) and the Eastern Cape Biodiversity Conservation Plan (Berliner and Desmet, 2007), a 32 m aquatic buffer is required and recommended around 1:50 000 watercourses, while 50 m is recommended by the Eastern Cape Biodiversity Conservation as the generic buffer around wetlands (without field verification and on-site buffer determinations). Buffer determination is usually based on ecological importance and sensitivity amongst other factors (Macfarlane et al., 2009).

According to South African legislation, a range of buffer recommendations are provided, as indicated in the table text below.

National/ Provincial / Department	Rivers / Watercourses	Wetlands
Eastern Cape Province	100 m (large floodplain) 50 m (upper foothill) 32 m (remaining 1:50 000)	50 m
Mpumalanga		20 m (natural areas) 30 m (urban areas)
KwaZulu Natal	45 m (Low intensity industrial) 70 m (High intensity industrial)	15 m – 20 m 50 m (Low intensity industrial) 75 m (High intensity industrial)
Gauteng	32 m (urban) 100 m (rural)	30 m (urban) 50 m (rural)
Department of Forestry		20 m
National Department of Environmental Affairs	32 m (National Environmental Management Act, 107 of 1998)	
City of Cape Town	10 m – 40 m (urban)	10 m – 75 m • CBA & Critical Ecological Support wetlands: 32 m - 75 m or greater. • Other Ecological Support Area Wetlands: 10 m
Nelson Mandela Bay Metropolitan Municipality	As per the ECBCP	Bioregional Plan CBA wetlands require: • 75 m – 200 m aquatic buffer (depending on rank and size) i.e: • Rank 1 & >20ha = 200m buffer. • Rank 2 & >20ha = 150m buffer.

Various buffer widths have been researched and recommended. The following provides a synthesis of these studies for the key functions the buffer will provide, as cited in Macfarlane et al. (2009).

Table 13 provides a synthesis of some of the studies, as cited in Macfarlane et al. (2009) and Macfarlane et al. (2014), noting that widths depend on various criteria researched e.g. slope steepness, vegetation type (forest, grassland etc.), soil type and intensity of land use etc. The most frequently recommended minimum buffer zone width was 15 m wide, according to a literature review by MacFarlane et al (2014) (Table 14).

Table 13. Synthesis of the some studies and recommended buffers widths (Macfarlane et al., 2009 and Macfarlane et al., 2014)

Function	Macfarlane et al. (2009)		Macfarlane et al. (2014)
	Minimum Widths (m)	Maximum Widths (m)	Buffer efficiency widths
Nutrient removal	4.6 – 260 m	7 – 260 m (nitrogen) / 100 m	High level of buffer efficiency < 20 m but very wide buffers may be

Function	Macfarlane et al. (2009)		Macfarlane et al. (2014)
	Minimum Widths (m)	Maximum Widths (m)	Buffer efficiency widths
		(phosphates)	needed for high risk situations
Sediment removal (erosion impacts)	1 – 100 m	10 – 61 m (sediment) /122 m (clay)	Sedimentation & turbidity: 2 m – 50 m
Removal of pathogens (faecal coliforms, salmonella)	3.8 – 50 m	3.8 – 50 m	2 m - 30 m
Removal of toxics (pesticides)	2 – 50 m	18 – 50 m	High levels of buffer efficiency < 20m but up to 80 m for high risk situations
Water temperature and microclimate control	5 – 40 m	15.2 – 60 m	Not applicable
Buffer widths for wetland species for high intensity impacts	30 m	100 m	
Buffer widths for wetland species for low intensity impacts	15 m	30 m	
Wetlands that are a significant feature in the landscape or support rare, threatened or endangered species.	75 m	300 m	
<i>Kniphofia leucocephala</i> (Critically Endangered) or <i>Kniphofia latifolia</i> (Endangered) (selected species not in study area).	200 m	600 m	
Maintaining habitat for semi-aquatic biota – Amphibians (selected species <u>not</u> in study site, e.g. Giant Bullfrog buffer: 500 m – 1000 m) (selected species not in study area).	30 – 60 m	50 – 1000 m	
Maintaining habitat for semi-aquatic biota – Birds (bird / waterfowl diversity correlated with these buffers) – not South African studies.	15 – 35 m	15 – 95 m	
Maintaining habitat for semi-aquatic biota – Birds (Blue Swallow, African Marsh Harrier, White Backed Night Heron, Grey Crowned Crane, Half-collard Kingfisher, African Finfoot) - South African studies.	65 – 2 200m	65 – 2 200 m (Marsh Harrier 350 m)	
Maintaining habitat for semi-aquatic biota – to maintain species diversity (general)	3 – 30 m	22 – 110 m	
Maintaining habitat for semi-aquatic biota – dragonflies (KZN study)	30 m	-	

Table 14. Review of different buffer types and the recommended minimum buffer zone widths (Macfarlane et al., 2014)

Buffer type	Minimum buffer zone width (m)	Reference (cited in Macfarlane et al. (2014))
Vegetated filter strip	30	Barling & Moore 1994
Vegetated filter strip	11	Corbert et al., 1978
Vegetated filter strip	20	Department of Conservation & Environment 1990
Forested riparian buffer	15	Blinn & Kilgore 2001
Forested riparian buffer	15	Bray 2010
Grass filter strip and vegetated buffer	35	Hansen et al., 2010
Vegetated filter strip	5	Hawes & Smith 2007
Vegetated filter strip	20	Ives et al., 2005
Vegetated filter strip	15	Lee et al., 2004
Vegetated filter strip	10.7	Lowrance et al., 2001
Vegetated filter strip	50	Mayer et al., 2007
Forested buffer strip	15	Palone & Todd 1997
Vegetated filter strip	27	Parkyn 2004

Vegetated filter strip	10	Parkyn et al., 2000
Vegetated filter strip	30	Castelle et al., 1994
Vegetated filter strip	45	Brosofske et al., 1997
Forested buffer strip	9	Schultz et al., 2004
Grass filter strip and vegetated buffer	15	Semlitsch & Bodie 2003
Vegetated filter strip	15	Technology Associates 2010
Forested buffer strip	11	Tjaden & Weber 1998
Riparian buffer strip	15	Wegner 1999
Hardwood buffer	15	Woodard & Rock 1995
Vegetated filter strip	25	Young et al., 1980

Recommended buffer width for this assessment

- A specific buffer is not recommended for the proposed development footprint (1,900 m²). This is because –
 - The proposed footprint is at an adequate horizontal distance from the wetland system, namely 67 m – 102 m for all alternatives (alternative 1 – 2 & 3, respectively).
 - The proposed footprint is at an adequate vertical distance from the wetland system, namely from around 15 m (Alternative 1) to 30 m (Alternative 2/3) above the wetland.
 - The existing development is low intensity tourism, and an adequate buffer of natural vegetation occurs between the proposed development footprint and the wetland boundary.
 - Future developments should not permit high density development along the boundary of the wetland.
 - The proposed development is thus >50 m from the wetland, which is the generic ECBCP wetland buffer. While the Nelson Mandela Bay Bioregional Plan recommends 75 m – 200 m buffers around CBA wetlands (depending on size and rank), the significant vertical height, intact vegetation and low intensity nature of the proposed development suggests 67 m – 102 m to be an adequate buffer.

Other Recommendations

- A water use application with the Department of Water and Sanitation (DWS) for the wetland, Lake de la Vie, is required as the proposed development is situated within the 500 m regulated area of a watercourse.
- Based on the fact that the wetland will not be impacted on by the proposed development, and the results of the risk assessment, i.e. low post mitigation (Section 4.2.6), a general authorisation is likely to be required. However, the DWS should be consulted.
- It is the assessor's opinion that, because the dam (with wetland habitat) was excavated in 2009 and because it will not be impacted on in any way, a water use application should not apply to the dam, however feedback from DWS should be acquired. Importantly, it is not a natural wetland.

5. TERRESTRIAL ECOSYSTEMS: VEGETATION AND FLORISTICS

5.1. AVAILABLE BROAD-SCALE VEGETATION MAPS

Refer Table 15 below for the vegetation types that have been mapped on the property and within the proposed development footprints by the various broad-scale vegetation maps, namely the Nelson Mandela Bay Vegetation Map, South African Vegetation Map, the STEP Vegetation Map and National Forest Layer. Low and Rebelo (1996) were also consulted for additional support.

Table 15. Vegetation types mapped on the property and within the proposed development footprints

Vegetation Type	Site Alternative	Ecosystem Status	Biodiversity Target	Protection Status
Nelson Mandela Bay Vegetation Map (SRK, 2009 based on the NMB MOSS Vegetation Map, 2003)				
Bushy Park Indian Ocean Forest	Alternative 1 -3	Critically Endangered	77.2 %	Not available
National SA Vegetation Map (Mucina and Rutherford, 2012)				
Southern Coastal Forest	Alternative 2 - 3	Least Threatened	40 %	Well protected
Algoa Dune Strandveld	Neither	Least Threatened	20 %	Partially protected
Algoa Sandstone Fynbos	Alternative 1, partially Alternative 3	Vulnerable	23 %	Poorly protected
STEP Vegetation Map (Vlok and Euston-Brown, 2002)				
Alexandria Secondary Mosaic (Non-Thicket)	Alternative 1 - 3	Vulnerable	17 %	Not available
Vegetation of South Africa, Swaziland and Lesotho (Low and Rebelo, 1996)				
Afromontane Forest	Alternative 2 - 3	Not available	Not available	Not available
South and South-West Renosterveld	Alternative 1 & 3	Not available	Not available	Not available
National Forest Layer (DWA, 2003)				
Albany Forests (VII2)	Alternative 2 & 3	Integrated into the SA Vegetation Map, as Southern Coastal Forest		

5.1.1. Nelson Mandela Bay Vegetation Map (SRK, 2009 and 2012)

Bushy Park Indian Ocean Forest is greater than 3 m tall and is supported on calcereous or sandy **south** facing slopes. Key forest indicator species is *Podocarpus falcatus*. The forest occurs in a matrix of Algoa Dune Thicket clumps including *Sideroxylon inerme* and *Pterocelastrus tricuspidatus*. *Morella cordifolia* is abundant (SRK, 2009) (Figure 6).

5.1.2. National South African Vegetation Map (2012)

The South African Vegetation Map (Mucina and Rutherford, 2006; amended 2012) indicates that the property supports Algoa Dune Strandveld, Algoa Sandstone Fynbos and Southern Coastal Forest, (Figure 7), pre-modification levels.

Algoa Dune Strandveld: Typical species include, for example: *Cussonia thyrsifolia*, *Searsia crenata*, *Pterocelastrus tricuspidatus*, *Dovyalis rotundifolia*, *Sideroxylon inerme* and *Zanthoxylum capense*; while *Cotyledon adscendens*, *Brunsvigia litoralis* and *Gymnosporia elliptica* comprise some of the endemic taxa.

Algoa Dune Strandveld is **Vulnerable** (National Spatial Biodiversity Assessment, 2011) and is therefore listed as a Threatened Ecosystem in terms of the National Environmental Management: Biodiversity Act (10 of 2004).

Algoa Sandstone Fynbos: Typical species include, for example: *Protea eximia*, *P. nerifolia*, *Erica zeyheriana* and *Leucadendron salignum*, *Agathosma gonaquensis*, *Erica ethelia* and *Holothrix longicornu* comprise some of the endemic taxa.

Southern Coastal Forest: Typical species include, for example: *Celtis africana*, *Dovyalis rotundifolia*, *Mimusops caffra*, and *Sideroxylon inerme*; while important taxa comprise species such as *Ficus*

burkei, *Searsia chirindensis*, *Schotia latifolia*, *Podocarpus falcatus*, *Gymnosporia buxifolia*, *Encephalartos altensteinii* and *Trichocladus ellipticus*.

5.1.3. Subtropical Thicket Ecosystem Plan (STEP) (Vlok and Euston-Brown (2002)

Alexandria Secondary Mosaic: A mosaic of relict forest patches (Alexandria Indian Ocean), thicket and grassland (Figure 8).

5.1.4. Vegetation of South Africa, Swaziland and Lesotho (Low and Rebelo,1996)

Afromontane Forest: Typical tree species include, for example: *Podocarpus latifolius*, *Calodendrum capense*, *Searsia chirindensis*, *Pterocelastrus tricuspidatus*, *Apodytes dimidiata*, *Halleria lucida* and *Trichocladus ellipticus*. Distinct strata of trees, shrub and herb layer. Situated in kloofs, gullies and fire protected habitats.

South and South-West Coast Renosterveld: Typical species include, for example: *Elytopappus rhinocerotis*, *Relhania pungens*, *Hermannia flammea*, and *Indigofera denudate*; with a high proportion of grasses, such as *Sporobolus africanus* and *Themeda triandra*. (Refer Figure 9).

5.1.5. National Forest Layer (DWAF, 2003)

Albany Forest (VII2): Dense, short-statured forest, with canopy height varying from approximately 5 m to 15 m on deep sands, overlaying the Nanaga and Alexandria Formations in the Port Elizabeth region. The presence of the canopy emergents, *Erythrina cafra* and *Podocarpus falcatus*, and the abundance of lianas, spinescent shrubs, such as *Scutia myrtina* and *Capparis sepriaria*, and herbs are characteristic. *Celtis africana*, *Calodendrum capense*, *Euphorbia triangularis*, *Nuxia floribunda*, *Vepris lanceolata* and *Encephalartos altensteinii* are some of the diagnostic species (DWAF, 2003). The Albany Forest is mapped as Southern Coastal Forest on the SA Vegetation Map (Figure 7).

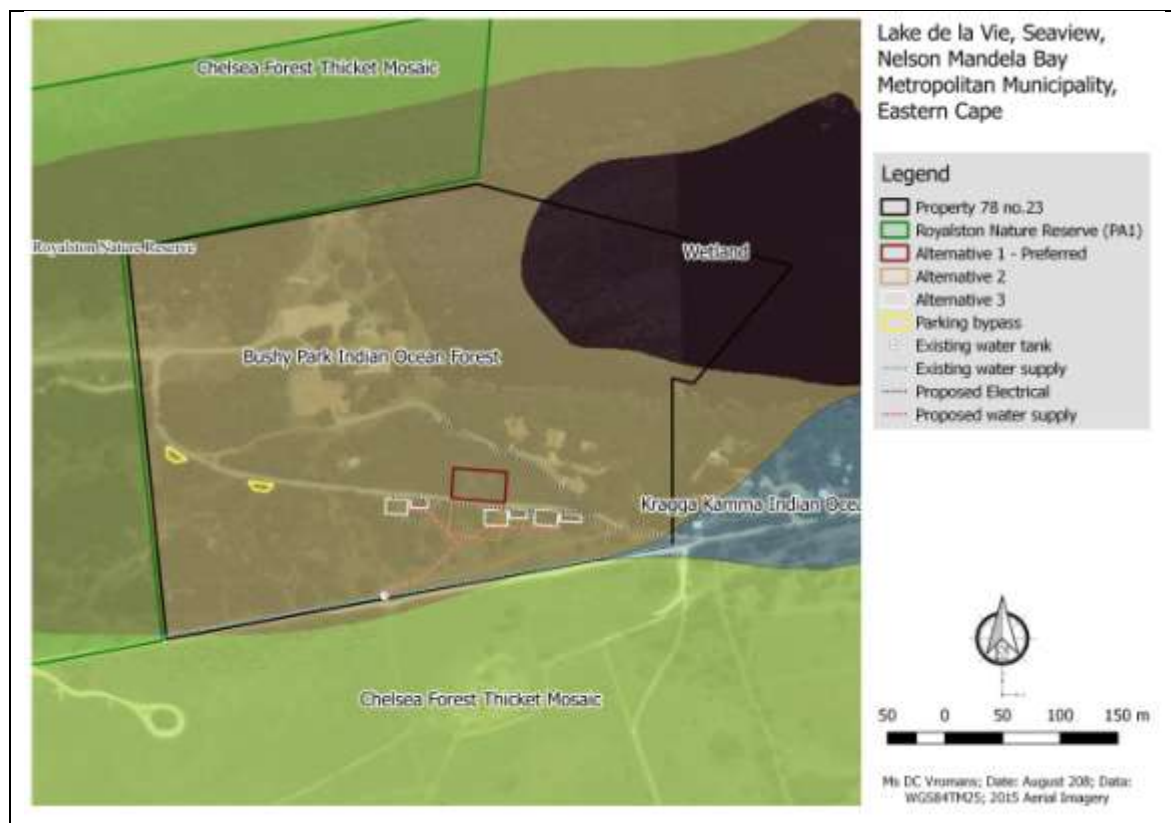


Figure 6. The Nelson Mandela Bay Vegetation Map delineates Bushy Park Indian Ocean Forest on the property, and the wetland (SRK, 2009).

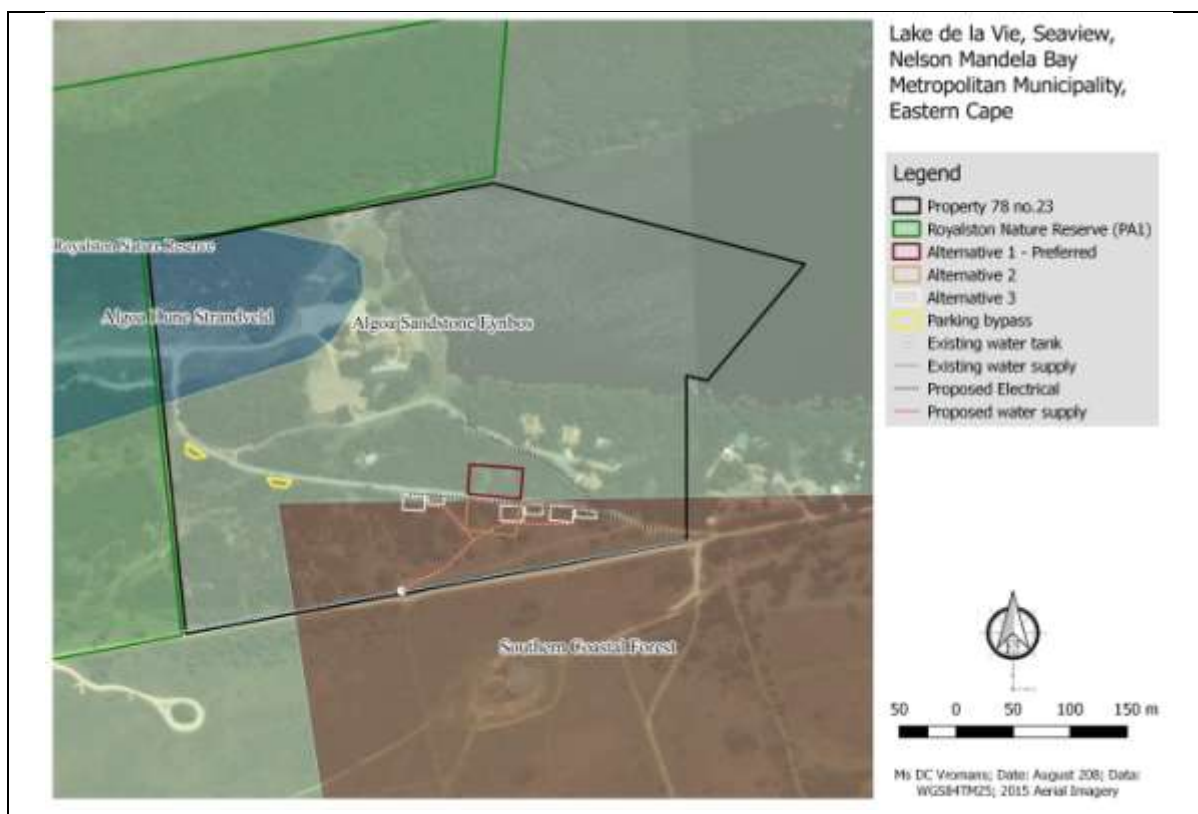


Figure 7. The South African Vegetation Map delineates Algor Dune Strandveld, Algor Sandstone Fynbos and Southern Coastal Forest (Albany Forest) on the property (Mucina and Rutherford, 2006; amended 2012), pre-modification.

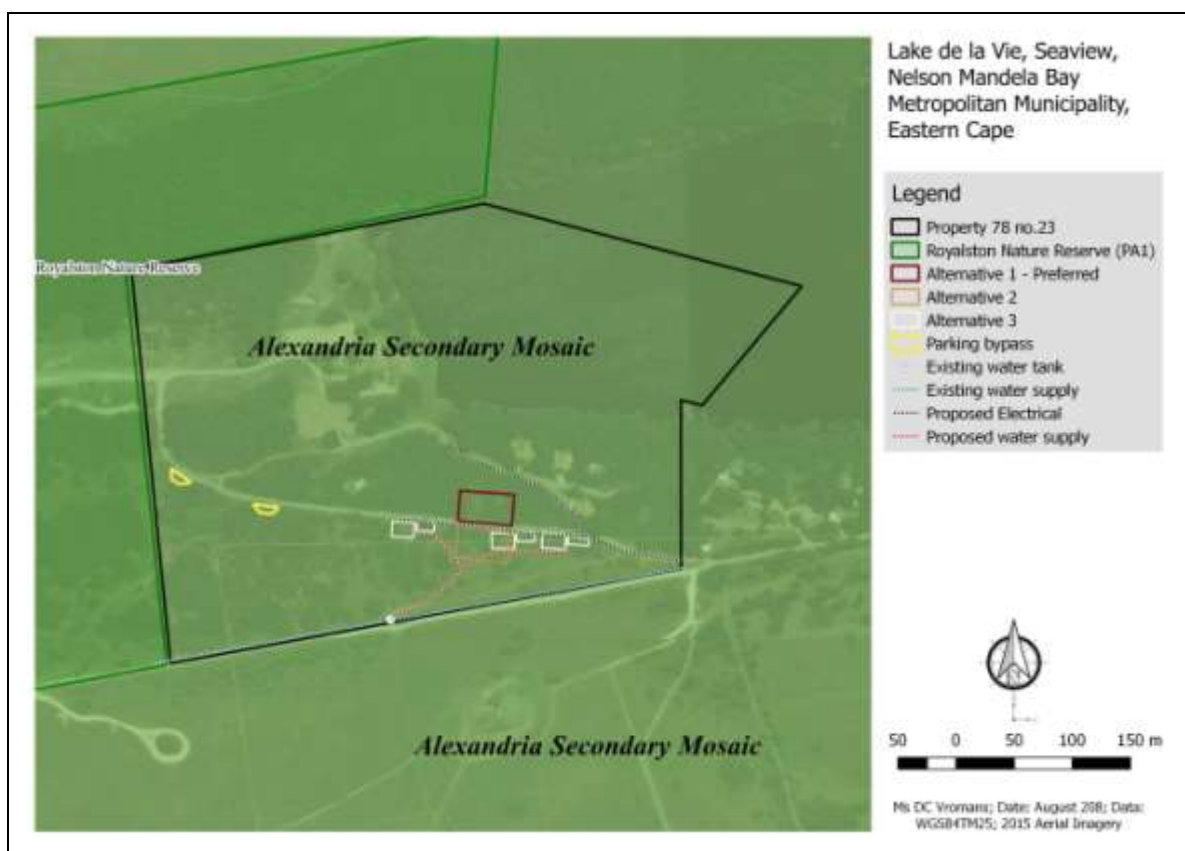


Figure 8. The STEP Vegetation Map delineates a non-thicket on the property, namely Alexandria Secondary Mosaic (Vlok and Euston-Brown, 2002), pre-modification.

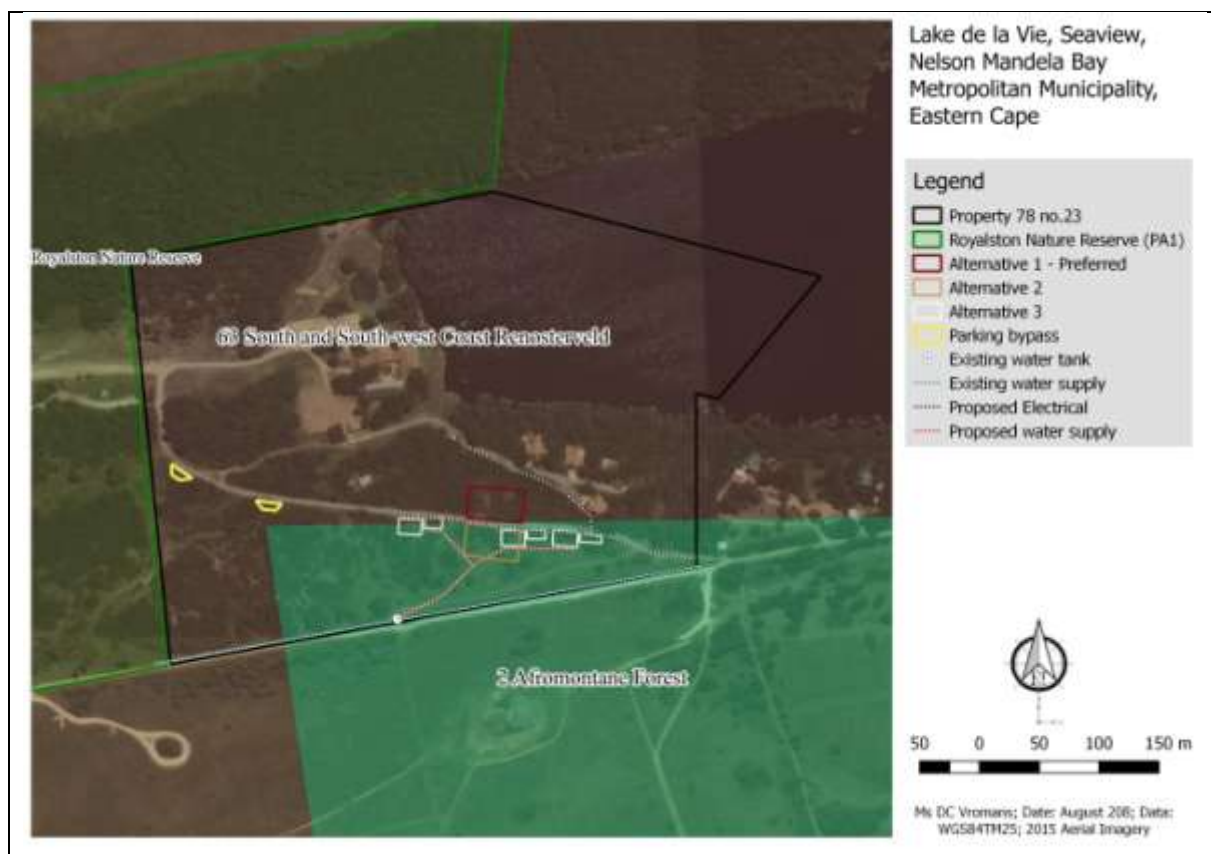


Figure 9. Low and Rebelo (1996) map Afromontane Forest and South and South-West Coast Renosterveld, pre-modification.

5.1.6. Available Data: Plant Species of Conservation Concern

Plant species of conservation concern comprise those species that are either threatened, rare or declining. However, none of these species were recorded. The South African National Biodiversity Institute (SANBI) POSA plant database (<http://posa.sanbi.org>), quarter degree grid 3325CD, was consulted to identify potential species of conservation concern within the proposed development footprints (Table 16).

The entire footprint (1200 m²) of Alternative 1 could not be accessed due to impenetrable thicket, although the presence of these species is unlikely. Alternative 2 and most of Alternative 3 was surveyed in detail; and the species were not observed. Most of the threatened species are unlikely to occur due to habitat preferences.

Table 16. Potential species of conservation concern within the proposed development footprints (<http://posa.sanbi.org>)

Key: CR = Critically Endangered; CR PE = Critically Endangered, Possibly Extinct; EN = Endangered; VU = Vulnerable, LT = Least Threatened

Family	Species	Red List / Conservation Status
RUTACEAE	<i>Agathosma gonaquensis</i> Eckl. & Zeyh.	CR
ASPHODELACEAE	<i>Aloe bowiea</i> Schult. & J.H.Schult.	CR
FABACEAE	<i>Cyclopia pubescens</i> Eckl. & Zeyh.	CR

Family	Species	Red List / Conservation Status
SCROPHULARIACEAE	<i>Selago polycephala</i> Otto ex Walp.	CR PE
ASTERACEAE	<i>Senecio hirtifolius</i> DC.	CR PE
FABACEAE	<i>Argyrolobium crassifolium</i> Eckl. & Zeyh.	EN
AMARYLLIDACEAE	<i>Brunsvigia litoralis</i> R.A.Dyer	EN
AMARYLLIDACEAE	<i>Cyrtanthus spiralis</i> Burch. ex Ker Gawl.	EN
ZAMIACEAE	<i>Encephalartos horridus</i> (Jacq.) Lehm.	EN
EUPHORBIACEAE	<i>Euphorbia globosa</i> (Haw.) Sims	EN
ASTERACEAE	<i>Euryops ericifolius</i> (Bél.) B.Nord.	EN
ASPHODELACEAE	<i>Haworthia attenuata</i> (Haw.) Haw. var. <i>attenuata</i>	EN
ASPHODELACEAE	<i>Haworthia longiana</i> Poelln.	EN
ASPHODELACEAE	<i>Haworthia springbokvlakensis</i> C.L.Scott	EN
PROTEACEAE	<i>Leucadendron orientale</i> I.Williams	EN
POLYGALACEAE	<i>Muraltia brevicornu</i> DC.	EN
PROTEACEAE	<i>Paranomus reflexus</i> (E.Phillips & Hutch.) Fourc.	EN
PROTEACEAE	<i>Protea rupicola</i> Mund ex Meisn.	EN
ASTERACEAE	<i>Syncarpha recurvata</i> (L.f.) B.Nord.	EN
RUTACEAE	<i>Agathosma stenopetala</i> (Steud.) Steud.	VU
ASTERACEAE	<i>Amphiglossa callunoides</i> DC.	VU
ASTERACEAE	<i>Amphiglossa corrudifolia</i> DC.	VU
ASTERACEAE	<i>Aster laevigatus</i> (Sond.) Kuntze	VU
IRIDACEAE	<i>Bobartia macrocarpa</i> Strid	VU
AMARYLLIDACEAE	<i>Crinum lineare</i> L.f.	VU
ORCHIDACEAE	<i>Disa lugens</i> Bolus var. <i>lugens</i>	VU
ERICACEAE	<i>Erica glumiflora</i> Klotzsch ex Benth.	VU
ERICACEAE	<i>Erica zeyheriana</i> (Klotzsch) E.G.H.Oliv.	VU
IRIDACEAE	<i>Gladiolus huttonii</i> (N.E.Br.) Goldblatt & M.P.de Vos	VU
CELASTRACEAE	<i>Gymnosporia elliptica</i> (Thunb.) Schönland	VU
FABACEAE	<i>Podalyria sericea</i> (Andrews) R.Br. ex Aiton f.	VU
FABACEAE	<i>Psoralea angustifolia</i> Jacq.	VU
SCROPHULARIACEAE	<i>Selago rotundifolia</i> L.f.	VU
ASTERACEAE	<i>Syncarpha sordescens</i> (DC.) B.Nord.	VU
ASPHODELACEAE	<i>Aloe micracantha</i> Haw.	NT
AMARYLLIDACEAE	<i>Crinum campanulatum</i> Herb.	NT
CORNACEAE	<i>Curtisia dentata</i> (Burm.f.) C.A.Sm.	NT
FABACEAE	<i>Cyclopia genistoides</i> (L.) R.Br.	NT
ZAMIACEAE	<i>Encephalartos longifolius</i> (Jacq.) Lehm.	NT
ASTERACEAE	<i>Euryops linearis</i> Harv.	NT
ASTERACEAE	<i>Gnaphalium declinatum</i> L.f.	NT
ASPHODELACEAE	<i>Haworthia fasciata</i> (Willd.) Haw.	NT
ORCHIDACEAE	<i>Holothrix pilosa</i> (Burch. ex Lindl.) Rchb.f.	NT
PROTEACEAE	<i>Leucadendron tinctum</i> I.Williams	NT
MESEMBRYANTHEMACEAE	<i>Mestoklema albanicum</i> N.E.Br. ex Glen	NT

Family	Species	Red List / Conservation Status
HYPOXIDACEAE	<i>Pauridia minuta</i> (L.f.) T.Durand & Schinz	NT
IRIDACEAE	<i>Tritonia dubia</i> Eckl. ex Klatt	NT
MESEMBRYANTHEMACEAE	<i>Erepsia aristata</i> (L.Bolus) Liede & H.E.K.Hartmann	Rare
IRIDACEAE	<i>Gladiolus geardii</i> L.Bolus	Rare
FABACEAE	<i>Cyclopia intermedia</i> E.Mey.	Declining
AMARYLLIDACEAE	<i>Cyrtanthus obliquus</i> (L.f.) Aiton	Declining
DIOSCOREACEAE	<i>Dioscorea elephantipes</i> (L'Hér.) Engl.	Declining
HYACINTHACEAE	<i>Drimia altissima</i> (L.f.) Ker Gawl.	Declining
ANACARDIACEAE	<i>Loxostylis alata</i> A.Spreng. ex Rchb.	Declining

5.2. RESULTS VEGETATION AND FLORISTICS - SITE ASSESSMENT OBSERVATIONS

5.2.1. Results: Vegetation Pattern

The alternative footprints are located on a northern aspect and are situated within Algoa Dune Thicket (Vlok and Euston-Brown, 2002), or Dune Thicket (Low and Rebelo, 1996) on aeolian dune sands of the Nanaga Formation (1:250 000 Geological Series Map). According to the vegetation map classifications of the Nelson Mandela Bay Bioregional Plan (Stewart et al., 2005, SRK, 2014) this is likely to represent **Critically Endangered Chelsea Forest Thicket Mosaic** (Chelsea Dune Forest Thicket – Indian Ocean Forest), as Algoa Dune Thicket occurs as a mosaic thicket with forest on northern facing slopes (SRK, 2009/2014). The vegetation was distinctly Dune Thicket at the footprints and surrounds, thus suggesting the mosaic Algoa Dune Thicket component of the Chelsea Forest Thicket Mosaic. There was no evidence of true forest patches in the immediate surrounds. This is motivated by the fact that the vegetation map for the Nelson Mandela Bay Municipality differentiated between solid forest, solid thicket with forest elements, and a mixture of forest species within Thicket bush clumps, located within a fynbos matrix. This differs from the other vegetation maps and the DWAF national forest map (Section 5.1). The bioregional plan states that '*solid forest is mostly confined to steep riverine gorges, which are sheltered from fire, and confined to a band along the wetter southern portion of the municipal area*'.

Chelsea Forest Thicket Mosaic is Critically Endangered with a 100 % target; whereas Algoa Dune Thicket is a Vulnerable vegetation type with a 17 % target (STEP biodiversity target).

The determination of Algoa Dune Thicket at the footprints is based on the fact that the vegetation, as evidenced on the near-natural Alternative 1 site, did not present with distinct strata in the vegetation profile and is relatively low compared to coastal Dune Forest (Low and Rebelo, 1996; Vlok and Euston-Brown, 2002). It was also largely impenetrable and occurs on the drier, northern facing slope. *Cussonia spicata*, which emerged from the canopy in the surrounding area, also differentiate it from true forests (Vlok and Euston-Brown, 2002), while *Podocarpus falcatus*, *Erythrina caffra* and *Ekebergia capensis*, the forest patch indicator trees of the Chelsea Forest Thicket Mosaic were absent from the footprints and surrounds. Key species composition determined the vegetation at the footprints, although some typical forest pioneer species were evident, namely *Diospyros dichrophylla* and *Pittosporum viridiflorum*.

Forest pioneer species, such as *D. dichrophylla* and *P. viridiflorum* can be present in Thicket units, and thus does not necessarily demonstrate the recovery of true Forest vegetation. This is evidenced

in the STEP Kromme Forest-Thicket, which occurs in open terrain where strong winds (including desiccating high winds) and periodic fires probably prevented the development of true forest, but yet only support pioneer forest species (Vlok and Euston-Brown, 2002). This is also evident in the Ndlambe coastal regions, especially along the R72 fence lines and the coastal towns, where these pioneer species are prevalent but true Forest absent. *P. viridiflorum* is also a typical Albany Thicket indicator species. Vlok and Euston Brown (2020) state that Albany Dune Thicket has long been a precursor of climax forest vegetation, probably not dissimilar to those of the present Alexandria Forest, however, the authors do not imply that the Dune Thicket is a direct precursor to forest in the Clementsion understanding. Furthermore, Albany Dune Thicket, supports forest species, but is not classified as true Forest by Vlok and Euston-Brown (2002). Although not surveyed, the hills on the southern slopes, at the northern boundary of the property, potentially support Forest.

It should be noted that the historical aerial imagery (1939) (Figure 12, Section 6.1) shows that vegetation cover on the crest of the hill and below, around the alternative footprints, has been cleared and at minimum selectively cleared at Alternative 1 site. This indicates that, after approximately 77 years, the establishment of the indicator forest species has not taken place (at the footprints and immediate surrounds), while interestingly at a site some 6 km eastward, which was completely cleared in the 1939 aerial imagery, supports the indicator forest species, *Erythrina caffra*, *Searsia chirindensis*, *Ekebergia capensis*, *Harpephyllum caffrum*, *Vepris undulata* and *Celtis africana*, amongst others. The Southern Coastal Forest (Albany Coastal Forests sub-group), as mapped to the south by the DWA Forests Map (Figure 7), includes forest species such as *E. caffra*, *P. falcatus*, *C. africana*, *Vepris undulata* and *S. chirindensis* (DWA, 2003). None of these species, particularly the faster growing, more resilient species like *E. caffra* and *S. chirindensis*, were present at the footprints or in the immediate surrounds. The alternative sites are positioned near the crest of the hill, which is subject to stronger, desiccating winds, while it is unlikely that periodic fires would have been excluded from the footprint areas in the past.

Alternative 1 site is natural to near-natural (due to few open patches dominated by grasses), whereas Alternative 2 and 3 sites are degraded. In fact, historical Google Earth imagery (2006) shows some clearing took place around the south-western corner of the degraded areas (refer Figure 10, Section 6.1). The high prevalence of the grasses, especially *Stenotaphrum secundatum*, as well as *Cynodon dactylon* and *Digitaria sanguinalis*; and the presence of *Vachellia (Acacia) karroo* indicate degradation. However, it should be noted that the historical aerial imagery from 1939 (Figure 12, Section 6.1) shows that clearing appears to have taken place on both sites, but more so on Alternative 2 and 3 sites, or on/near the crest of the hill.

Thicket species such as *Putterlicka pyracantha*, *Pterocelastrus tricuspidatus*, *Searsia crenata*, *Searsia pallens*, *Searsia pyroides*, *Searsia pterota*, *Scutia myrtina*, *Gymnosporia elliptica*, *Vachellia (Acacia) karroo* and *Zanthoxylum capense* occurred. *Pittosporum viridiflorum* and *Sideroxylon inerme* were common, especially *P. viridiflorum* on Alternative 1 site. Other less dominant species included *Canthium inerme*, *Hippobromus pauciflorus* *Maerua caffra*, *Mystroxydon aethiopicum*, *Pappea capensis*, *Scolopia zeyheri*, *Searsia incisa* and *Rhamnus prinoides*, including the large shrub *Chrysanthemoides monolifera*, which is typical of Dune Thicket along with *S. crenata*.

The canopy was largely closed on Alternative 1 site, whereas Alternative 2 site presented with thicket bush clumps and a low grassy layer, which is likely due to past clearing (rather than representing a natural mosaic character). The grassy areas supported *Eragrostis curvula*, *Stenotaphrum secundatum* and *Sporobolus africanus* including other herbs and geophytes e.g. *Moraea britteniae*, *Brunsviga gregaria* and *Gazania krebsiana*. The succulent *Carpobrotus edulis* was abundant, and the shrublets *Muraltia spinosa*, *Passerine obtusifolia* and *Selago corymbosa* were recorded, along with the lianas *Rhoicissus tridentata* and *Cynanchum ellipticum*. *Cotyledon velutina* and *Ruschia sp.* were also supported in the surrounds. Refer Addendum 1 for the plant inventory.

Alien Invasive Plants

The National Environmental Management: Biodiversity Act (10 of 2004) (NEMBA) lists alien invasive species, which should be controlled, as well as the Conservation of Agricultural Resources Act (CARA) (43 of 1998). The NEMBA list supersedes the CARA list. Several alien invasive plant species were recorded on site.

The only alien invasive plant that was recorded on site was *Vachellia (Acacia) cyclops*, a CARA category 2 species and a NEMBA category 1b species, which was located near the Alternative 2 site footprint (Table 17).

Table 17. Inventory of alien invasive plants recorded on site

SPECIES	CARA CATEGORY	NEMBA CATEGORY
<i>Vachellia (Acacia) cyclops</i>	Category 2 Category 2 invader plants may be grown under controlled conditions in permitted zones, but no trade in these plants is allowed.	Category 1b The NEMBA prohibits the spreading or allowing the spread of any category 1b alien invasive species, and exempts a person from having in possession or exercising physical control over the species. In other words, these species must be controlled and wherever possible, removed and destroyed. Trade and planting is prohibited.

Plate 2. Photographic images of the thicket vegetation.



Photographic images of the thicket vegetation



1.2. Largely impenetrable thicket of Alternative 1 site.



2.3. Alternative 1 site, with clearing within the proposed footprint, and *Vachellia karroo* establishing.

Photographic images of the thicket vegetation



2.4. Looking towards Alternative 2 site, including footprint proposed in the Alternative 3 layout.



2.5. Alternative 2 site, including footprint proposed in the Alternative 3 layout.

5.2.2. Results: Plant Species of Conservation Concern

Several protected species were recorded, all of which are of Least Concern (Table 18, Plate 3).

Carpobrotus edulis and *Aizoon rigidum* (vygie) were abundant in the open, sunny areas on Alternative 2 site, including a few *Ruschia* species. Numerous *Pittosporum viridiflorum* and *Sideroxylon inerme* trees were recorded on both sites, with *P. viridiflorum* particularly prevalent on Alternative 1 site. *Moraea britteniae* was common along the access track running parallel to the fence line. *Brunsvigia gregaria* was also common and scattered on Alternative 2 / 3 sites, while one *Acrolophia capensis* was recorded on Alternative 2 / 3 sites or within the vicinity, and another individual along the existing tar road.

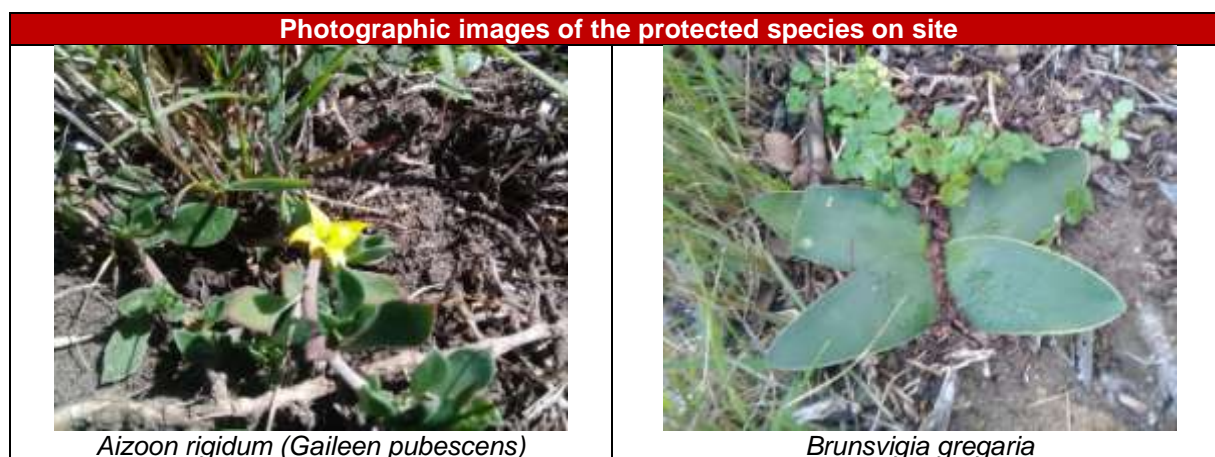
All the species are protected by the provincial Nature and Environmental Conservation Ordinance (19 of 1974). These species will require a license from the Provincial Environmental Affairs Department to be removed. A rescue and translocation, and/or rehabilitation plan is usually required.

Table 18. Protected species recorded on site

Species	Family	Red Data Listing	Protected By
1. <i>Aizoon rigidum</i> (<i>Galenia pubescens</i>)	AIZOACEAE	Least Concern	PNCO
2. <i>Brunsvigia gregaria</i>	AMARYLLIDACEAE	Least Concern	PNCO
3. <i>Carpobrotus edulis</i>	AIZOACEAE	Least Concern	PNCO
4. <i>Acrolophia capensis</i>	ORCHIDACEAE	Least Concern	PNCO
5. <i>Moraea britteniae</i>	IRIDACEAE	Least Concern	PNCO
6. <i>Pittosporum viridiflorum</i>	APOCYNACEAE	Least Concern	NFA
7. <i>Sideroxylon inerme</i>	SAPOTACEAE	Least Concern	NFA
8. <i>Ruschia</i> sp.	AIZOACEAE	Least Concern	PNCO

- PNCO = Provincial Nature Conservation Ordinance = Nature and Environmental Conservation Ordinance (19 of 1974). **Note that the scheduled species in terms of the Eastern Cape Conservation Bill have not been indicated as the species list that is regulated by the Department of Economic Development, Environmental Affairs and Tourism is in terms of the 1974 PNCO. This is because the Bill has not been gazetted.**
- No NEMBA Protected species (National Environmental Management: Biodiversity Act, 10 of 2004).
- NFA = National Forest Act (84 of 1998).

Plate 3. Photographic images of the protected species on site.



Photographic images of the protected species on site



Carpobrotus edulis



Ruschia



Ruschia



Pittosporum
Al

the hill of
d.



Pittosporum

1 site.



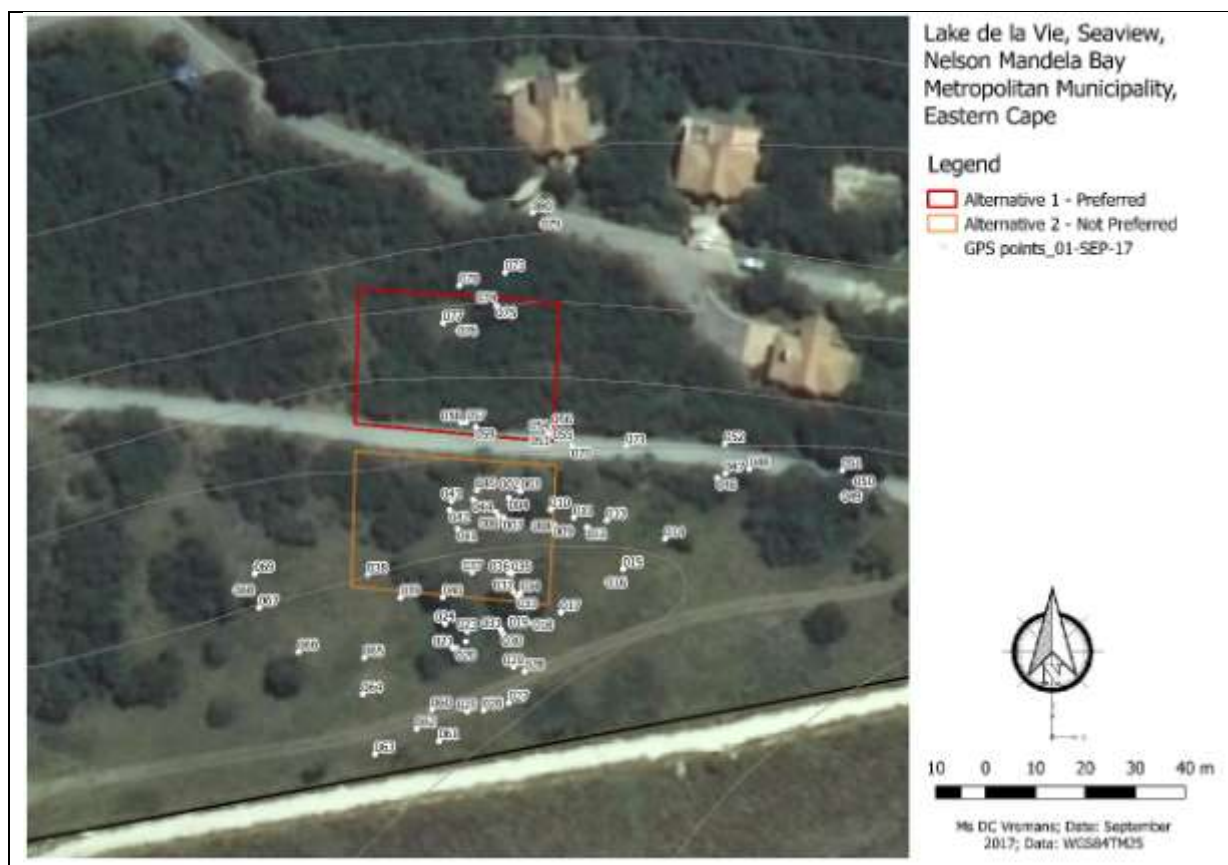


Figure 10. Map indicating GPS points of protected species (GPS points of protected species include 1 - 80, apart from 5, 29 and 75).

6. LAND COVER, LAND USE ACTIVITIES AND ASSOCIATED LAND USE IMPACTS

6.1. REMAINDER PORTION 78 OF THE FARM CRAGGA KAMMA NO. 23

Currently land cover on the property is largely natural to near natural (60.9 %), with degraded areas (19.6 %) and modified areas (19.4 %) (refer Table 19). Modified areas represent low density tourism accommodation (Figure 11) with access roads and lawns. If an additional **1,900 m²** or **0.19 ha** is modified on the property, this would raise the percentage modification only very slightly to **20.2 % (Alternative 2 and 3)**.

Alternative 1 site is natural to near-natural, whereas Alternative 2 site is degraded. The high prevalence of the grasses, especially *Stenotaphrum secundatum*, as well as *Cynodon dactylon* and *Digitaria sanguinalis*; and the presence of *Vachellia (Acacia) karroo* indicated degradation. Historical Google Earth imagery (2006) shows some clearing around the south-western corner of the degraded area, and subsequent re-growth.

If Alternative 1 site is cleared this would reduce near-natural areas to 59.7 % from 60.9 % (Table 19). If Alternative 2 and 3 sites are developed this would reduce degraded areas to 18.4 % while increasing the modified areas; but not reducing the near-natural areas on the property (Table 19).

The historical aerial imagery from 1939 (Figure 12) demonstrates the extensive clearing that occurred in the past due to agriculture. Both sites appear to have been selectively cleared, probably for livestock grazing, but more so on Alternative 2 site, or on the crest of the hill.

Current land use is tourism and zoning is 'Special Zone'.

Table 19. Land cover statistics on Remainder Portion 78 No. 23

Existing Land Cover on Property (approximate)	Hectares (approximate)	Percentage
Pre-Development		
Natural/Near-Natural	9.72	60.9
Degraded	3.13	19.6
Modified	3.10	19.4
TOTALS	15.95	100.0
Post Development (0.19 ha) – Alternative 1		
Natural/Near-Natural	9,53	59,7
Degraded	3,13	19,6
Modified	3,29	20,6
TOTALS	15,95	100,0
Post Development (0.19 ha) – Alternative 2 and 3		
Natural/Near-Natural	9,72	60,9
Degraded	2,94	18,4
Modified	3,22	20,2
TOTALS	15,95	100,0

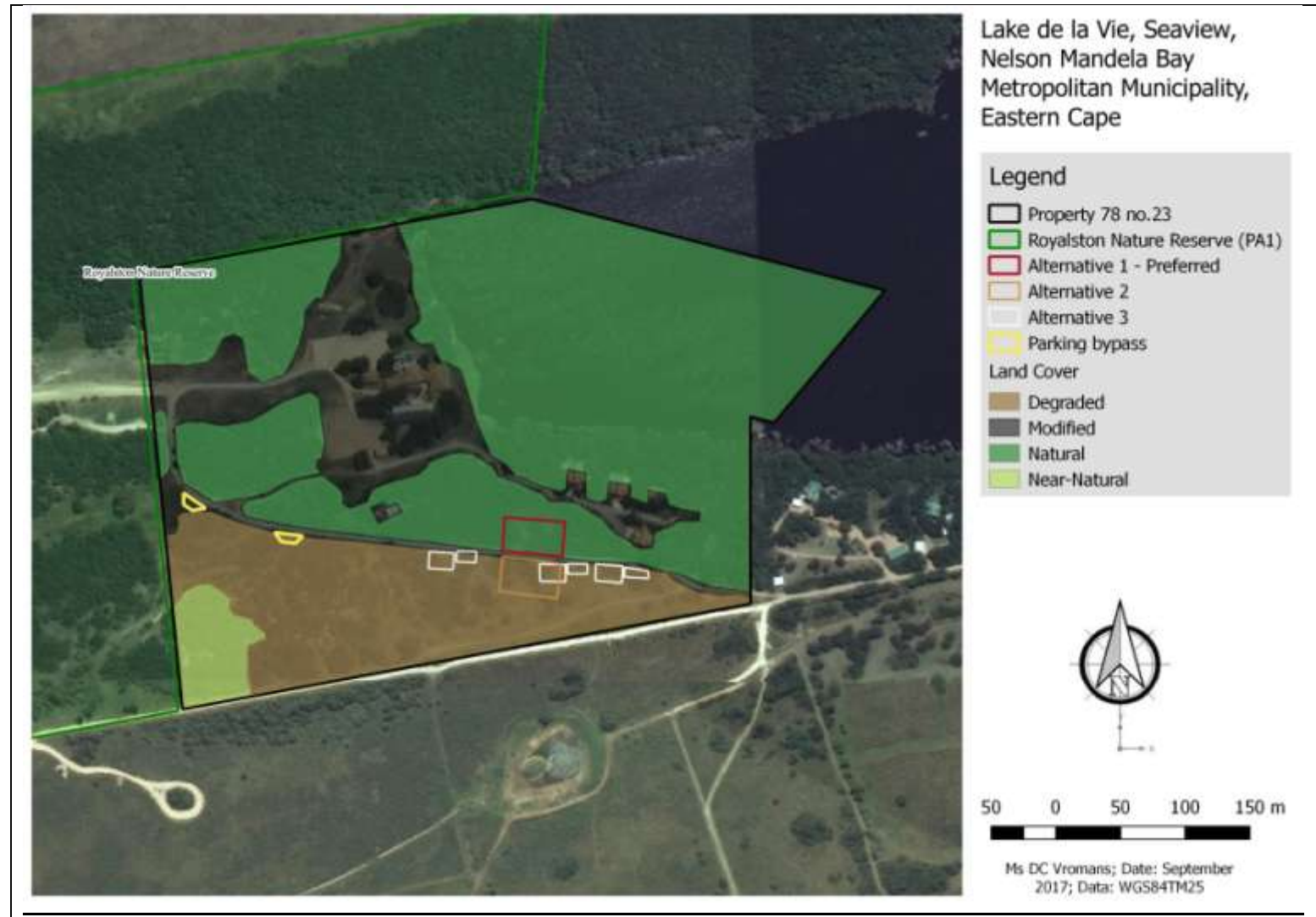


Figure 11. Land cover on Remainder Portion 78 No. 23. Refer Figure 19 for Alternative 3, which is located in degraded and modified land cover.



Figure 12. Land cover on Remainder Portion 78 No. 23 in 1939, and the surrounds, demonstrating past clearing.

6.2. CUMULATIVE IMPACTS IN THE CATCHMENT

From a cumulative perspective, large areas of the sub-quaternary catchment were previously cultivated as indicated in the land cover data.

The land cover statistics for the sub-quaternary catchment, within which the proposed development area falls, indicates that approximately 67.204 % is modified while 32.8 % is near-natural. (Table 20, Figure 13). If an additional **1,900 m²** or **0.19 ha** is modified on the property, this would raise the percentage modification only very slightly to **67.209 %**.

The land cover statistics indicates that approximately 65.6% of the quaternary catchment M20A (which is the basic unit for water use management in South Africa) has been modified, while 34.4 % is near-natural. The quaternary catchment covers most of Port Elizabeth, and for the purposes of this assessment the sub-quaternary catchment will apply when assessing cumulative impacts (Section 10.2.6 – 10.2.8).

Catchment modification

Analyses showed that for every 10 % of altered catchment land use, a correlative 6 % loss in freshwater diversity was noted, as a linear relationship (Weitjers et al., 2009 cited in Driver et al., 2012). Additionally, streams in agricultural catchments usually remain in good condition until the extent of agriculture in the catchment exceeds 30 % -50 %. (Allan, 2004 cited in Driver et al., 2012 - NFEPA Implementation Manual). In this case, agricultural activities in the sub-quaternary catchment have declined, although land cover has been modified due to past clearing for agriculture.

Table 20. Land cover statistics for the sub-quaternary and quaternary catchment M20A (Nelson Mandela Bay land cover metadata)

Sub-quaternary catchment M20A - Clearing of 0.19 ha				Quaternary catchment M20A		
Land Cover	Hectares	Percentage	Percentage	Land Cover	Hectares	Percentage
Modified	2,336.14	67.204	67,209	Modified	23,673.74	65.6
Natural	1,140.06	32.8	32,8	Natural	12,432.90	34.4
TOTALs	3,476.20	100.0	100	TOTALs	36,106.64	100.00

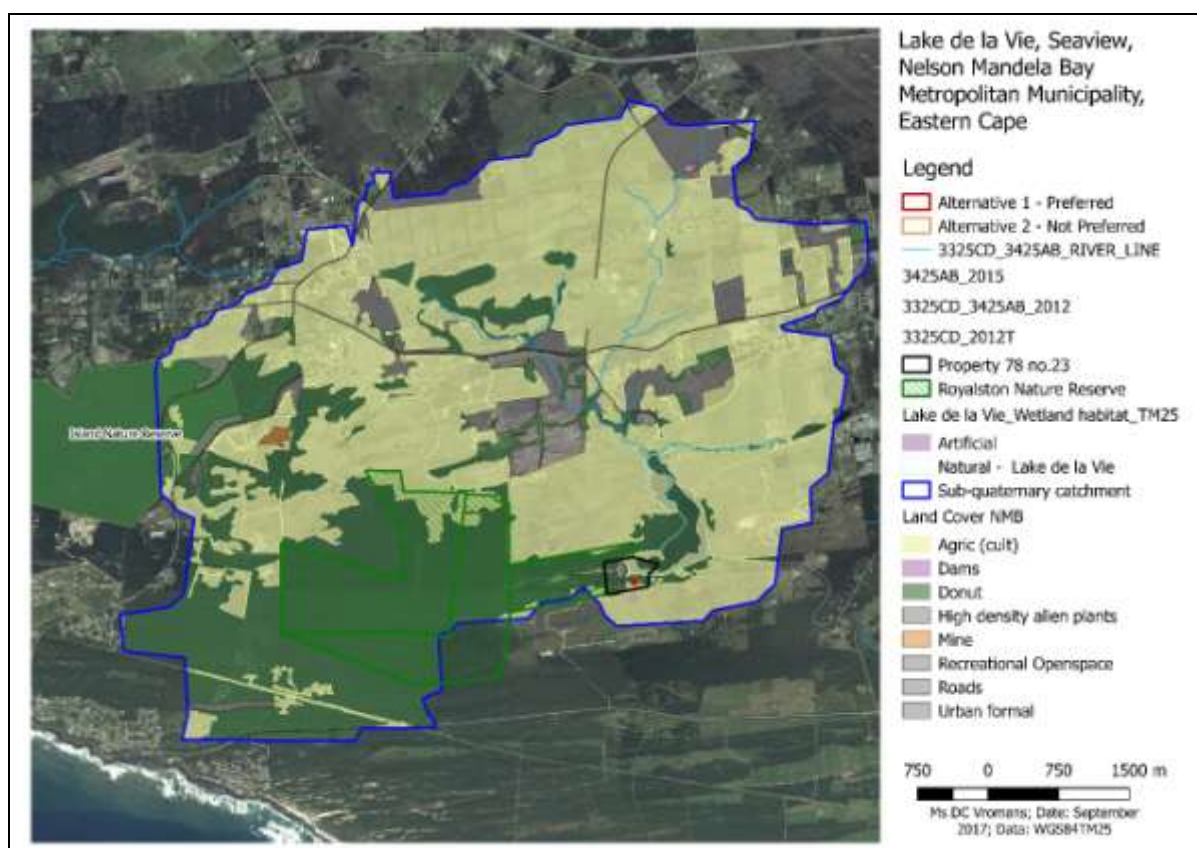


Figure 13. Map indicating land cover in the sub-quaternary catchment (Nelson Mandela Bay land cover metadata).

7. SYSTEMATIC BIODIVERSITY PLANS DEVELOPED FOR THE REGION

7.1. AVAILABLE BROAD-SCALE SYSTEMATIC BIODIVERSITY PLANS

Systematic biodiversity plans or maps that have been produced for the region in which the property portion is located include:

1. The Nelson Mandela Bay Critical Biodiversity Areas Map or Bioregional Plan (SRK, 2014), which supersedes the Eastern Cape Biodiversity Conservation Plan's (ECBCP) (2007) and Subtropical Thicket Ecosystem Programme (STEP) Biodiversity Map (2002).
2. Eastern Cape Biodiversity Conservation Plan's (ECBCP) (2007). Although the ECBCP is superseded by the Nelson Mandela Bay Bioregional Plan Critical Biodiversity Area (CBA) Map, the recommended transformation thresholds for Aquatic CBA were consulted for additional support.
3. The National Protected Area Expansion Strategy (NPAES) (2008) and Provincial Protected Area Expansion Strategy (ECPTA, 2012).

7.1.1. The Nelson Mandela Bay Critical Biodiversity Areas (CBA) Map (2014)

According to the Nelson Mandela Bay Critical Biodiversity Areas Map or Bioregional Plan (SRK, 2014), the property is classified as Critical Biodiversity Area (CBA) and Ecological Support Area 1 (ESA1), with only a small amount of no natural areas remaining (or cultivated land) (Table 21, Figure 14 & 15). Interestingly, the ESA also include modified (transformed) areas i.e. buildings.

The proposed Alternative 1 is situated in CBA, whereas Alternative 2 is located in no natural areas remaining (or cultivated land) according to the CBA Map (Figure 14 & 15). Alternative 3 is situated in CBA, ESA 1 and no natural areas remaining (or cultivated land).

Approximately 92.6 % (14.78 ha) of the property is designated as CBA and ESA 1 (Table 21). If 0.19 ha is removed for the proposed development, 91.4 % of CBA and ESA will remain or 1.2 % will be lost.

Table 21. CBA Map category statistics for the biodiversity priority areas (CBA, ESA1) on the property

CBA Map Category	Hectares	Percentage	0.19 ha (proposed footprint)	
			Hectares	Percentage
CBA	12.05	75.55	11,86	74,36
ESA 1	2.73	17.12	2,73	17,12
Cultivated	1.17	7.34	1,36	8,53
Property Area (Ha)	15.95	100	15,95	100
<i>CBA and ESA 1</i>	<i>14.78</i>	<i>92.66</i>	<i>14,59</i>	<i>91,47</i>

The M20A sub-quaternary catchment supports 23.429 % CBA and 3.7 % ESA 1 (Table 22, Figure 16). *If 0.19 ha is removed for the proposed development, 23.424 % CBA will remain.*

Table 22. CBA Map category statistics for the biodiversity priority areas (CBA, ESA1 and PA1) within the sub-quaternary catchment

CBA Map Category	Hectares	Percentage	0.19 ha (proposed footprint)	
CBA	814.45	23.429	814,26	23,424
ESA 1	129.49	3.7	129,49	3,7
PA 1*	517.56*	14.9	104,32	14,9
Other	2,014.70	58.0	2 014,89	58,0
Sub-Quaternary Area	3,476.20	100.0	814,26	23,424
<i>CBA and ESA 1</i>	<i>943.94</i>	<i>27.2</i>	<i>943,75</i>	<i>27,149</i>

* Included Royalston Nature Reserve.

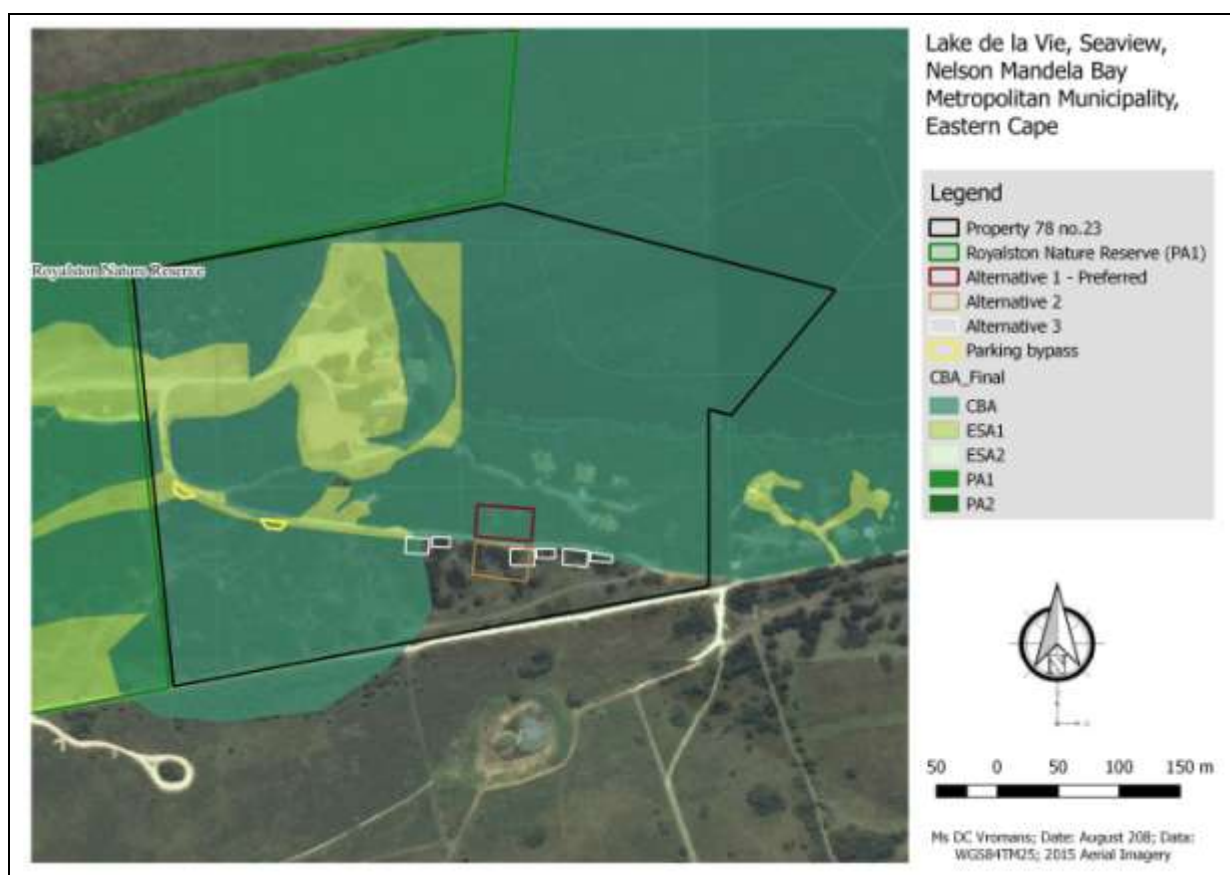


Figure 14. Map indicating Critical Biodiversity Areas and Ecological Support Areas extending across the property (SRK, 2014).

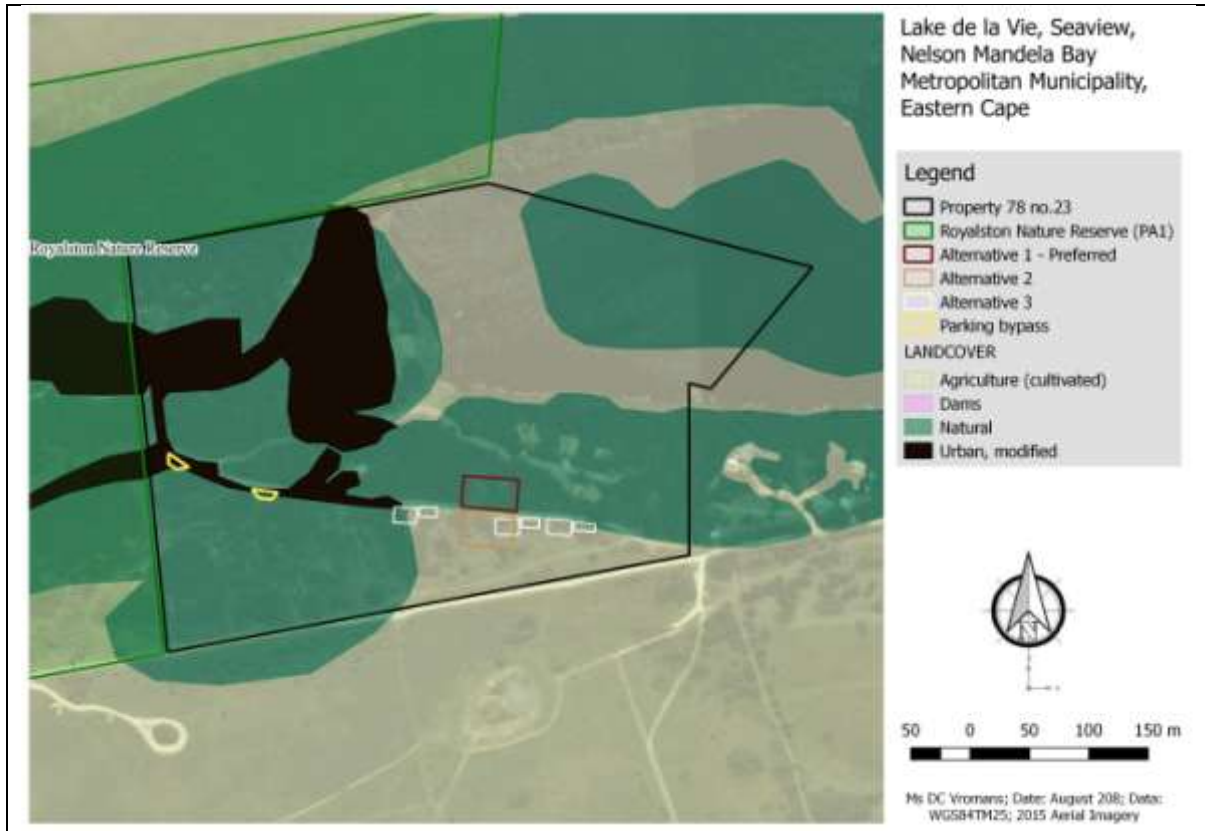


Figure 15. Map indicating land cover delineated by the Nelson Mandela Bay Bioregional Plan (SRK, 2009, 2014).

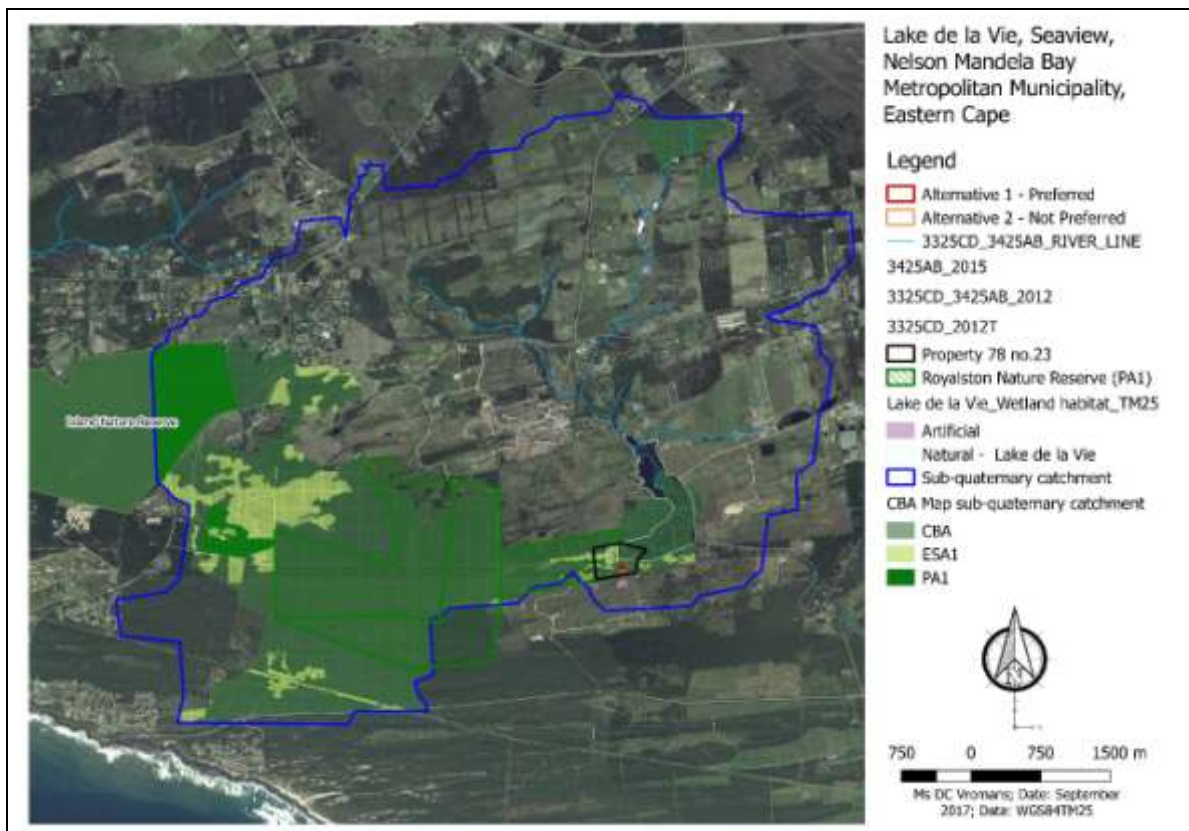


Figure 16. Map indicating Critical Biodiversity Areas and Ecological Support Areas extending across the M20A sub-quaternary catchment (SRK, 2014).

Key Land Use and Land Use Management Guidelines

- CBA = Conservation land uses.
- ESA 1 and 2 = Extensive agriculture or similar low intensity purposes that promote conservation and ecological connectivity.
- No further loss of natural habitat in Critical Biodiversity Areas and Ecological Support Areas.
- Resort developments are classified as a Moderate impact land use type, and developments should preferably be clustered in already modified areas.
- Wetlands classified as CBA (near natural) should be afforded a 75 m – 100 m buffer.

Refer to Section 7.2 for a critical evaluation of the CBA Map.

7.1.2. The Eastern Cape Biodiversity Conservation Plan Critical Biodiversity Areas (CBA) Map (2007)

Although the Nelson Mandela Bay CBA Map and the NFEPA priority catchment data supersedes the Eastern Cape Biodiversity Conservation Plan (ECBCP), the CBA Map for the ECBCP is displayed below (Figure 17). The ECBCP indicates that all the alternatives are situated in “cultivated land”, and were thus not classified as CBA. The ECBCP land cover data was based on land cover patterns in 2000; and is therefore out-dated.

The property does not fall within an Aquatic CBA and therefore there are no transformation thresholds recommended for the sub-quaternary catchment.

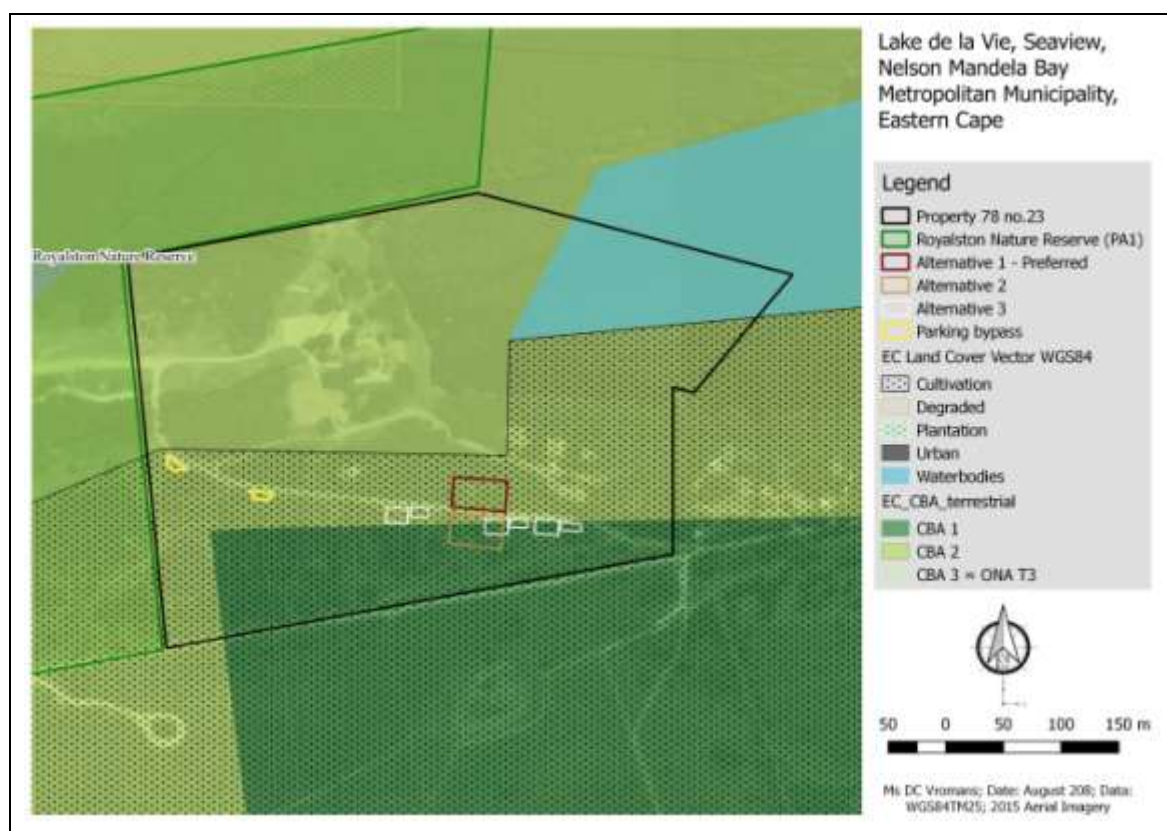


Figure 17. The ECBCP CBA Map indicates that the alternatives are situated in cultivated land and are thus not CBA (Berliner and Desmet, 2007).

7.1.3. The National Protected Area Expansion Strategy (2008) and the Eastern Cape Protected Area Expansion Strategy (2012)

Target areas (focus areas) for expansion of the Protected Area network in South Africa were identified through a systematic biodiversity planning process undertaken as part of the development of the 2008 National Protected Area Expansion Strategy (NPAES), as well as the 2012 provincial Protected Area Expansion Strategy.

The property and proposed development footprint relative to focus areas for expansion of formal Protected Areas:

- The proposed development does not fall within a focus area.

7.2. RESULTS: CRITICAL EVALUATION AND SITE VERIFICATION OF THE NELSON MANDELA BAY CBA MAP

Based on the site survey and assessment results (Section 4 – Section 6), the areas on which the alternatives are positioned should be classed as Critical Biodiversity Area (Alternative 1) and Ecological Support Area 1 (Alternative 2 and Alternative 3). This is based on the condition of the vegetation and proximity to the large wetland (Lake de la Vie) given that most of the land is natural to near-natural and degraded to modified (Section 6). This is also motivated by the fact that the bioregional plan itself classifies other modified (transformed) areas as ESA 1.

The classification of the land on which Alternative 2 and Alternative 3 are located is not currently agricultural land, as is indicated in the land cover data for the Nelson Mandela Bay Bioregional Plan's (Figure 15), but rather degraded to modified, with indigenous vegetation cover. Consequently, the degraded to modified areas should be classed as ESA 1, which is the criteria for ESA 1 in the Nelson Mandela Bay Bioregional Plan (SRK, 2014). CBA should ideally be natural areas, although the proximity to the large wetland system, Lake de la Vie, could motivate for the CBA classification (as is done in other more recent systematic conservation plans which base CBA status on a 500 m radius derived from the NFEPA data). Importantly though, the land use guidelines guide the type of development recommended in these categories and they do not differ greatly in that development is required to be conservation oriented (CBA) or low intensity (ESA).

The proposed development and existing development is low intensity, and is located adjacent to the Royalston Nature Reserve (owned by the Applicant), therefore some loss of habitat is not considered a fatal flaw for the alternatives if appropriate mitigation measures are adopted (refer Section 10.3).

Because the Nelson Mandela Bay Bioregional Plan (SRK, 2014) supersedes the ECBCP, the ECBCP was not assessed. The proposed development does not fall within a focus area for expansion of the national and provincial protected area expansion strategies.

8. COMBINED RESULTS: ECOLOGICALLY SENSITIVE AREAS

Ecologically Sensitive Areas were identified based on both the vegetation assessment (Section 5.2) and the aquatic assessment (Section 4.2), including the critical evaluation of the CBA Map (Section 7.2 above).

Ecological sensitivity was determined using the criteria described in Table 23 below; and is presented in Figure 18.

Table 23. Criteria used to determine Ecologically Sensitive Areas

CRITERIA	EXPLANATION
1. Wetlands	<ul style="list-style-type: none"> The extensive wetland lies 67 m to 102 m away from Alternative 1 and Alternative 2 - 3 sites respectively. The extensive wetland lies at a vertical distance of approximately 15 m to 30 m from Alternative 1 and Alternative 2 - 3 sites respectively. Based on the proposed development type, and both the vertical and horizontal distances, the alternatives are at a safe distance from the wetland (Figure 5).
2. Watercourse areas (rivers, streams and 1:50 000 drainage areas) and associated riparian & buffer areas	<ul style="list-style-type: none"> No watercourse, 1:50 000 drainage areas or streams occur on or within 100 m of the proposed development alternatives.
3. Critical Biodiversity Areas and Ecological Support Areas (includes special Habitats/Threatened habitats)	<ul style="list-style-type: none"> The proposed development falls within CBA (Refer Section 7.1); and at minimum the degraded areas would be considered ESA due to proximity to the extensive wetland system (and the fact that it is not cultivated land i.e. not completely transformed with no biodiversity value or no indigenous vegetation cover).
4. High conservation value areas due to high species diversity, unique species, threatened species.	<ul style="list-style-type: none"> The proposed development footprint does not fall within high conservation value areas. Refer below.
5. Presence of threatened species of conservation concern (Critically Endangered, Endangered, Vulnerable, Rare)	<ul style="list-style-type: none"> Threatened plant species were not recorded in the surveyed areas.
6. Very steep slopes	<ul style="list-style-type: none"> The proposed development footprint does not fall on very steep slopes (which would exclude development).
7. Biodiversity Target Area	<ul style="list-style-type: none"> The alternative sites are situated within Vulnerable Algoa Dune Thicket (Vlok and Euston-Brown, 2002), or Coastal Dune Thicket (Low and Rebelo, 1996), on a northern aspect, which is, according to the Nelson Mandela Bay Bioregional Plan' vegetation map (2005), Critically Endangered Chelsea Forest Thicket Mosaic, because Algoa Dune Thicket occurs as a mosaic thicket with forest on northern facing slopes (SRK, 2009/2014). There was no evidence of true forest on the sites surveyed. Chelsea Forest Thicket Mosaic is Critically Endangered with a target of 100 %, while Algoa Dune Thicket is a Vulnerable vegetation type according to the STEP biodiversity targets, with a target of 17 %. Critically Endangered Bushy Park Indian Ocean Forest is mapped on the property (according to the bioregional plan) and possibly occurs on southern slopes (due to habitat preference), on other areas of the property (biodiversity target of 77.2 %), not at the proposed sites. The biodiversity target areas should ideally be retained on the near-natural areas, and development should occur on the degraded areas (or modified areas), which represent 19.6 % of the property, thereby retaining 60.9 % of near natural vegetation cover (Table 19) on the property, which

CRITERIA	EXPLANATION
	<p>would represent a 100 % (biodiversity target for Chelsea Forest Thicket Mosaic). However, the sites do not represent true forest, rather a mosaic forest occurring within Algoa Dune Thicket. Furthermore, refer to the biodiversity offsets criterion below.</p> <ul style="list-style-type: none"> • If 0.19 ha is cleared on Alternative 1, then 9.5 ha or 59.7 % will remain near-natural (Table 19) on the property. This means 98 % of the near natural vegetation cover will be retained, which is 2 % below a 100 % target and 20.8 % above a 77.2 % target. • If the clearing takes place on Alternative 2 and 3 i.e. in degraded areas – this means 100 % of the natural/ near-natural areas will be retained and the degraded areas will be reduced from 19.6% to 18.4 % (Table 19).
8. Degree of intactness of the vegetation cover.	<ul style="list-style-type: none"> • The vegetation is in a good condition on Alternative 1 site, while it has been degraded on Alternative 2 and 3 sites. • Currently approximately 60.9 % of the vegetation cover is in a good condition on the property.
9. Consolidating proposed development proximate to the existing developed areas, but avoiding hydrological process areas and potential corridor areas.	<ul style="list-style-type: none"> • Alternative 1 site is positioned closer to the existing development (and services) compared with Alternative 2 and 3 sites; and thus promotes clustering of developments (better than the other alternatives).
10. Biodiversity offsets possible	<ul style="list-style-type: none"> • The rehabilitation of degraded and modified areas, on Alternative 2 and 3 sites and surrounds, is possible if the Alternative 1 site is developed (if approved by the Authorities).

As noted earlier, the Nelson Mandela Bay Critical Biodiversity Area (CBA) Map identified the Alternative 1 site as CBA, which is verified as CBA in this assessment. According to this site assessment (verification of the CBA Map), Alternative 2 and 3 sites are at minimum ESA 1 due to degradation on site (as CBAs should ideally be natural or near-natural sites). Although clearance of natural habitat is not recommended in terms of the Nelson Mandela Bay Bioregional Plan's land use management guidelines (Section 7.1), the land uses recommended for CBA and ESA are conservation and low intensity developments, respectively. Furthermore, wetlands classified as CBA (near natural) should be afforded a 75 m – 100 m buffer.

The proposed development is low intensity and promotes conservation as the majority of the property is undeveloped and thus represents natural vegetation cover (although not a conservation land use). Furthermore, it is adjacent to the Royalston Nature Reserve, which is owned by the Applicant, which increases the extent of natural habitat in the larger landscape and promotes conservation. Although Alternative 1 is situated in near-natural areas as opposed to Alternative 2 and Alternative 3, which are in degraded areas, the biodiversity offset of rehabilitation is an option to compensate for the loss of vegetation at this site, if it were to be developed. In addition, Alternative 1 will encourage nodal development.

However, the Department of Economic Development, Environmental Affairs and Tourism (DEDEAT) and the Department of Forestry - of the Department of Agriculture, Forestry and Fisheries (DAFF) - will not permit development on Alternative 1 (the preferred site) and thus this alternative is not feasible.

Figure 18 below indicates the ecologically sensitive areas ranging from high to moderate ecological sensitivity; and areas that are not ecologically sensitive (or modified areas).

Refer to Section 10.2 Impact Assessment and the final recommendations regarding alternatives (Section 10.5.3).

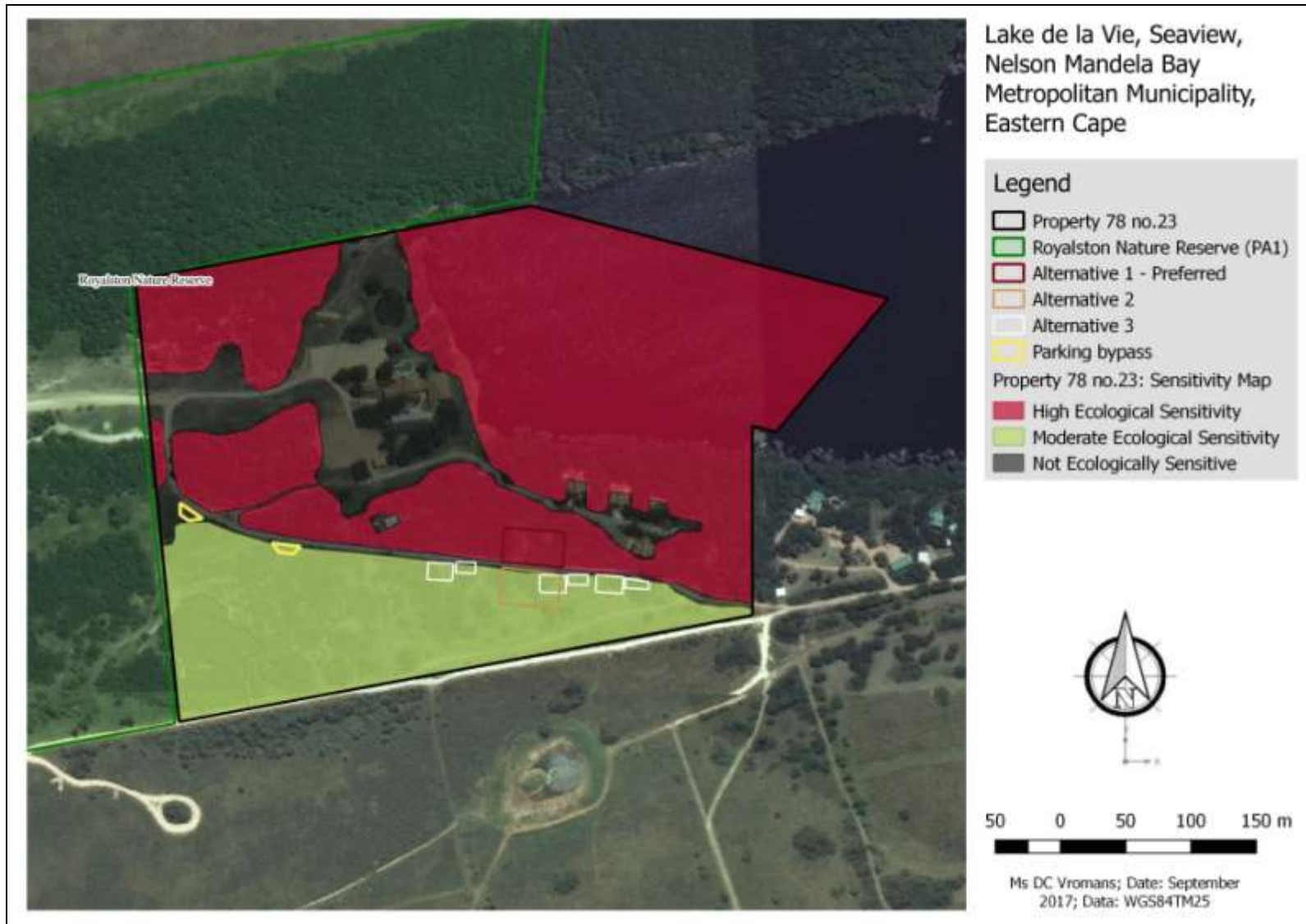


Figure 18. Ecologically Sensitive Areas on Remainder of Portion 78 no. 23.

9. LEGISLATIVE CONTEXT

The key piece of legislation that triggered the vegetation and aquatic assessment is the National Environmental Management Act (107 of 1998) and the National Water Act (36 of 1998), respectively.

The overriding legislation that guided the aquatic assessment pertains to Section 21(c) and 21(i) of the National Water Act (36 of 1998) as it requires that all wetland habitats be delineated within the 500 m radius of a proposed development. Section 21(c) refers to impeding or diverting the flow of water in a watercourse, and Section 21(i) refers to altering the bed, banks, course or characteristics of a watercourse. Section 21(c) and 21(i) also refers to any development that falls within 500 m of a wetland (number 3 (of bullet 4); and (b) below).

In terms of Section 21c and 21i General Authorisation (2016 Notice 509), the following terms are defined:

- **"diverting"** means to, in any manner, cause the instream flow of water to be rerouted temporarily or permanently;
- **"flow- altering"** means to, in any manner, alter the instream flow route, speed or quantity of water temporarily or permanently;
- **"impeding"** means to, in any manner, hinder or obstruct the instream flow of water temporarily or permanently, but excludes the damming of flow so as to cause storage of water;
- **"regulated area of a watercourse"** for section 21(c) or (i) of the Act water uses in terms of this Notice means:
 - (1) The outer edge of the 1 in 100 year flood line and /or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
 - (2) In the absence of a determined 1 in 100 year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act);
or
 - (3) A **500 m radius** from the delineated boundary (extent) of any wetland or pan.

The General Authorisation does not apply to:

- (a) to the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland as contemplated in General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009,
- (b) to the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the **Risk Matrix** (Appendix A [*of the general authorisation, not this report*]). This Risk Matrix must be completed by a suitably qualified SACNASP professional member;
- (c) in instances where an application must be made for a water use license for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity;
- (d) where storage of water results from the impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse; and
- (e) to any water use in terms of section 21(c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

In other words, if the proposed development does not conflict with any of the above, a water use licence application is not required, and a general authorisation in terms of Section 39 of the National Water Act can be issued.

A summary of the relevant legislation, which relates to potential ecological impacts that may accrue from the proposed development, is provided in the text table below. The legislative implication (management measure) is also indicated. The field work (or results) served to verify the implication of some of the legislation.

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p>THE CONSTITUTION (108 OF 1996)</p> <p>The South African Constitution is the supreme law of the land and ensures that: '... everyone has the right to an environment that is not harmful to their health or well-being; and to have the environment protected for the benefit of present and future generations. It requires that development is sustainable.</p>	<p>Measures must be implemented that 1) prevent pollution and ecological degradation; 2) promote conservation; and 3) secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development'.</p>
<p>NATIONAL WATER ACT (NWA) 36 OF 1998</p> <p>The NWA is concerned with the overall management, equitable allocation and conservation of water resources in South Africa. It controls and manages water use in terms of water abstraction, water storage, wastewater discharge, impact on watercourses, altering watercourse flow and the determination of the Reserve. The General Authorisations in terms of Section 39 of the Act identify certain water use activities that require registration or licensing via the Department of Water and Sanitation that impact aquatic resources (watercourses and wetlands).</p> <p><u>Section 21c and 21i:</u> A water use application is required where a proposed development lies within 500 m of wetland habitat, and within 100 m of a watercourse (river/stream), in terms of Section 21(c) (impeding or diverting flow in a watercourse) and 21(i) (altering the beds and banks etc. of a watercourse). A risk assessment must be conducted. If the post mitigation risk assessment concludes a moderate or high risk, a water use license application applies; whereas a general authorisation applies when the post mitigation risk is low. <u>Section 21g: Disposing of waste in a manner which may detrimentally impact on a water resource (September 2013), states that:</u> Wastewater storage dams and wastewater disposal sites must be located - (a) outside of a watercourse; (b) above the 1 in 100 year flood line or riparian habitat whichever is the greatest, or alternatively at least 100 metres from a water resource whichever is the greatest or at least further than a 500m radius from a borehole that is utilised for drinking water or stock watering; and (c)</p>	<p>Measures must be implemented that prevent pollution and ecological degradation of aquatic resources i.e. rivers and wetlands.</p> <p><u>Section 21c and 21i:</u> The risk assessment concluded a low risk (Section 4.2.5) and thus a general authorisation should apply if the Authority agrees with the conclusion.</p> <p><u>Section 21g:</u> Consultation with the Department for the proposed conservancy tanks and applicability of the National Water Act (36 of 1998).</p> <p><u>Section 144:</u> As this is not a township development and no watercourse crossings are proposed nor do any watercourses (rivers) occur within proximity to the proposed development, the determination of the 1:100 year flood line is not required, while wastewater storage and disposal are not components of this development.</p>

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p>at least outside a 500m radius from the boundary of a wetland, (d) on land that is not, or does not, overlie, a major aquifer (identification of a major aquifer will be provided by the responsible authority upon written request).</p> <p>Section 144 states the Departments view on development surrounding water resources: (144). For the purposes of ensuring that all persons who might be affected have access to information regarding potential flood hazards, no person may establish a township unless the layout plan shows, in a form acceptable to the local authority concerned, lines indicating the maximum level likely to be reached by floodwaters on average once in every 100 years. In other words, the township developer must delineate the 1:100 year flood line on a map when developing a township.</p>	
<p>NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) 107 OF 1998</p> <p>The NEMA provides for overarching principles that should inform South Africa's environmental management and governance. The NEMA is mainly regarded as a reasonable legislative measure required from the State in order to fulfil the environmental right (Section 24) of the Constitution. It requires development to be socially, environmentally and economically sustainable. The Environmental Impact Assessment (EIA) Regulations, gazetted in terms of Section 24, trigger an authorisation process for certain activities.</p>	<p>The activity requires a Basic Assessment. This report serves to inform the process.</p>
<p>NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (NEMBA) 10 OF 2004</p> <p>The Act provides for the protection of listed endangered ecosystems and restricts activities according to the categorization of the area (not just by listed activity as specified in the Environmental Impact Assessment regulations). It promotes the application of appropriate environmental management tools to protect biodiversity. Chapter 3 allows for the publication of bioregional plans. The Threatened or Protected Species Regulations, in terms of Section 97 (Chapter 8), requires an authorisation process to be followed. Chapter 5 allows for the promulgation of the alien invasive species regulations (Notice 598, 2014) and alien and invasive species lists (Notice 864, 2016). Alien invasive species are categorised in the following manner:</p> <ul style="list-style-type: none"> • Category 1a: must be combatted and eradicated. Trade and planting is prohibited. 	<p>The Nelson Mandela Bay Bioregional Plan has been gazetted and thus must be consulted prior to decision-making. However, it does require site verification and should not be followed blindly. The proposed development falls within a Critical Biodiversity Area in terms of the Nelson Mandela Bay Bioregional Plan.</p> <p>The vegetation on site is not listed as a Threatened Ecosystem in terms of the National South African Vegetation Map, and thus the NEMBA, however it is Critically Endangered in terms of the Nelson Mandela Bay Bioregional Plan.</p> <p>No threatened species were recorded on site.</p> <p>Alien species invasion should be controlled. <i>Vachellia (Acacia) cyclops</i> trees were</p>

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<ul style="list-style-type: none"> • Category 1b: must be controlled and wherever possible, removed and destroyed. Trade and planting is prohibited. • Category 2: species deemed to be potentially invasive. A permit is required to carry out a restricted activity. • Category 3: may remain in prescribed areas or provinces. Further planting, propagation or trade is prohibited. 	recorded on site.
<p>NATIONAL ENVIRONMENTAL MANAGEMENT: INTEGRATED COASTAL MANAGEMENT ACT (ICMA) 24 OF 2009</p> <p>The objective of the Act is to establish a country wide system of integrated coastal and estuarine management, to promote the conservation of the coastal environment, and to ensure that coastal development and natural resource use is ecologically sustainable and socio-economically justifiable. Importantly it provides for the – (a) coastal protection zone (1 km – 100 m etc.), (b) preparation of coastal management programmes (c) coastal access land (d) coastal public property (coastal waters, submerged land etc.) (e) coastal set back lines.</p>	<p>The proposed development should not deny public access to coastal land, should comply with any relevant coastal management programmes (e.g. Eastern Cape Coastal Management Programme) or coastal set back lines, and should prevent significant environmental damage within coastal ecosystems.</p> <p>The proposed development lies approximately 3.5 km from the high water mark and between the 120 m to 140 m contour, while a coastal set back line has been delineated for the coastline (NMBM. 2012). The proposed development falls beyond the coastal protection zone and coastal set back line.</p>
<p>NATIONAL FORESTS ACT (NFA) 84 OF 1998</p> <p>Any area that has vegetation that is characteristic of a closed and contiguous canopy is defined as a ‘forest’ and as a result falls under the authority of the Department of Forestry. The removal of any indigenous or protected trees or clearing of any woodland, thicket or forest requires a permit.</p> <p>‘forest’ includes - (a) a natural forest, a woodland and a plantation; (b) the forest produce in it; and (c) the ecosystems which it makes up.</p> <p>‘woodland’ means a group of indigenous trees which are not a natural forest, but whose crowns cover more than five per cent of the area bounded by the trees forming the perimeter of the group.</p> <p>In terms of policy, building structures must typically be placed outside the forest with a sufficient buffer area to keep the forest margin intact (usually > 20 m). In</p>	<p>Two protected trees were recorded, <i>Sideroxylon inerme</i> and <i>Pittosporum viridifolium</i>. <i>P. viridiflorum</i> is especially prevalent on Alternative 1 site.</p> <p>The Department of Forestry has indicated that Alternative 1 must be avoided, and indicated a preference for footprints within the degraded vegetation south of the existing tar road. Alternative 3 was thus designed to accommodate these recommendations.</p>

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p>addition, that only under exceptional circumstances will the Department of Forestry consider clearing forest, while forest habitat that has been cleared and which will restore with time should be considered forest and the forest policy guidelines should be applied (DAFF, 2007).</p>	
<p>CAPE NATURE AND ENVIRONMENTAL CONSERVATION ORDINANCE (19 OF 1974)</p> <p>The Provincial Nature Conservation Ordinance (PNCO) allows for conservation of the natural environment; and the protection of wildlife. Certain biota are scheduled and therefore protected. A permit must be obtained from Department of Economic Development, Environment Affairs and Tourism (DEDEAT), Provincial Environment Affairs (Biodiversity Unit), to remove or destroy any plants listed in the Ordinance.</p>	<p>Several protected species were recorded, which will require a license to be removed (see Section 5.2.1).</p>
<p>ENVIRONMENT CONSERVATION ACT (ECA) 73 OF 1989</p> <p>Section 20 of the Act requires for the appropriate disposal of waste and licensed waste disposal sites, although any new waste licenses are subject to approval via the NEMWA (below).</p>	<p>All wastes (general and hazardous) generated by the Contractor should be disposed of at an ECA or NEMWA licensed waste disposal site.</p>
<p>NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT (NEMWA) 59 OF 2008</p> <p>The Act provides for a national norm for the storage and handling of waste; and provides minimum standards for new and existing waste storage sites, and the licensing of new waste disposal sites.</p>	
<p>NATIONAL ENVIRONMENTAL MANAGEMENT: PROTECTED AREAS ACT (NEMPAA) 57 OF 2003</p> <p>The Act provides for the declaration of Protected Areas (PAs) in three forms (Chapter 3), namely Special Nature Reserves (Part 2), Nature Reserves (Part 3) and Protected Environments (Part 4). National Parks are the equivalent of National Protected Areas. Section 10 states that a Protected Area, declared in terms of provincial legislation, is</p>	<p>The property lies adjacent to the Royalston Nature Reserve, which was declared in March 2014; and which is owned by the Applicant.</p> <p>The site does not fall within a focus area for expansion. Section 7.3.</p> <p>The site is also approximately 4.1 km from the Sylvic Nature Reserve (to the south) and 4.3 km from the Island Nature Reserve (to the west). The Nelson Mandela Bay</p>

LEGISLATION AND OBJECTIVE	LEGISLATIVE IMPLICATIONS FOR THE PROPOSED DEVELOPMENT
<p>either a nature reserve or protected environment.</p>	<p>Bioregional Plan indicates a category 1 protected area (PA 1) approximately 2.7 km to the east, but this is not indicated in the national protected area database.</p>
<p>CONSERVATION OF AGRICULTURAL RESOURCES ACT (CARA) 43 OF 1983</p> <p>[to be replaced by the Sustainable Use of Agricultural Resources Bill]</p> <p>Section 6 of the Act, relates to the prescription of measures which all land users have to comply with, e.g. the prohibition of modifying run-off flow patterns; the control of invader plants; and the restoration of eroded land. Section 7 protects any vlei, marsh, water sponge or watercourse.</p> <p>A list of alien invasive species has been regulated.</p>	<p>This Act applies to agricultural applications. The NEMA and NWA effectively deal with the potential impacts of proposed developments in relation to erosion, alien invasive plants and impacts on aquatic resources.</p> <p>Alien invasive plants which should be controlled (Section 5.2), were recorded on site.</p>

10. IMPACT ASSESSMENT

10.1. IMPACT ASSESSMENT METHODOLOGY

Issues were assessed in terms of the following criteria:

CRITERIA	CATEGORIES	EXPLANATION
Overall nature	Negative	Negative impact on affected biophysical or human environment.
	Positive	Benefit to the affected biophysical or human environment.
Type	Direct	Are caused by the action and occur at the same time and place.
	Indirect Secondary or	Are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. May include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.
	Cumulative	Is the impact on the environment, which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Extent: Spatial Extent over which impact may be experienced (E)	Site (1)	Immediate area of activity incorporating a 50m zone which extends from the edge of the affected area.
	Local (2)	Area up to and/or within 10km of the 'Site' as defined above.
	Regional (3)	Entire community, drainage basin, landscape etc.
	National (4)	South Africa.
Duration of impact (D)	Very Short-term (1)	Impact would last for the duration of activities such as land clearing, land preparation, fertilising, weeding, pruning and thinning. Quickly reversible. (0–1 years).
	Short-term (2)	The lifetime of the impact will be of a short duration (2-5 years).
	Medium-term (3)	Impact would last for the duration of project activity, such as harvesting. Reversible over time (>5 - <15 years).
	Long-term (4)	Impact would continue beyond harvesting/ extraction of the trees (> 15 years).
	Permanent (5)	Impact would continue beyond decommissioning.
Severity (S)	Negative	Based on separately described categories examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning or slightly alters the environment itself. <ul style="list-style-type: none"> 0 is small and will have no meaningful effect on the environment; 2 is minor and will not result in an impact on processes;
	Positive	

CRITERIA	CATEGORIES	EXPLANATION
		<ul style="list-style-type: none"> • 4 is low and will cause a slight impact on processes; • 6 is moderate and will result in processes continuing but in a modified way; • 8 is high (processes are altered to the extent that they temporarily cease); • 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
Reversibility (R)	Completely Reversible (0)	The impact can be completely reversed with the implementation of correct mitigation and rehabilitation measures.
	Partly Reversible (0.5)	The impact can be partly reversed providing mitigation measures are implemented and rehabilitation measures are undertaken
	Irreversible (1)	The impact cannot be reversed, regardless of the mitigation or rehabilitation measures.
Irreplaceable Loss (I)	Resource will not be lost (0)	The resource will not be lost or destroyed provided mitigation and rehabilitation measures are implemented.
	Resource may be partly destroyed (0.5)	Partial loss or destruction of the resource will occur even though all management and mitigation measures are implemented.
	Resource cannot be replaced (1)	The resource cannot be replaced no matter which management or mitigation measures are implemented.
Probability of occurrence (P)	Unlikely (1)	<40% probability. Very improbable (probably will not happen).
	Possible (2)	40% probability. Improbable (some possibility, but low likelihood).
	Probable (3)	>70% probability. Probable (distinct possibility).
	Highly Probable (4)	>80 %. Highly probable (most likely).
	Definite (5)	>90% probability. Definite (impact will occur regardless of any prevention measures).
Mitigation Potential [i.e. the ability to manage or mitigate an impact given the necessary resources and feasibility of application.]	High Completely Mitigatable or	Relatively easy and cheap to manage. Specialist expertise or equipment is generally not required. The nature of the impact is understood and may be mitigated through the implementation of a management plan or through 'good housekeeping'. Regular monitoring needs to be undertaken to ensure that any negative consequences remain within acceptable limits. The significance of the impact after mitigation is likely to be low or negligible.
	Moderate Partially Mitigatable or	Management of this impact requires a higher level of expertise and resources to maintain impacts within acceptable levels. Such mitigation can be tied up in the design of the Project. The significance of the impacts after mitigation is likely to be low to moderate. May not be possible to mitigate the impact entirely, with a residual impact(s) resulting.
	Low Unmitigatable or	Will not be possible to mitigate this impact entirely regardless of the expertise and resources applied. The potential to manage the impact may be beyond the scope of the Project. Management of this impact is not likely to result in a measurable change in the level of significance.

CRITERIA	CATEGORIES	EXPLANATION
Impact Significance [Dur+Ext+R+I+Sev] X Probability	Negligible (0-26)	Negligible alterations of the environment and can be easily avoided by implementing appropriate mitigation measures.
	Low (>26-52.5)	Largely of HIGH mitigation potential, <u>after</u> considering the other criteria. Low to very low (the impact/risk may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making)
	Moderate (>52.5 ≤ 78/5)	Largely of MODERATE or partial mitigation potential <u>after</u> considering the other criteria. Medium (the impact /risk will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated).
	Very High/ Significant /Substantial (High) (>78.5 - 105)	Largely of LOW mitigation potential <u>after</u> considering the other criteria. Very high (the impact/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating).

10.2. ASSESSMENT OF ALTERNATIVES

Three alternatives are assessed below in Section 10.3. These include:

Alternative 1:	<p>This is the applicants preferred option.</p> <p><u>Motivation:</u> It is preferred because the proposed guest units will be positioned outside of the strong winds (improving guest experience) and closer to the existing services infrastructure, thus promoting nodal development. The latter will reduce financial costs.</p>
Alternative 2:	<p>This alternative is positioned near the crest of the slope, in the wind, at a greater distance from the existing services infrastructure, thus increasing costs, which are the reasons why the applicant preferred alternative 1 above.</p> <p>This site is situated in degraded vegetation cover, and will clear less tree cover. It was selected as an alternative for this purpose, while still encouraging nodal development but to a lesser degree compared with Alternative 1.</p>
Alternative 3:	<p>This alternative was designed based on recommendations received from the DEDEAT and DAFF to prevent any clearing of the woody forest-thicket vegetation on the Alternative 1 site.</p> <p>The units are dispersed within the degraded open, grassy patches, although some trees (adult or young) and protected plants (Least Concern) are likely to be cleared, northwards of the tar road. Units are positioned closer to the crest of the hill compared with Alternative 1 with 3 of the 6 units positioned along the tar road.</p>

All alternatives: Electrical supply is proposed to align with existing servitudes, including the tar roads, but some clearing of woody forest-thicket vegetation will be required, north of the existing tar road, approximately 13 m long.

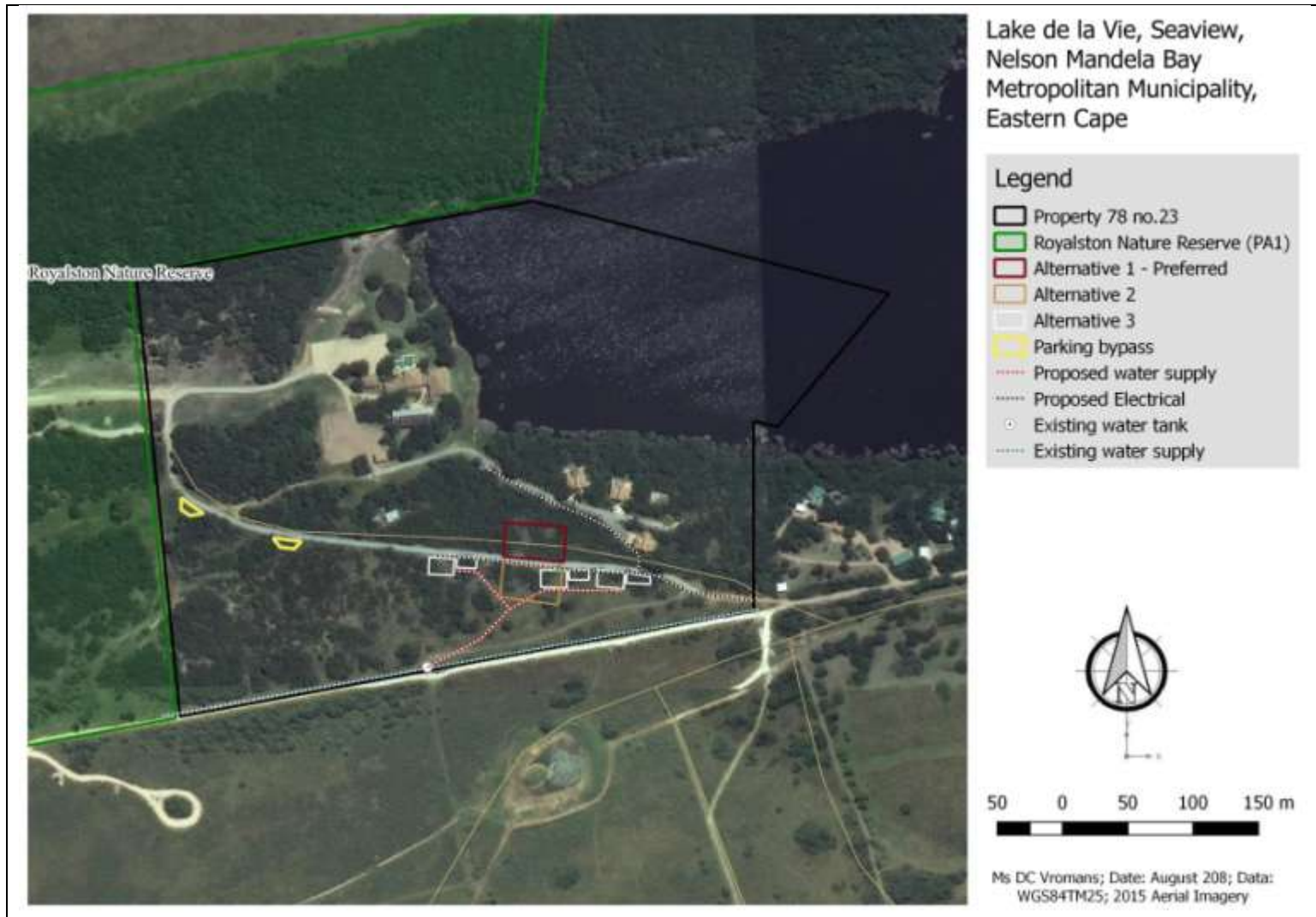


Figure 19. Alternatives assessed.

10.3. ASSESSMENT OF IDENTIFIED IMPACTS

Potential wetland impacts:

Potential impacts on the wetland system were not identified. This is because the Lake de la Vie is at a good distance both vertically (15 m - 30 m) and horizontally (67 m – 102 m) from the proposed development footprint to prevent any negative impacts from occurring. Furthermore, the small scale and low intensity nature of the proposed development (*and potential cumulative impact when considering the existing development*) will not result in any loss or disturbance of the wetland habitat or associated hydrological functions. Refer to the risk assessment (Section 4.2.5) required to be completed in terms of Section 21c and 21 of the National Water Act (36 of 1998).

Potential vegetation impacts identified and assessed:

- Impact 1: Loss of terrestrial vegetation cover and associated habitat (Biodiversity Loss)
- Impact 2: Loss of Protected Species (Biodiversity Loss)
- Impact 3: Fragmentation and loss of Critical Biodiversity Areas (Biodiversity Loss)
- Impact 4: Spread of Alien Invasive Species (Biodiversity Loss)
- Impact 5: Loss of vegetation due to erosion as a result of increased stormwater run-off from hardened surfaces (biodiversity and hydrological process loss)

The Construction Environmental Management Programme should provide management specifications for the control of pollution from potential oil and fuel spillages; and portable chemical toilets.

The following impacts were assessed as follows:

10.3.1. Project Specific Impact 1: Loss of terrestrial vegetation cover and associated habitat (biodiversity loss)

Nature of the Impact	<p><u>Alternative 1 - 3</u></p> <p>Nature of Impact: Approximately 0.19 ha / 1,900 m² of vegetation will need to be cleared to construct the guest units and parking area.</p> <p>Although the vegetation unit is indicated as Critically Endangered Bushy Indian Ocean Forest (which occurs on southern facing slopes) by the Nelson Mandela Bay Bioregional Plan 1:10 000 vegetation map (2003), the site assessment confirmed that alternative sites are situated within Vulnerable Algoa Dune Thicket (Vlok and Euston-Brown, 2002), a Coastal Dune Thicket (Low and Rebelo, 1996), which according to the Nelson Mandela Bay Bioregional Plan vegetation types, is likely to represent Critically Endangered Chelsea Forest Thicket Mosaic, as Algoa Dune Thicket occurs as a mosaic thicket with forest on <u>northern facing</u> slopes (SRK, 2009/2014). The vegetation was distinctly Dune Thicket at the footprints and surrounds thus suggesting the mosaic Algoa Dune Thicket component of Chelsea Forest Thicket Mosaic. There was no evidence of forest patches in the immediate surrounds.</p> <p>Chelsea Forest Thicket Mosaic is Critically Endangered with a target of 100 %. Algoa Dune Thicket is a Vulnerable vegetation type according to the STEP biodiversity targets, with a biodiversity target of 17 %. The Critically Endangered and Vulnerable status raises the severity of the impact despite the small footprint (relative to the size</p>
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	<p>of the property and remaining natural areas).</p> <p>If 0.19 ha is cleared on Alternative 1, then 9.5 ha or 59.7 % will remain near-natural (Table 19) on the property. This means 98 % of the near natural vegetation cover will be retained, which is 2 % below a 100 % target and 20.8 % above a 77.2 % target. If the clearing takes place on Alternative 2 and 3 i.e. in degraded areas – this means 100 % of the natural/ near-natural areas will be retained and the degraded areas will be reduced from 19.6% to 18.4 % (Table 19). Clearing in the degraded areas would not result in loss of near-natural areas, but indigenous vegetation cover will be lost.</p> <p>Because Alternative 1 is in an area assigned high ecological sensitivity (Section 8, Figure 18), the pre-mitigation impact is considered higher than Alternative 2 in the more degraded area. Alternative 3 also places units within the degraded grassy patches (Figure 19) as far as possible, although some trees (adult and younger trees) and other protected floral species will also be cleared. The impact is much the same as Alternative 2. The severity scores therefore decrease from Alternative 1 through to Alternative 2/3. The severity scores are not high due to the Dune Thicket character of the sites, the degraded nature of the sites (particularly Alternative 2 and 3) and low intensity nature of the proposed development, which will not result in complete destruction of ecological processes. However, because rehabilitation of the degraded areas (with indigenous species) is recommended as a biodiversity offset to the loss of CBA (or ESA), the post mitigation significance is equivalent.</p> <p>Electrical supply is proposed to align with existing servitudes, including the tar roads, but some clearing of woody forest-thicket vegetation will be required, north of the existing tar road, approximately 13 m long – for all alternatives. This will be a short term / temporary impact because the cables will be installed underground and rehabilitation will be necessary, post installation.</p>			
Development Phase:	Construction phase. Although clearing will not occur during operations this loss of vegetation will be retained during the operational phase due to the permanent nature of the development footprint.			
Extent	Site (Score 1)			
Duration	<u>Alternative 1 – 3</u> Permanent (Score 5)		<u>Electricity reticulation</u> Medium-term (Score 3) (without rehabilitation)	
Consequence / Intensity / Severity	<u>Alternative 1</u> Medium (Score 7)	<u>Alternative 2</u> Medium (Score 6)	<u>Alternative 3</u> Medium (Score 6)	<u>Electricity reticulation</u> Medium (Score 7)
Probability	Definite (Score 5)			
Reversibility	Partly Reversible (Score 0.5)			
Degree of Confidence	High			

<p>Irreplaceable Loss of Resources</p>	<p>Partially Replaceable (0.5)</p>			
<p>Status and Significance (without mitigation) [Dur+Ext+R+I+ Sev] X Probability</p>	<p><u>Alternative 1</u> Moderate-High Negative (-) (Score -70)</p>	<p><u>Alternative 2</u> Moderate Negative (-) (Score -65)</p>	<p><u>Alternative 3</u> Moderate Negative (-) (Score -65)</p>	<p><u>Electricity reticulation</u> Moderate Negative (-) (Score -60)</p>
<p>Mitigation</p>	<p>Recommended mitigation measures – compile an environmental management programme that provides the following specifications</p> <ul style="list-style-type: none"> • Limit vegetation removal to the disturbance footprint only. This can be improved by fencing in the area with danger tape so as to prevent encroachment into the surrounding areas. • Appropriate preventative measures to be implemented to prevent erosion due to increased stormwater run-off from the construction footprint (due to site clearance that could lead to vegetation loss beyond the footprint). • Rehabilitate any disturbance areas, in particular where the electrical supply will clear vegetation north of the tar road, with indigenous grasses, bulbs and trees, as well as protected species (as indicated in Section 10.3.2) (refer below). Refer impact below in this regard. • The applicant, Mr Watson, also the landowner of the adjacent properties on Royalston Estate and Private Wildlife Reserve, owns an indigenous tree nursery. Planting indigenous trees within the degraded areas (Figure 11) is also encouraged as a biodiversity offset. Trees can be planted in small clumps, scattered in these areas, to encourage natural restoration over time. This is especially recommended for Alternative 1, as a biodiversity offset, and is encouraged for Alternative 2 and 3 as well. • 80 % - 90 % vegetation cover should be achieved in areas that are re-vegetated, which should determine the rehabilitation period (including maintenance or establishment period). • The Contractor to provide detailed method statements for rehabilitation / re-vegetation. • An Environmental Management Programme to indicate the above specifications. • An Environmental Control Officer to oversee the implementation of the Environmental Management Programme at strategic intervals. 			
<p>Significance and Status (with mitigation)</p>	<p><u>Alternative 1</u> Moderate Negative (-) (Score -60)</p>	<p><u>Alternative 2</u> Moderate Negative (-) (Score -50)</p>	<p><u>Alternative 3</u> Moderate Negative (-) (Score -50)</p>	<p><u>Electricity reticulation</u> Low Negative (-) (Score -14)</p>

10.3.2. Project Specific Impact 2: Loss of Protected Species (Biodiversity Loss)

Nature of the Impact	<p><u>Alternative 1 - 3</u></p> <p>Several Provincial Nature Conservation Ordinance protected species of Least Concern were recorded, as well as two trees protected in terms of the National Forest Act (Section 5.2.1). Because of the Least Concern status of all the species, the severity score is not considered high.</p> <p><u>Alternative 1:</u> Only the two trees, <i>Pittosporum viridiflorum</i> and <i>Sideroxylon inerme</i>; and <i>Carpobrotus edulis</i> were recorded (at the road edges). There were many more <i>P. viridiflorum</i> on this site.</p> <p><u>Alternative 2:</u> All species were recorded on / around this site.</p> <p><u>Alternative 3:</u> It is likely that all the species will be cleared. Difficult to say as I didn't go to each footprint</p>		
Development Phase:	Construction phase. Although clearing will not occur during operations this loss of vegetation will be retained during the operational phase due to the permanent nature of the development footprint.		
Extent	Site (Score 1)		
Duration	Permanent (Score 5)		
Consequence / Intensity / Severity	<p><u>Alternative 1</u></p> <p>Low (Score 4)</p>	<p><u>Alternative 2</u></p> <p>Low (Score 4)</p>	<p><u>Alternative 3</u></p> <p>Low (Score 4)</p>
Probability	Definite (Score 5)		
Reversibility	Reversible (Score 0)		
Degree of Confidence	High		
Irreplaceable Loss of Resources	Replaceable (Score 0)		
Status and Significance (without mitigation) [Dur+Ext+R+I+ Sev] X Probability	<p><u>Alternative 1</u></p> <p>Moderate (Score -50)</p>	<p><u>Alternative 2</u></p> <p>Moderate (Score -50)</p>	<p><u>Alternative 3</u></p> <p>Moderate (Score -50)</p>
Mitigation	<p>Recommended mitigation measures – compile an environmental management programme that provides the following specifications</p> <ul style="list-style-type: none"> As many of the herbaceous, succulent or bulbous species should be rescued and translocated to the degraded area (Figure 11). It should be noted that some of the 		

	<p>species are weedy, pioneers which establish very easily where disturbance has occurred, especially <i>Aizoon rigidum</i> and <i>Carpobrotus edulis</i> species. Focus should therefore be on the other species.</p> <ul style="list-style-type: none"> • Purchase as many indigenous trees removed and plant in the degraded area (Figure 11), without disturbing other protected species). The applicant, Mr Watson, also the landowner of the adjacent properties on Royalston Estate and Private Wildlife Reserve, owns an indigenous tree nursery. Planting indigenous trees within the degraded areas is also encouraged as a biodiversity offset. Trees can be planted in small clumps, scattered in these areas, to encourage natural restoration over time. • 100 % survival rate of planted trees is recommended. • License application to the Department of Economic Development, Environmental Affairs and Tourism for the protected species. • License application to the Department of Forestry (of Department of Agriculture, Forestry & Fisheries) for the removal of <i>Pittosporum viridiflorum</i> and <i>Sideroxylon inerme</i> trees. • The Contractor to provide detailed method statements for rehabilitation / re-vegetation. • Rehabilitation of disturbed areas with these species, as soon as possible. • Audit reporting by the Environmental Control Officer to ensure rehabilitation.
<p>Significance and Status (with mitigation)</p>	<p><u>All Alternatives</u> Low Negative (-)</p>

10.3.3. Project Specific Impact 3: Loss of Critical Biodiversity Area and Ecological Support Area due to clearing of vegetation (biodiversity and hydrological process loss)

<p>Nature of the Impact</p>	<p><u>Alternative 1 - 3</u></p> <p>This impact relates to both vegetation (pattern) aspects, as well as catchment hydrological process aspects (due to proximity to Lake de la Vie). Alternative 1 falls within CBA according to the Nelson Mandela Bay Bioregional Plan (SRK, 2014), as confirmed in this assessment (Section 7.2). <u>According to this assessment</u>, the Alternative 2 site and Alternative 3 layout is within degraded vegetation, which would classify the site as, at minimum Ecological Support Area 1, due to the area supporting indigenous vegetation (i.e. not modified/built up) and the site being within 500 m of the extensive wetland system, Lake de la Vie. The land use management guidelines are much the same for both categories i.e. conservation and low intensity developments. The proposed development and existing development is low intensity. However, it is noted that the Bioregional Plan does not recommend the loss of natural habitat and encourages development in already modified / cleared areas or degraded areas, but noting that disturbed, degraded areas do not imply appropriateness for development purposes or discount the potential for rehabilitation, especially if CBA or ESA.</p> <p>Because this is a small scale, low intensity, low impact development type, that lies adjacent to the Royalston Nature Reserve, which is owned by the Applicant, some loss of habitat is not considered a fatal flaw for all alternatives. The biodiversity offset, namely rehabilitating degraded areas, if the near-natural Alternative 1 site were to be developed, supports this conclusion (in the opinion of the assessor).</p>
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	<p>Because Alternative 1 is in an area assigned high ecological sensitivity (Section 8, Figure 18), the pre-mitigation impact is considered higher than Alternative 2 and 3. However, because rehabilitation of the degraded areas with indigenous species is recommended as a biodiversity offset to the loss of CBA (or ESA), the post mitigation significance is considered equivalent.</p> <p>Electrical supply is proposed to align with existing servitudes, including the tar roads, but some clearing of woody forest-thicket vegetation will be required, north of the existing tar road, approximately 13 m long – for all alternatives. This will be a short term / temporary impact because the cables will be installed underground and rehabilitation will be necessary, post installation (post mitigation).</p>			
Development Phase:	Construction phase. Although clearing will not occur during operations this loss of vegetation will be retained during the operational phase due to the permanent nature of the development footprint.			
Extent	Site (Score 1)			
Duration	<u>Alternative 1 – 3</u> Permanent (Score 5).		<u>Electricity reticulation</u> Medium-term (Score 3) (without rehabilitation)	
Consequence / Intensity / Severity	<u>Alternative 1</u> Medium (Score 7)	<u>Alternative 2</u> Medium (Score 6)	<u>Alternative 3</u> Medium (Score 6)	<u>Electricity reticulation</u> Medium (Score 7)
Probability	Definite (Score 5)			
Reversibility	Reversible (Score 0.5)			
Degree of Confidence	High			
Irreplaceable Loss of Resources	Replaceable (0.5)			
Status and Significance (without mitigation) [Dur+Ext+R+I+ Sev] X Probability	<u>Alternative 1</u> Moderate Negative (-) (Score -70)	<u>Alternative 2</u> Moderate Negative (-) (Score -65)	<u>Alternative 3</u> Moderate Negative (-) (Score -65)	<u>Electricity reticulation</u> Moderate Negative (-) (Score -60)
Mitigation	<ul style="list-style-type: none"> As per impact 1 and 2. Including: Retain all other natural areas (including degraded areas that are retaining indigenous vegetation) on the property as CBA or ESA. Where the vegetation is cleared for the electrical reticulation, rehabilitation must 			

	be undertaken (as per impact 1).	
Significance and Status (with mitigation)	<p><u>Alternative 1 - 3</u></p> <p>Medium Negative (-) (Loss of some mapped CBA; and ESA as assessed /verified for this study).</p> <p>(As per impact 1)</p>	<p><u>Electricity reticulation</u></p> <p>Low Negative (-)(Score -20)</p>

10.3.4. Project Specific Impact 4: Spread of alien invasive plants (biodiversity and hydrological process loss)

Nature of the Impact	<p><u>Alternative 1 - 3</u></p> <p>A number of <i>Vachellia (Acacia) cyclops</i> (NEMBA Category 1b) were observed. <i>Vachellia (Acacia) melanoxylon</i> (NEMBA Category 2) were also observed on other areas of the property.</p> <p>The spread of alien invasive plants is encouraged during construction due to the exposure of bare soils; and during operations.</p>		
Development Phase:	Construction phase. The impact will occur during construction due to clearing. It is likely that it will continue during the operations phase. Impacts are scored equivalently.		
Extent	Site (Score 1)		
Duration	Permanent (Score 5)		
Consequence / Intensity / Severity	<p><u>Alternative 1</u></p> <p>Medium (Score 6)</p>	<p><u>Alternative 2</u></p> <p>Medium (Score 6)</p>	<p><u>Alternative 3</u></p> <p>Medium (Score 6)</p>
Probability	Definite (Score 5)		
Reversibility	Reversible (Score 0)		
Degree of Confidence	High		
Irreplaceable Loss of Resources	Replaceable (0)		
<p>Status and Significance (without mitigation)</p> <p>[Dur+Ext+R+I+ Sev] X</p>	<p><u>Alternative 1 - 3</u></p> <p>Moderate Negative (-) (Score -65)</p>		

Probability	
Mitigation	<p>Recommended mitigation measures – compile an environmental management programme that provides the following specifications</p> <ul style="list-style-type: none"> • The contractor will be responsible for clearing and destroying any newly emerging alien invasive plants. • Hand removal is recommended. • During operations, the applicant is encouraged to prevent the spread of alien invasive plants, as required in terms of the NEMBA alien invasive species regulations (see Section 9).
Significance and Status (with mitigation)	<p>All Alternatives</p> <p>Low Negative (-)</p>

10.3.5. Project Specific Impact 5: Loss of vegetation due to erosion as a result of increased stormwater run-off from hardened surfaces (biodiversity and hydrological process loss)

Nature of the Impact	<p>Alternative 1 - 3</p> <p>If effective stormwater management and erosion control is not implemented during the design and construction phase, increased stormwater run-off from hardened surfaces will result in erosion downslope and further loss of vegetation cover is likely to occur. This is particularly a concern due to the sloped topography. However, with appropriate stormwater management this can easily be negated.</p>		
Development Phase:	Operations Phase.		
Extent	Site (Score 1)		
Duration	Permanent (Score 5)		
Consequence / Intensity / Severity	<p>Alternative 1</p> <p>Medium-Low</p> <p>(Score 5)</p>	<p>Alternative 2</p> <p>Medium-Low</p> <p>(Score 5)</p>	<p>Alternative 3</p> <p>Medium-Low</p> <p>(Score 5)</p>
Probability	Definite (Score 5)		
Reversibility	Reversible (Score 0)		
Degree of Confidence	High		
Irreplaceable Loss of	Replaceable (0)		

Resources	
Status and Significance (without mitigation) [Dur+Ext+R+I+ Sev] X Probability	<u>Alternative 1 - 3</u> Moderate Negative (-) (Score -55)
Mitigation	<p>Recommended mitigation measures – compile an environmental management programme that provides the following specifications</p> <ul style="list-style-type: none"> • Design and construct effective stormwater management and erosion control infrastructure to prevent long term erosion. • The developer should consider permeable parking surfaces and paving areas. • Rainfall harvesting is encouraged, which should also contribute to reducing the intensity of stormwater run-off from buildings.
Significance and Status (with mitigation)	<p><u>All Alternatives</u></p> <p>Low Negative (-)</p>

10.3.6. Cumulative Impact 1: Potential cumulative loss of vegetation due to clearing on the property and the M20A sub-quaternary catchment (biodiversity loss)

Nature of the Impact	<p><u>With respect to cumulative impacts on Remainder Portion 78 no 23:</u></p> <p>The extent of near natural vegetation cover on the property is approximately 61.3 %, and with the removal of vegetation, this will be reduced to 60.5 %, while degraded areas will remain at 19.6 %. Modified or cleared areas will be raised from 19.1 % to 19.9 %. Thus the potential future cumulative impact is considered to be LOW (severity) since the property is a low density development type (i.e. 0-30 % cleared).</p> <p>It should be noted that the applicant also owns the Royalston Estate and the Royalston Nature Reserve (currently measuring 413.244 ha), and has thus contributed to conservation. The Royalston Nature Reserve is largely natural, with some modified land (approximately 8.8 %). In addition, the applicant is undertaking rehabilitation in the Royalston Estate and Private Wildlife Reserve by planting indigenous trees.</p> <p><u>With respect to cumulative impacts of land uses within the M20A sub-quaternary catchment:</u> Modification in the quaternary catchment M20 sub-quat is approximately 67.204 % and the addition of a 0.19 ha development footprint will raise it to 67.209 % (refer to table text below).</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="4">Sub-quaternary catchment M20A</th> </tr> <tr> <th>Land Cover</th> <th>Ha</th> <th>%</th> <th>Footprint of 0.19 ha Percentage</th> </tr> </thead> <tbody> <tr> <td>Modified</td> <td>2,336.14</td> <td>67.204</td> <td>67,209</td> </tr> </tbody> </table>	Sub-quaternary catchment M20A				Land Cover	Ha	%	Footprint of 0.19 ha Percentage	Modified	2,336.14	67.204	67,209
Sub-quaternary catchment M20A													
Land Cover	Ha	%	Footprint of 0.19 ha Percentage										
Modified	2,336.14	67.204	67,209										

	Natural	1,140.06	32.8	32,8
	TOTALs	3,476.20	100.0	100
	<p>Thus the cumulative impact is considered to be HIGH (severity) (i.e. 60 % - 100 % cleared) without considering biodiversity pattern and process targets (the CBA Map) which have implications for opportunities and constraints within specific catchments. The M20A sub-quaternary catchment is not situated within a FEPA priority catchment nor an aquatic CBA in terms of the ECBCP.</p> <p>Future developments are unknown in the catchment, however 58 % of the catchment does not fall within CBA, ESA 1 or PA 1, which means that additional development opportunities are still present with the catchment. From this perspective the potential future cumulative impact is thus considered LOW to MEDIUM.</p>			
Extent	Local (Score 2)		Regional (Score 3)	
Duration	Permanent (Score 5)			
Consequence / Intensity / Severity	<u>Property</u> Low (Score 4)		<u>Sub-quaternary catchment M20A</u> High (Score 8)	
Probability	Definite (Score 5)			
Reversibility	Partially Reversible (Score 0.5).			
Degree of Confidence	<u>Property</u> High		<u>Sub-quaternary catchment M20A</u> Medium	
Irreplaceable Loss of Resources	Partially replaceable (Score 0.5)			
Status and Significance (without mitigation)	<u>Property</u> Medium Negative (-) (Score - 60)		<u>Sub-quaternary catchment M20A</u> Very High Negative (-) (Score - 85)	
Mitigation	<ul style="list-style-type: none"> Adopt mitigation measures of all impacts above. (Project specific mitigation). 		<p>The following mitigation measures are not the responsibility of the Applicant, but serve to inform the cumulative impact assessment:</p> <ul style="list-style-type: none"> Maintain biodiversity pattern and process targets on individual properties proposed for development in the future and/or comply with the CBA Map (where applicable). (Catchment mitigation measure not 	

		<p>within the control of the Applicant).</p> <ul style="list-style-type: none"> • Ensure revision of the CBA Map to compensate for losses every 5 years. (Catchment mitigation measure not within the control of the Applicant). • Support expansion of the Protected Area network in terms of the National Environmental Management: Protected Areas Act. (Catchment mitigation measure not within the control of the Applicant).
Significance and Status (with mitigation)	<p><u>Property</u></p> <p>Low Negative (-)</p>	<p><u>Sub-quaternary catchment M20A</u></p> <p>Medium Negative (-)</p>

10.3.7. Cumulative Impact 2: Potential cumulative loss species of conservation concern due to clearing of vegetation on the property and the M20A sub-quaternary catchment (biodiversity loss)

Nature of the Impact	<p>This impact considers loss of species of conservation (threatened and declining species, rather than protected species in general).</p> <p><u>With respect to cumulative impacts on Remainder Portion 78 no 23:</u></p> <p>As per impact 1. With loss of natural vegetation, the potential for loss of species of conservation/special concern is created. However, it is highly unlikely that future loss will be significant given the nature of the proposed development and land use type.</p> <p>It should be noted that the applicant also owns the Royalston Estate & Private Wildlife Reserve and the Royalston Nature Reserve (currently measuring 413.244 ha). The Royalston Nature Reserve is largely natural, with some modified land (approximately 8.8 %). In addition, the applicant is undertaking rehabilitation in the Royalston Estate & Private Wildlife Reserve by planting indigenous trees.</p> <p><u>With respect to cumulative impacts of land uses within the M20A sub-quaternary catchment:</u></p> <p>As per impact 1.</p>	
Extent	Site (Score 1)	Regional (Score 3)
Duration	Permanent (Score 5)	
Consequence / Intensity / Severity	<p><u>Property</u></p> <p>High (Score 8)</p>	<p><u>Sub-quaternary catchment M20A</u></p> <p>High (Score 8)</p>

Probability	Probable (Score 3)	Highly Probable (Score 4)
Reversibility	Reversible (Score 0).	
Degree of Confidence	Property High	Sub-quaternary catchment M20A Medium
Irreplaceable Loss of Resources	Replaceable (Score 0)	
Status and Significance (without mitigation)	Property Low Negative (-) (Score -42)	Sub-quaternary catchment M20A Moderate Negative (-) (Score - 64)
Mitigation	<ul style="list-style-type: none"> Rescue and translocation of plants as recommended in impact 2 (project specific impact). 	<p>The following mitigation measures are not the responsibility of the Applicant, but serve to inform the cumulative impact assessment:</p> <ul style="list-style-type: none"> As per cumulative impact 1 and 3 above, including rescue and translocation of species with respect to other future developments (catchment mitigation measure not within the control of the Applicant).
Significance and Status (with mitigation)	Low Negative (-)	Low Negative (-)

10.3.8. Cumulative Impact 3: Potential cumulative loss of Critical Biodiversity Area and Ecological Support Area due to clearing of vegetation on the property and in the M20A catchments (biodiversity and hydrological process loss)

Nature of the Impact	<p><u>With respect to cumulative impacts on Remainder Portion 78 No. 23:</u></p> <p>Alternative 1 is located within CBA and Alternative 2 and 3 within ESA 1 (at minimum), due to degradation but positioning within 500 m of the extensive wetland (Refer Section 7.2). The potential future cumulative loss on the property is likely to be low due to the nature of the existing development / land use, as well as the fact that it is adjacent to the Royalston Nature Reserve.</p> <p>It should be noted that the Applicant also owns the Royalston Estate & Private Wildlife Reserve and the Royalston Nature Reserve (currently measuring 413.244 ha). The Royalston Nature Reserve is largely natural, with some modified land (approximately 8.8 %) and is largely classified as CBA and ESA. In addition, the applicant is undertaking rehabilitation in the Royalston Estate & Private Wildlife</p>
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	Reserve by planting indigenous trees.	
	<u>With respect to cumulative impacts of land uses within the M20A sub-quaternary catchment:</u>	
	According to the available land cover data (see Cumulative Impact 1), the current and potential loss in extent (ha) of CBA and ESA is probably LOW (Section 7.1). Approximately 27.2% of the M20A sub-catchment is CBA and ESA (Table 22). These areas would have been incorporated into the municipal SDF given the bioregional plan status (although this does not guarantee that losses will not occur in the future).	
	Future developments are unknown in the catchment, however 58 % of the catchment does <u>not</u> fall within CBA, ESA 1 or PA 1 (Table 22), which means that additional development opportunities are still present with the catchment. From this perspective the potential future cumulative impact is thus considered LOW to MEDIUM post mitigation.	
Extent	Local (Score 2)	Regional (Score 3)
Duration	Permanent (Score 5)	
Consequence / Intensity / Severity	<u>Property</u> Medium (Score 6)	<u>M20A catchment</u> High (Score 8)
Probability	Possible (Score 3)	Definite (Score 5)
Reversibility	Partially Reversible (Score 0.5).	
Degree of Confidence	Medium	
Irreplaceable Loss of Resources	Partially Replaceable (Score 0.5)	
Status and Significance (without mitigation)	<u>Property</u> Low Negative (Score -42)	<u>M20A catchment</u> Very High Negative (-) (Score - 85)
Mitigation	<ul style="list-style-type: none"> As per impact 3 for the property (project specific impact). 	<p>The following mitigation measures are not the responsibility of the Applicant, but serve to inform the cumulative impact assessment:</p> <ul style="list-style-type: none"> Maintain biodiversity pattern and process targets on individual properties proposed for development in the future and/or comply with the CBA Map (where applicable). (Catchment mitigation measure not within the control of

		<p>the Applicant).</p> <ul style="list-style-type: none"> • Ensure revision of the CBA Map to compensate for losses every 5 years. • Support expansion of the Protected Area network in terms of the National Environmental Management: Protected Areas Act. (Catchment mitigation measure not within the control of the Applicant).
Significance and Status (with mitigation)	<p><u>Property</u></p> <p>Low Negative (-)</p>	<p><u>M20A catchment</u></p> <p>Low to Medium Negative (-)</p>

10.4. ENVIRONMENTAL MANAGEMENT PROGRAMME RECOMMENDATIONS

A summary of the project specific mitigation measures recommended in Section 10.3 is provided below, which can be incorporated into the Environmental Monitoring Programme and implemented/monitored by the Environmental Control Officer.

<p>Compile an Environmental Management Programme which provides the following specifications for implementation by the Environmental Control Officer:</p>
<p>CONSTRUCTION PHASE</p>
<p>IMPACT 1 - Loss of Vegetation due to Clearing</p> <ul style="list-style-type: none"> • Limit vegetation removal to the disturbance footprint only. This can be improved by fencing in the area with danger tape so as to prevent encroachment into the surrounding areas. • Appropriate preventative measures to be implemented to prevent erosion due to increased stormwater run-off from the construction footprint (due to site clearance that could lead to vegetation loss beyond the footprint). • Rehabilitate any disturbance areas (although these should not occur if construction remains within the footprint, as indicated in bullet 1 above) with indigenous grasses, bulbs and trees, as well as protected species (as indicated in Section 10.3.2) (refer below). • The applicant, Mr Watson, also the landowner of the adjacent properties on Royalston Estate and Private Wildlife Reserve, owns an indigenous tree nursery. Planting indigenous trees within the degraded areas (Figure 11) is also encouraged as a biodiversity offset. Trees can be planted in small clumps, scattered in these areas, to encourage natural restoration over time. Refer impact below in this regard. • 80 % - 90 % vegetation cover should be achieved in areas that are re-vegetated, which should determine the rehabilitation period (including maintenance or establishment period). • The Contractor to provide detailed method statements for rehabilitation / re-vegetation. • An Environmental Management Programme to indicate the above specifications. • An Environmental Control Officer to oversee the implementation of the Environmental Management Programme at strategic intervals.

IMPACT 2 - Loss of Protected Species (Biodiversity Loss)

- As many of the herbaceous, succulent or bulbous species should be rescued and translocated to the degraded area (Figure 11). It should be noted that some of the species are weedy, pioneers which establish very easily where disturbance has occurred, especially *Aizoon rigidum* and *Carpobrotus edulis* species. Focus should therefore be on the other species.
- Purchase as many indigenous trees removed and plant in the degraded area (Figure 11), without disturbing other protected species). The applicant, Mr Watson, also the landowner of the adjacent properties on Royalston Estate and Private Wildlife Reserve, owns an indigenous tree nursery. Planting indigenous trees within the degraded areas is also encouraged as a biodiversity offset. Trees can be planted in small clumps, scattered in these areas, to encourage natural restoration over time.
- 100 % survival rate of planted trees is recommended.
- License application to the Department of Economic Development, Environmental Affairs and Tourism for the protected species.
- License application to the Department of Forestry (of Department of Agriculture, Forestry & Fisheries) for the removal of *Pittosporum viridiflorum* and *Sideroxylon inerme* trees.
- Rehabilitation of disturbed areas with these species, as soon as possible.
- The Contractor to provide detailed method statements for rehabilitation / re-vegetation.
- Audit reporting by the Environmental Control Officer to ensure rehabilitation.

IMPACT 3 - Loss of Critical Biodiversity Area due to clearing of vegetation (biodiversity and hydrological process loss)

- As per impact 1 and 2. Including:
- Retain all other natural areas (including degraded areas that are retaining indigenous vegetation) on the property as CBA or ESA.
- Where the vegetation is cleared for the electrical reticulation, rehabilitation must be undertaken (as per impact 1).

IMPACT 4: Spread of alien invasive plants (biodiversity and hydrological process loss)

- The contractor will be responsible for clearing and destroying any newly emerging alien invasive plants.
- Hand removal is recommended.

OPERATIONS PHASE**IMPACT 4: Spread of alien invasive plants (biodiversity and hydrological process loss)**

- The applicant is encouraged to prevent the spread of alien invasive plants, as required in terms of the NEMBA alien invasive species regulations (see Section 9).

IMPACT 5: Loss of vegetation due to erosion as a result of increased stormwater run-off from hardened surfaces (biodiversity and hydrological process loss)

- Design and construct effective stormwater management and erosion control infrastructure to prevent long term erosion.
- The developer should consider permeable parking surfaces and paving areas. \
- Rainfall harvesting is encouraged, which should also contribute to reducing the intensity of stormwater run-off from buildings.

10.5. FINAL RECOMMENDATION AND CONCLUSIONS

10.5.1. Impact Statement

The proposed development is not considered to be a fatal flaw despite being positioned within CBA (Alternative 1) or at minimum ESA (Alternative 2 and Alternative 3). This is because the proposed development is of a small scale, low intensity development type, measuring approximately 0.19 ha (1,900 m²); and because it is positioned on a property that is characterised by low density, tourism accommodation.

A footprint of 1,900 m² will therefore not result in any significant loss of biodiversity pattern or process; and poses no threat to the extensive wetland habitat, known as Lake de la Vie, to the north. In addition, the biodiversity offset to compensate for the loss of CBA and/or ESA is to rehabilitate the degraded areas (see Figure 11) with small patches / clumps of indigenous trees, in order to encourage natural restoration over the long term. Furthermore, the property lies adjacent to the Royalston Nature Reserve, which is owned by the Applicant and which increases the extent of natural habitat in the larger landscape and promotes conservation. This means that the property will not be subject to significant or even moderate loss of biodiversity pattern or process in the future (without an Authorisation from DEDEAT or DAFF).

From both a tourism value perspective and an ecological perspective, these alternatives are considered more feasible than placing the units elsewhere on the property, due to enhanced views of Lake de la Vie and the opposing (intact) vegetated slopes; while Alternative 1 and 2 promote nodal development to reduce ecological impacts.

However, due to the recommendations received from the DEDEAT and DAFF, which is not in favour of Alternative 1 being developed, Alternative 1 is likely not feasible. In order to comply with the recommendations from the DAFF, the Applicant proposed the Alternative 3 layout (Figure 19). According to this assessment, Alternative 3 is feasible from an ecological perspective given the reasons stated above.

Refer to Section 10.4.3 below for the final recommendations regarding the alternatives.

10.5.2. Summary of Impacts

Refer Table 24 below for a summary of the impacts pre- and post-mitigation.

The loss of vegetation is considered MODERATE post mitigation for all alternatives. This is because the footprint is small in extent relative to the remaining near-natural areas post development and because true forest was not observed on the sites and in the immediate surrounds. Furthermore, Alternative 2 and 3 sites are degraded, whereas Alternative 1 is more representative of Algoa Dune Thicket rather than true forest, although it is acknowledged that Algoa Dune Thicket occurs as a mosaic thicket with forest according to the Nelson Mandela Bay Bioregional Plan's Chelsea Forest Thicket Mosaic.

The loss of species of special concern can be mitigated (reduced) to LOW through the translocation of species, particularly succulents and bulbs that are easy to transplant, as well as purchasing *Pittosporum viridiflorum* and *Sideroxylon inerme* trees to compensate for the removal of these two protected trees.

The loss of Critical Biodiversity Area and at minimum Ecological Support Area in the degraded areas is considered MODERATE post mitigation, as large areas of the property will **not** be developed, leaving approximately **59.7 % – 60.9 %** of the property as natural vegetation cover. In addition, the biodiversity offset to compensate for the loss of CBA and/or ESA is to rehabilitate the degraded areas with small patches / clumps of indigenous trees, in order to encourage natural restoration in the long term.

The impacts associated with the proposed electrical reticulation are temporary because the cables will be installed underground, while rehabilitation will be required. These factors contribute to lower impacts, and LOW post mitigation ratings.

The spread of alien invasive plants can be negated during the construction phase via hand removal, whereas stormwater and erosion control measures can also negate any further loss of vegetation during the operational phase. Removal of alien invasive plants during the operations phase is encouraged.

No aquatic / wetland related impacts were identified and assessed because the extensive wetland habitat, Lake de la Vie, is approximately 67 m horizontally and 15 m vertically from Alternative 1; and 102 m horizontally and 30 m vertically from Alternative 2 and Alternative 3.

Table 24. Summary of impacts pre- and post-mitigation

ENVIRONMENTAL IMPACT	DEVELOPMENT PHASE	PRE- MITIGATION			POST MITIGATION		
		Alternative 1	Alternative 2	Alternative 3	Alternative 1	Alternative 2	Alternative 3
PROJECT SPECIFIC IMPACTS							
IMPACT 1: Loss of vegetation due to clearing	Construction	Moderate (-70)	Moderate (-65)	Moderate (-65)	Moderate (-60)	Moderate (-50)	Moderate (-50)
		<u>Electrical reticulation</u> Moderate (-60)			<u>Electrical reticulation</u> Low (-)		
IMPACT 2: Loss of species of special concern due to clearing	Construction	Moderate (-50)	Moderate (-50)	Moderate (-50)	Low (-)	Low (-)	Low (-)
IMPACT 3: Loss of Critical Biodiversity Area and Ecological Support Area due to clearing	Construction	Moderate (-70)	Moderate (-65)	Moderate (-65)	Moderate (-)	Moderate (-)	Moderate (-)
		<u>Electrical reticulation</u> Moderate (-60)			<u>Electrical reticulation</u> Low (-)		
IMPACT 4: Spread of alien invasive plant species due to clearing	Construction & operations	Moderate (-65)	Moderate (-65)	Moderate (-65)	Low (-)	Low (-)	Low (-)
IMPACT 5: Loss of vegetation due to erosion as a result of increased stormwater run-off	Operations	Moderate (-55)	Moderate (-55)	Moderate (-55)	Low (-)	Low (-)	Low (-)

from hardened surfaces						
CUMULATIVE IMPACTS						
ENVIRONMENTAL IMPACT	DEVELOPMENT PHASE	Property	Sub-quaternary catchment M20A	Property	Sub-quaternary catchment M20A	
IMPACT 1: Loss of vegetation due to clearing	Construction	Moderate (- 60)	Very High (- 85)	Low (-)	Moderate (-)	
IMPACT 2: Loss of species of special concern due to clearing	Construction	Low (-42)	Moderate (- 64)	Low (-)	Low (-)	
IMPACT 3: Loss of Critical Biodiversity Area and Ecological Support Area due to clearing	Construction	Low (-42)	Very High (- 85)	Low (-)	Low to Moderate (-)	

10.5.3. Final Recommendation regarding Alternatives

All post mitigation impacts are equivalent for both alternatives 1 and 3, while alternative 1 has a slightly higher rating for the removal of vegetation and CBA but still retains a moderate post mitigation impact (Table 24 above). This is largely due to the small scale nature of the proposed development (and existing development) which allows for the remaining near-natural areas to be retained, while the recommended biodiversity offset to compensate for the loss of CBA and ESA would involve rehabilitation of the degraded and modified areas (see Figure 11).

Alternative 1 on the one hand encourages nodal development or clustering as it is proximate to the existing development, which is a generic recommendation in order to reduce impacts on the natural environment. Alternative 2 and Alternative 3 are both positioned within degraded areas, but which is not significantly degraded and can be viewed as “secondary vegetation”, representing ESA (according to this site assessment/ verification of the CBA Map). It was cleared for intensive cultivation in the past, as indicated in the 1939 aerial imagery (Figure 12, Section 6.1). Both alternatives 2 and 3 are positioned further from the existing development, and therefore do not encourage nodal development.

Alternative 1 could potentially be developed if rehabilitation of the degraded areas (Figure 11) is implemented. This can be in the form of planting small clusters (groups) of indigenous trees (which should include the protected trees) in order to encourage natural restoration over time in the degraded areas. This is the recommended biodiversity offset for permitting development on Alternative 1 site (but only on approval from the relevant Authorities)); and is encouraged for the Alternative 2 and 3 as well.

This recommendation is also supported by the fact that the applicant owns the ‘Royalston Estate and Private Wildlife Reserve’; as well as the Royalston Nature Reserve (currently measuring 413.244 ha), which lies adjacent to the property. The Royalston Nature Reserve is largely natural, with some modified land (approximately 8.8 %); and is largely classified as CBA and ESA. The Royalston Nature Reserve, combined with the Cragga Kamma property thus promotes conservation under the current landownership. In addition, the applicant is undertaking rehabilitation in the Royalston Estate & Private Wildlife Reserve (also owned by the Applicant) by planting indigenous trees.

The loss of approximately 1,900m² of vegetation within this context is not deemed a fatal flaw for permitting Alternative 1 (but only on approval from the relevant Authorities).

However, due to the recommendations received from the DEDEAT and DAFF, which is not in favour of Alternative 1 being developed, Alternative 1 is likely not feasible. In order to comply with the recommendations from the DAFF, the Applicant proposed the Alternative 3 layout (Figure 19). According to this assessment, Alternative 3 is feasible from an ecological perspective given the reasons stated above.

10.5.4. Permitting, Licensing or Authorisation Requirements

The following permitting, licensing or authorisations have been identified:

- A license application to the Department of Economic Development, Environmental Affairs and Tourism for the protected species in terms of the Cape Nature and Environmental Conservation Ordinance (19 of 1974) (Refer Section 5.2.1 for the species).
- License application to the Department of Forestry (of Department of Agriculture, Forestry & Fisheries) for the removal of *Sideroxylon inerme* and *Pittosporum viridiflorum* trees (Refer Section 5.2.1 for the species).
- Section 21c and 21 of the National Water Act: A water use application to the Department of Water and Sanitation (DWS) for the wetland, Lake de la Vie, as the proposed development is situated within the 500 m regulated area of a watercourse. A general authorisation is likely to be required based on the risk assessment, low post mitigation (Section 4.2.5), however consultation with DWS is necessary. It is the assessor's opinion that, because the dam (with wetland habitat) was excavated in 2009 and because it will not be impacted on in any way, a water use application should not apply to the dam, however feedback from DWS should be acquired. Importantly, it is not a natural wetland.
- Section 21g of the National Water Act: Consultation with the Department of Water and Sanitation (DWS) for the proposed conservancy tanks and applicability of the National Water Act (36 of 1998).

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12. ADDENDUM 1: PLANT INVENTORY

Family	Species	Red Data Listing / Conservation Status	Endemic
AGAPANTHACEAE	<i>Agapanthus praecox</i>	LC	Yes
AIZOACEAE	<i>Aizoon rigidum</i> (<i>Galenia pubescens</i>)	LC	No
ASPARAGACEAE	<i>Asparagus africanus</i>	LC	No
ASPARAGACEAE	<i>Asparagus densiflorus</i>	LC	No
AMARYLLIDACEAE	<i>Brunsvigia gregaria</i>	LC	No
ASPHODELACEAE	<i>Bulbine frutescens</i>	LC	No
CYPERACEAE	<i>Bulbostylis humilis</i>	LC	No
RUBIACEAE	<i>Canthium inerme</i>	LC	No
CAPPARACEAE	<i>Capparis sepiaria</i>	LC	No
AIOZACEAE	<i>Carpobrotus edulis</i>	LC	No
APIACEAE	<i>Centella asiatica</i>	LC	No
SCROPHULARIACEAE	<i>Chaenostoma campanulatum</i>	LC	Yes
ASTERACEAE	<i>Chrysanthemoides monilifera</i>	LC	No
COLCHICACEAE	<i>Colchicum eucomoides</i>	LC	Yes
ASTERACEAE	<i>Conyza scabrida</i>	LC	No
ASTERACEAE	<i>Cotula coronopifolia</i>	LC	No
CRASSULACEAE	<i>Cotyledon velutina</i>	LC	No
ARALIACEAE	<i>Cussonia spicata</i>	LC	No
POACEAE	<i>Cymbopogon marginatus</i>	LC	No
APOCYNACEAE	<i>Cynanchum ellipticum</i>	LC	No
POACEAE	<i>Cynodon dactylon</i>	LC	No
CYPERACEAE	<i>Cyperus crassipes</i>	LC	No
CYPERACEAE	<i>Cyperus dives</i>	LC	No
CYPERACEAE	<i>Cyperus durus</i>	LC	No
CYPERACEAE	<i>Cyperus sphaerospermus</i>	LC	No
VITACEAE	<i>Cyphostemma woodii</i>	LC	No
SCROPHULARIACEAE	<i>Diascia capsularis</i>	LC	No
EBENACEAE	<i>Diospyros dichrophylla</i>	LC	No
CYPERACEAE	<i>Eleocharis limosa</i>	LC	No
POACEAE	<i>Eragrostis curvula</i>	LC	No
POACEAE	<i>Eriochryis pallida</i>	LC	No
RUSCACEAE	<i>Eriospermum sp.</i>		
EBENACEAE	<i>Euclea crispa</i>	LC	No
ORCHIDACEAE	<i>Eulophia parviflora</i>	LC	No
ASTERACEAE	<i>Felicia amelloides</i>	LC	No
CYPERACEAE	<i>Ficinia nodosa</i>	LC	No
ASTERACEAE	<i>Gazania krebsiana</i>	LC	No
MALVACEAE	<i>Grewia occidentalis</i>	LC	No
CELASTRACEAE	<i>Gymnosporia heterophylla</i>	LC	No
ASTERACEAE	<i>Helichrysum cymosum</i>	LC	No
ASTERACEAE	<i>Helichrysum teretifolium</i>	LC	No
ASTERACEAE	<i>Helichrysum cooperi</i>	LC	No
MALVACEAE	<i>Hermannia saccifera</i>	LC	No
SAPINDACEAE	<i>Hippobromus pauciflorus</i>	LC	No
ARALIACEAE	<i>Hydrocotyle bonariensis</i>	LC	No
CYPERACEAE	<i>Isolepis cernua</i>	LC	No
CYPERACEAE	<i>Juncus lomatophyllus</i>	LC	No
CELASTRACEAE	<i>Lauridia tetragona</i>	LC	No

Family	Species	Red Data Listing / Conservation Status	Endemic
POACEAE	<i>Leersia hexandra</i>	LC	No
SOLANACEAE	<i>Lycium ferocissimum</i>	LC	No
CAPPARACEAE	<i>Maerua cafra</i>	LC	No
IRIDACEAE	<i>Moraea britteniae</i>	LC	Yes
POLYGALACEAE	<i>Muraltia spinosa</i>	LC	Yes
CELASTRACEAE	<i>Mystroxydon aethiopicum</i>	LC	No
OXALIDACEAE	<i>Oxalis incarnata</i>	LC	Yes
OXALIDACEAE	<i>Oxalis semiloba</i>	LC	No
POACEAE	<i>Panicum maximum</i>	LC	No
SAPINDACEAE	<i>Pappea capensis</i>	LC	No
POACEAE	<i>Paspallum distichum</i>	LC	No
THYMELAEACEAE	<i>Passerina falcifolia</i>	LC	No
GERANIACEAE	<i>Pelargonium auritum</i>	LC	No
POACEAE	<i>Phragmites australis</i>	LC	No
PITTIOSPORACEAE	<i>Pittosporum viridiflorum</i>	LC	No
CELASTRACEAE	<i>Pterocelastrus tricuspidatus</i>	LC	No
CELASTRACEAE	<i>Putterlickia pyracantha</i>	LC	No
RHAMNACEAE	<i>Rhamnus prinoides</i>	LC	No
VITACEAE	<i>Rhoicissus digitata</i>	LC	No
VITACEAE	<i>Rhoicissus tridentata</i>	LC	No
AIOZACEAE	<i>Ruschia sp.</i>		
SALICACEAE	<i>Scolopia zeyheri (Nees) Harv.</i>	LC	No
RHAMNACEAE	<i>Scutia myrtina (Burm.f.) Kurz</i>	LC	No
ANACARDIACEAE	<i>Searsia crenata</i>	LC	No
ANACARDIACEAE	<i>Searsia incisa</i>	LC	No
ANACARDIACEAE	<i>Searsia laevigatus</i>	LC	No
ANACARDIACEAE	<i>Searsia pallens</i>	LC	No
ANACARDIACEAE	<i>Searsia pterota</i>	LC	No
ANACARDIACEAE	<i>Searsia pyroides</i>	LC	No
SCROPHULARIACEAE	<i>Selago corymbosa</i>	LC	Yes
ASTERACEAE	<i>Senecio coronatus</i>	LC	No
ASTERACEAE	<i>Senecio deltoideus</i>	LC	No
ASTERACEAE	<i>Senecio madagascariensis</i>	LC	No
SAPOTACEAE	<i>Sideroxylon inerme L. subsp. inerme</i>	LC	No
SOLANACEAE	<i>Solanum linnaeanum</i>	LC	No
POACEAE	<i>Sporobolus africanus</i>	LC	No
POACEAE	<i>Stenotaphrum secundatum</i>	LC	No
TYPHACEAE	<i>Typha capensis</i>	LC	No
FABACEAE	<i>Vachellia (Acacia) cyclops</i>	Alien invasive plant	
FABACEAE	<i>Vachellia (Acacia) karroo</i>	LC	No
VISCACEAE	<i>Viscum rotundifolium</i>	LC	No
RUTACEAE	<i>Zanthoxylum capense</i>	LC	No

13. ADDENDUM 2: CURRICULUM VITAE

CURRICULUM VITAE: MS DEBORAH CLAIRE VROMANS

ENVIRONMENTAL SCIENTIST : BIODIVERSITY SERVICES PROFESSIONAL

BOTANICAL, RIPARIAN, ESTUARINE AND WETLAND SURVEYS, ECOLOGICAL ASSESSMENTS, GIS MAPPING

720815 0189 084

Services and Skills Offered

- Botanical and horticultural
 - Terrestrial and estuarine botanical surveys and assessments
 - Wetland surveys and assessments
 - Riparian delineation and assessments
 - Basic ecological assessments
 - Basic GIS mapping and digitizing
 - General Environmental Support – Completing Basic Assessment questionnaires and Water Use Licence applications, edit & review, assisting with the Public Participation Process, Strategic Environmental Assessments, compiling Environmental Management Programmes etc.
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Ms Deborah Vromans holds an MSc degree in Botany (Estuaries) (NMMU) and a BA degree in Environmental and Geographical Sciences (UCT), including a National Diploma in Horticulture (Botany) (Cape Technikon). Her MSc permitted publication and poster presentation in the international and national domain. She has 15 years of experience in the environment and biodiversity sector. Her focus is botanical (terrestrial and aquatic), wetland, basic ecological assessments, and riparian delineation & assessments, coupled with basic GIS mapping and digitizing. Deborah has river and estuary research experience. She can also process Water Use License Applications. Deborah has conducted numerous Environmental Impact Assessments, Environmental Management Plans, Basic Assessments, wetland surveys and specialist botanical surveys. Deborah has also performed several environmental risk assessments for abalone, as well as freshwater and marine fish species, in association with Enviro-Fish Africa (Department of Ichthyology and Fisheries Science, Rhodes University). She also assisted with the development of one of the first Municipal Coastal Management Programmes, required in terms of the Integrated Coastal Management Act. Deborah has a good understanding of environmental and planning legislation. She was employed by South African National Parks on two Global Environmental Facility (GEF) funded projects, aimed at mainstreaming biodiversity data and policy guidelines into land use planning and decision-making at the local, provincial and national level. Activities encompassed stakeholder consultation, the development of municipal biodiversity sector plan handbooks and compiling a legislative guide, as well as leading local and provincial capacity building workshops. She provided biodiversity input into the development of draft rural land use management guidelines for the Department of Environmental Affairs and Development Planning (Western Cape). She has undertaken a review of 30 key municipal planning documents in the Olifants Catchment (Limpopo, Mpumalanga and Gauteng Provinces), as part of the Resilim-O Project supported by the United States Agency for International Development (USAID). Deborah was involved in the compilation of the Waterberg District Municipality Bioregional Plan (Limpopo Province) for the Department of Economic Development, Environmental and Tourism; as well as the a Biodiversity Sector Plan for the North West Province for the Rural, Environmental and Agricultural Development, also in association with Ecosol GIS (the leading conservation planners in South Africa).

QUALIFICATIONS

Nelson Mandela Metropolitan University (2011)

- MSc Botany (Estuaries): The Phenology of Macrophytes in a Temporarily Open/Closed Estuary compared with a Permanently Open Estuary, South Africa.

University of Cape Town – Bachelor of Arts Degree (1997)

- Major Subject - Environmental & Geographical Sciences
- Relevant Subjects - Integrated Environmental Management (IEM), Environmental Impact Assessment (EIA), Conflict Management, Ecological Issues in Africa, Geo-Science, Statistics, Research Methodologies and Report Writing.

Cape Technikon – National Horticultural Diploma (1994)

- Relevant Subjects - IEM, EIA, Environmental Studies, Soil Science, Botany, Plant Identification and Landscape Design, Soil Science, Horticultural Science, Propagation and Re-vegetation Practices.

Additional Courses

- Estuary Management Course (2009) - Nelson Mandela Metropolitan University
- Landscape Function Analysis (2005) – Potchefstroom University
- Rehabilitation Course (2004) – Rhodes University (Prof R Lubke)
- Environmental Impact Assessment (2003) – Coastal & Environmental Services, Rhodes University.
- Class 4 Commercial Diver (2002)

PROFESSIONAL EXPERIENCE

Independent Biodiversity Services Professional: Integrating Biodiversity and Planning

Botanical, Wetland, Riparian and Estuarine Surveys, Basic Ecological Assessments, Basic GIS Mapping (2011 -2017)

Projects -

- Protected Area Management Plan. Indalo Game Reserves. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Indalo Game Reserves) (Current).
- Lebombo Msikaba Wetland Assessment. Eastern Cape. (Contracted by: ETC Environmental Consultants) (Current).
- San Miguel Sylvania Citrus. Expansion of Citrus. Vegetation and Aquatic Survey and Assessment. Kirkwood, Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (Current).
- Biodiversity Assessment. Intsomi Farm. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: R Niven, San Miguel Citrus) (Current).
- Dunbrody Estates. Expansion of Citrus. Vegetation and Aquatic Survey and Assessment. Kirkwood, Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (June 2017).
- Falcon Ridge Farm. Vegetation and Aquatic Survey and Assessment. Nelson Mandela Bay Municipality. (Contracted by: Public Process Consultants) (December 2015 –February 2015/Phase 2 current).
- Ikamva Lethu. Falcon Ridge Farm Vegetation and Aquatic Assessment: Phase ii Impact Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (Current).
- Langbos Citrus. Section 21c and 21i water use application. Addo. Sundays River Valley Municipality. (Contracted by: Francois Joubert) (April – August 2017).
- Freshgro Kariega Citrus Development. Section 21c and 21i Supplementary Form Completion, Kirkwood, Sundays River Valley Municipality. (Contracted by: Applicant) (2016).
- Biodiversity Assessment. Buffalo Kloof Game Reserve. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Mr W Rippon) (December 2016 – February 2017).
- Riparian Desktop Assessment. Proposed Low Level Bridge Crossings at Ngqandulo (Kujadu River) and Suncity (Mzenge River). Ingquza Hill Local Municipality, Eastern Cape. (Contracted by: Izwile Africa Development Consultants) (September 2016).

- Zoetgenoegd Farm – Citrus Agriculture: Ecological Assessment. Addo. Nelson Mandela Bay Municipality. (Contracted by: IWR Terblanche and Associates – Environmental Consulting) (August 2016).
- Wetland Assessment. Chatty Bulk Stormwater Development, Nelson Mandela Bay Municipality, Port Elizabeth. (Contracted by: SRK Consulting) (August 2016).
- Wetland and Riparian Assessment. Bengal Heights Proposed Housing Development, Buffalo City Municipality, East London. (Contracted by: Terreco Environmental cc) (June – July 2016).
- Biodiversity Assessment. Indalo Game Reserves. Protected Environment Application to the Eastern Cape Parks and Tourism Agency. Eastern Cape. (Contracted by: Indalo Game Reserves) (May – August 2016).
- Langbos Farm. Expansion of Citrus. Vegetation and Aquatic Survey and Assessment. Addo, Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (Current, Draft submitted).
- Proposed Mncwasa Bridge Crossing. Present Ecological State Assessment. Mbashe Local Municipality (Contracted by: Ikamva Consulting) (March – April 2016).
- Proposed Quarry along the N2 between Grahamstown and Peddie. Vegetation Survey and Assessment Makana Local Municipality. (Contracted by: Terreco Environmental cc) (March 2016).
- Seven Fountains Mixed Use Development. Aquatic Survey and Assessment. Makana Local Municipality. (Contracted by: Public Process Consultants) (February 2016).
- Misty Mount Aquatic Study. Mthatha, Nyandeni Local Municipality, Eastern Cape (Contracted by: Ikamva Consulting) (January – February 2016).
- Wolweton Farm. Citrus Cultivation. Vegetation and Aquatic Survey and Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (December 2015 – January 2015).
- Habata Portion 15 of 203. Vegetation and Wetland Survey and Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (November 2015).
- Habata Portion 8 of 203. Vegetation and Wetland Survey and Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (November 2015).
- Amajingqi Macadamia Cultivation. Shixini Area, former Transkei. Mbashe Municipality. Aquatic Survey and Assessment. Present Ecological State, Riparian Vegetation Delineation and Impact Assessment. (Contracted by: Laughing Waters) (October – November 2015).
- Wetland Survey and Assessment. Eskom Ankerlig-Sterrekus Powerline 20km, Cape Town, Western Cape (Contracted by: Environmental Impact Management Services Pty Ltd) (Current).
- North West Province Biodiversity Sector Plan (BSP). BSP handbook for the Department of Rural, Environment and Agricultural Development (Contracted by: ECOSOL GIS) (Current).
- Advisor to RESILIM/AWARD - Integrating Biodiversity into Municipal Planning Documents in the Limpopo Catchment of South Africa and Mozambique. (Contracted by: RESILIM/AWARD – USAID Funded Project) (Current).
- Waterberg District Bioregional Plan. Limpopo Province. Department of Economic Development and Environmental Affairs (Contracted by: ECOSOL GIS) (Current).
- Umgcabo Farm Vegetation and Aquatic Assessment. Rapid Environmental Risk Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (June – July 2015).
- Gafney Farm Vegetation and Aquatic Assessment: Sensitive Areas Mapping. Rapid Environmental Risk Assessment. Sundays River Valley Municipality. (Contracted by: Public Process Consultants) (June – July 2015).
- Aquatic Assessment. Citrus Cultivation of Farm Hitgeist. Sundays River Valley Municipality. Instomi Citrus Cultivation. (Contracted by: Engineering Advise and Services) (Current).

- Aquatic Assessment and Water Use License Application. Sundays River Valley Municipality. Instomi Citrus Cultivation. (Contracted by: Public Process Consultants) (Current/Ongoing).
- Botanical Survey to Mark Threatened and Protected Species. R72 Road Upgrade: Port Alfred to Fish River Estuary – 25 km. (Contracted by: Gibb) (July 2015).
- Freshgro Aquatic Sensitivity Mapping. Sundays River Valley Municipality. Freshgro Citrus Cultivation. (Contracted by: Public Process Consultants) (May 2015).
- Ecological Assessment: Ablution facility at Mtamvuna Estuary, Port Edward. Eastern Cape Province. (Contracted by: Ikamva Consulting Pty Ltd) (March / April 2015).
- Botanical Survey to Identify Protected Plant Species. Eskom Albany-Mimosa Powerline 1.1km, Alicedale, Eastern Cape (Contracted by: Environmental Impact Management Services Pty Ltd) (April 2015).
- Municipal review of the socio-ecological content of spatial and non-spatial planning documents in the Limpopo Catchment. (Contracted by: RESILIM/AWARD – USAID Funded Project) (Current).
- Ecological Assessment: Citrus Cultivation Scheepers Vlakke Farm. Sundays River Valley Municipality. (Contracted by: I.W. Terblanche and Associates) (September/October 2014).
- Buffelspruit Nature Reserve Ecological Assessment: Lodge Development, Maletswai Local Municipality, Eastern Cape (Contracted by: NS Environmental Consulting) (Current).
- Ecological Assessment: Loerie Heights Mixed Use Development, Buffalo City Metropolitan Municipality, Eastern Cape (Contracted by USK Consulting Engineers) (Current).
- Wetland Aquatic Assessment. Rosedale Water Works. Mthatha. (Contracted by: Scherman Colloty and Associates) (October 2014).
- Aquatic Assessment. Sabelele Road Upgrade, Cofimvaba, Eastern Cape. (Contracted by: SRK Consultants) (August – September 2014).
- Specialist Review: Construction activities within buffers recommended in the Sunny South Housing Development, Buffalo City Metropolitan Municipality, Eastern Cape. (Contracted by: Environmental Impact Management Services Pty Ltd) (August 2014).
- Wetland Survey and Assessment. Gonubie. Buffalo City Metropolitan Municipality (Contracted by: Tshani Consulting) (December 2014).
- Ecological Assessment: Citrus Cultivation Scheepers Vlakke Farm. Sundays River Valley Municipality. (Contracted by: I.W. Terblanche and Associates) (August - September 2014).
- Ecological Assessment: Thina Lodge Development, Thina Falls, Mhontlo Municipality, Eastern Cape (Contracted by: Ikamva Consulting) (September – October 2014).
- Aquatic Assessment. Summerstrand Stormwater Upgrade. Nelson Mandela Bay Metropolitan Municipality (Contracted by: Public Process Consultants) (August 2014).
- Hintsabe Ecological Assessment: Mixed Use Development, Nqgushwa Local Municipality, Eastern Cape (Contracted by: Indwe Environmental Consulting) (August 2014).
- Gonubie Ecological Assessment: Residential Development, Buffalo City Metropolitan Municipality, Eastern Cape (Contracted by: NS Environmental Consulting) (Current).
- Mkuze Wetland Survey and Water Use License Application (Contracted by: Scherman Colloty and Associates) (April - September 2014).
- Specialist Botanical Assessment: Vegetation and Floristics. Thornhill Bulk Water Supply Scheme, Greater Mthatha Area, Eastern Cape (Contracted by: Gibb Africa) (Current).
- Ecological Assessment: Cofimvaba Mixed Use Human Settlement. Cofimvaba, Intsika Yethu Local Municipality, Eastern Cape. (Contracted by USK Consulting) (February 2014).
- R72 Main Road Biodiversity Assessment. Ndlambe and Nqgushwa local municipalities, Eastern Cape (Contracted by: Scherman Colloty and Associates) (January – March 2014).

- Specialist Botanical Assessment: Vegetation and Floristics. Rosedale Water Treatment Works and Associated Pipeline, Mthatha, Eastern Cape (Contracted by: Gibb Africa) (Current).
- Specialist Ecologist and Wetland Assessment. Coega Tankatara Road Upgrade. Coega Industrial development Zone. Nelson Mandela Bay Municipality. Eastern Cape. (Contracted by: Environmental Impact Management Services Pty Ltd) (2014).
- Msenge Emoyeni Wind Farm Water Use Licensing Application, Bedford (Phase II) – Report Compilation in collaboration with Dr Patsy Scherman (Contracted by: Scherman Colloty and Associates) (Current & Ongoing).
- Mvoti – Mzimkulu Water Management Area (WMA 12) – Assistance with Water Quality component of Classification Study (Contracted by: Scherman Colloty and Associates) (Current & Ongoing).
- Inkomati Water Management Area– Assistance with Water Quality component of Classification Study (Contracted by: Scherman Colloty and Associates) (Current & Ongoing).
- R72 Main Road Biodiversity Assessment. Ndlambe and Ngqushwa local municipalities, Eastern Cape (Contracted by: Scherman Colloty and Associates) (October 2013).
- Swaziland Scoping Study. Biodiversity Data and Mapping Report (Contracted by: Scherman Colloty and Associates) (October 2013).
- Ingquza Wetland Study. Eastern Cape (Contracted by: Scherman Colloty and Associates for AURECON) (September 2013).
- Specialist Ecologist and Wetland Assessment. Proposed Residential Development within 100 m of the High-Water Mark, Kariega Estuary, Kenton-On-Sea. Ndlambe Municipality (Contracted by Conservation Support Services). (July – September 2013).
- Proposed Dedisa – Grassridge 132 kV Powerline. Protected Species Permit Application - Specialist Botanical Survey. (Contracted by: Scherman Colloty and Associates). (Feb – July 2013).
- Proposed Dedisa – Grassridge 132 kV Powerline Environmental Management Programme and Specialist Botanical Survey. (Contracted by: Scherman Colloty and Associates). (Feb – July 2013).
- Specialist Botanical and Vegetation Assessment. Proposed Upgrade of Storm water Infrastructure. Addo, Sundays River Valley Municipality, Eastern Cape. (Contracted by: Scherman Colloty and Associates). (June – July 2013).
- Specialist Wetland Study. Proposed Port Alfred Central Well Fields. Ndlambe Municipality, Eastern Cape (Contracted by Coastal and Environmental Services) (June 2013).
- Specialist Ecologist Assessment. Proposed Residential Development within 100 m of the High-Water Mark, Bushmans Estuary, Bushmans Mouth, Kenton-On-Sea. Ndlambe Municipality (Contracted by Conservation Support Services). (March – May 2013).
- Specialist Ecologist and Wetland Assessment. Proposed Access Road and Culvert Crossing over the Salt Vlei Wetland, Port Alfred. Ndlambe Municipality (Contracted by Conservation Support Services). (January – April 2013)
- Specialist Ecologist and Wetland Assessment. Proposed Slipway on the Mthatha River, Mthatha. King Sabata Dalinyendebo Municipality (Contracted by Conservation Support Services) (February – April 2013).
- Specialist Ecological and Wetland Study for the proposed Sunny South Housing Development, Buffalo City Metropolitan Municipality, Eastern Cape. (Contracted by: Environmental Impact Management Services Pty Ltd) (May 2013).
- Specialist Botanical Report for the Kwanobuhle Housing Development, Port Elizabeth, Nelson Mandela Bay Municipality (Contracted by: Scherman Colloty and Associates) (May 2013).
- Swanepoel Kraals Wetland Study. (Contracted by: Scherman Colloty and Associates) (April 2013).
- Watercourse Delineation Study for the formalization of the Mdantsane Townships. East London. Buffalo City Metropolitan Municipality, Eastern Cape. (Contracted by: Scherman Colloty and Associates) (March 2013).

- Letaba Catchment Reserve – Assistance with Water Quality component of Classification Study (Contracted by: Scherman Colloty and Associates) (October 2012 – June 2013).
- Aquaculture Scoping Study for South Africa Environmental Risk Analysis of current species farmed and associated farming methods in South Africa (Contracted by: Enviro-Fish Africa, Department of Ichthyology and Fisheries Science, Rhodes University) (2012).
- Addo Elephant National Park Mainstreaming Biodiversity Project: Ndlambe, Sundays River Valley, Blue Crane Route and Ikwezi Municipalities, Eastern Cape (Contracted by: South African National Park Parks, French GEF funded project) – Biodiversity and Planning Advisor, capacity building at the local and provincial level on the uptake of biodiversity information, production of user friendly products (four handbooks, four posters, a mapbook and DVD), managing the design component of user friendly products. The production of four Biodiversity Sector Plans (main author) (July 2011 – December 2012).
- Eden District Municipality Coastal Management Programme – Assistance with report compilation: Sensitive environments, legislative review, and management action plans (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Ndlambe Wetland Delineation Study – Present Ecological State Assessment and GIS Mapping (Contracted by: Coastal and Environmental Services) (2012).
- Amakhala Emoyeni Wind Farm Water Use Licensing Application (Phase I), Bedford – Assistance with report compilation (Contracted by: Scherman Colloty and Associates) (2012).
- Tsitsikamma Wind Farm Water Use Licensing Application, Kouga Local Municipality – Assistance with report compilation, including an Integrated Water and Waste Management Plan. Technical assistance with wetlands and wetland GIS mapping, including Wetland Delineation and Sensitivity Assessment Report (Contracted by: Scherman Colloty and Associates). (2012).
- Tombo Access Roads: Water Use Licensing Application, Port St Johns Local Municipality – Assistance with report compilation (Contracted by: Scherman Colloty and Associates) (2012).
- Mthatha Corana Bridge Crossings: Water Use Licensing Application, King Sabata Municipality, Eastern Cape - Assistance with report compilation (Contracted by: Scherman Colloty and Associates). (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project EC1: Schoemakerskop (Sardinia Bay) Marine Protected Area to Cape Recife, Eastern Cape, Nelson Mandela Bay Municipality. Including Environmental Management Plan. Report Compilation in collaboration with Aquaculture Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project EC2: Hamburg to East London Harbour, Eastern Cape. Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area EC3: Chintsa to Mazeppa Bay, Eastern Cape Great Kei Municipality. Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area EC3: Chintsa to Mazeppa Bay, Eastern Cape Great Kei Municipality. Including Environmental Management Plan. Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area NC1: Boegoeburg Noord to Beach North of North Point, Richtersveld Local Municipality, Northern Cape. Including Environmental Management

Plan.Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).

- Environmental Assessment and Abalone Marine Ranching Proposal Report. Proposed Abalone Marine Ranching Pilot Project Concession Area NC4: Skulpfontein to Two Small Rocks 200m From Shore, Kamiesberg Local Municipality, Northern Cape Including Environmental Management Plan.Report Compilation in collaboration with Fisheries (Abalone) Specialist Prof P Britz (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Ecological Risk Assessment. Proposed Aquaculture Development: The Development of a Pilot Land-Based Dusky Kob (*Argyrosomus japonicus*) Mariculture Facility at Hamburg, Ngqushwa Municipality, Eastern Cape. Including Environmental Management Plan. Report Compilation in collaboration with Aquaculture Specialist Dr T Shipton (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).
- Basic Assessment Report. Proposed Trout Aquaculture Facility, Reedsdell Farm, north of Barkley East, Senqu Local Municipality, Eastern Cape. Including Environmental Management Plan (Contracted by: Enviro-Fish Africa, Rhodes University) (2012).

Addo Elephant National Park Biodiversity Mainstreaming Project Global Environmental Facility Funded project (2011-2012)

- Duties: Main author of four biodiversity sector plan handbooks for 4 local municipalities (Ndlambe, Ikwezi, Sundays River Valley, Blue Crane Route), Production of user friendly products and input into the design process, Leading local municipal capacity building workshops, Assisting with incorporating biodiversity into IDP and SDF documents.

Biodiversity Liaison Officer for South African National Parks, Global Environmental Facility Funded project (2007 – 2010) – Garden Route Initiative

- Duties – Mainstreaming biodiversity into land use planning and decision making through government stakeholder workshops, main author of two biodiversity sector plan handbooks for 5 local municipalities, capacity building at the local and provincial level on the uptake of biodiversity information, the review of municipal Integrated Development Plans and Spatial
- Development Frameworks, the review of biodiversity policy documents e.g. biodiversity offset guidelines and rural land use guidelines developed by the Department of Environmental Affairs and Development Planning.
 - Vromans, D.C., Maree, K.S., Holness, S., Job, N. and Brown, A.E. 2010. The Garden Route Biodiversity Sector Plan for the George, Knysna and Bitou Municipalities. Supporting land-use planning and decision-making in Critical Biodiversity Areas and Ecological Support Areas for sustainable development. Garden Route Initiative. South African National Parks. Knysna. ISBN 978-0-9869776-1-9.
 - Vromans, D.C., Maree, K.S., Holness, S., Job, N. and Brown, A.E. 2010. The Garden Route Biodiversity Sector Plan for the Southern Regions of the Kouga and Koukamma Municipalities. Supporting land-use planning and decision-making in Critical Biodiversity Areas and Ecological Support Areas for sustainable development. Garden Route Initiative. South African National Parks. Knysna. ISBN 978-0-9869776-2-6.

Environmental Consultant for 'Coastal and Environmental Services' (May 2003 – December 2006)

- Duties – Quotation and Proposal Compilation, Report Writing, Environmental Impact Assessment and Scoping Studies/Reports, Basic Assessments, Botanical Sampling, Vegetation Surveys and Assessments & Herbarium Work (Plant Identification), Sensitivity Assessments, Rehabilitation Specifications, Environmental Management Plans. Environmental Control Officer. Project Management.

Projects –

- Environmental Control Officer – Environmental Auditing Reports for the proposed “Upgrade of Kenton-on-Sea/Bushmansrivermouth - Bulk Water Supply”. Prepared for the Albany Coast Water Board, Eastern Cape (2005).

- The proposed establishment of an 'Eco-Residential' Development at Seafield (Kleinemonde) in the Eastern Cape: Environmental Scoping Report (2006).
- The proposed Rosehill Mixed Use Development at Port Alfred: Environmental Impact Assessment (2006).
- The proposed Trailees Wetland Access Road at Port Alfred: Environmental Scoping Report (2006).
- Vegetation Survey, River Sands, Ndlambe Local Municipality (2006)
- Cola Beach Guide Plan Amendment: Vegetation Survey, Knysna Local Municipality (2006)
- Upgrade and extension of the Mpekweni Resort, Ndlambe Local Municipality (2006)
- KZN Vegetation Mapping, Durban, Kwazulu Natal (2006)
- ACSA EL Airport Upgrade: Basic Assessment Report, Buffalo City Municipality, Eastern Cape (2006)
- CSL Vegetation Monitoring, Proposed Mining Project, Mozambique (2006)
- Vegetation Survey and Environmental Scoping Report: Proposed Eco-Lodge Development and Nature Reserve, as an Extension to Lalibela Game Reserve, Eastern Cape (2006)
- Vegetation Survey and Sensitivity Assessment, Proposed Mixed Use Development, Gonubie, Buffalo City Municipality (2006).
- Environmental Scoping study: Proposed Shopping Development, Beacon Bay, Buffalo City Municipality (2006).
- Lima Massacre Heritage Site, Environmental Scoping Study and Vegetation Survey, Queenstown (2006).
- Review and editing of several Scoping Studies, EIAs and Vegetation Surveys (2005 – 2006).
- The proposed upgrading and construction of two tented campsites with jetties along the Kariega River and the reparation of the watercourse bank, Kenton-On-Sea, Eastern Cape. Environmental Scoping Report. Prepared for Foxlaw investments - Private Developer (2004 – 2005).
- Preparation of a Construction and Operational Environmental Management Plan for the proposed "Upgrade of Kenton-on-Sea/Bushmansrivermouth - Bulk Water Supply". Prepared for the Albany Coast Water Board, Eastern Cape (2005).
- Upgrade of Main Road 435, Coega Industrial Development Zone, Nelson Mandela Metropolitan Municipality, Eastern Cape. Includes Vegetation Survey (2005).
- Environmental Control Officer – Coega Port Rehabilitation (2005).
- The proposed construction of an 'eco-lodge camp' on a ridge located on Salem farm # 498 above the Bushmans River, Eastern Cape – Environmental Scoping Report. Prepared for Mr J Kritzinger (2003 – 2004).
- The proposed construction of a lodge resort within the Ntlangano Community Reserve adjacent to the Tsitsa Falls and Chipoka Mineral Sands, Salima Bay, Malawi: Volume 1: Scoping and Terms of Reference. Compiled this report. Allied Procurement Agency, Lilongwe, Malawi (2003).
- Establishment of a Community Nature Reserve on the south bank of the Umtamvuna River, Eastern Cape - Environmental Scoping Report. Preparing for PondoCrop, Port Edward. (2003 – 2004).
- The proposed establishment of a Marine and Wildlife Rehabilitation Centre, St Francis Bay, Eastern Cape: Environmental Scoping Report. Prepared for Ajubatis Marine and Wildlife Rescue. (2004 – 2005).
- Construction of a 66kv Power Line, 22Kv Feeder Bays and Substation St Francis Bay, Eastern Cape: Environmental Scoping Report. Prepared for Eskom, Southern Region, East London (2004 – 2005).
- Long term Rehabilitation Plan for the Port of Ngqura. Prepared for the National Ports Authority (NPA), Coega. Port Elizabeth (2004 – 2005).

- Construction of the proposed refurbishment and rebuilding requirements for the Melkhout/Gamtoos 22kv Feeder Powerline and Gamtoos/Melkhout 22kv Feeder Powerline, Eastern Cape. Environmental Scoping Report. Prepared for Eskom, Southern Region, East London (2004 - 2005).
 - The assessment of an Existing Environmental Scoping Study with additional adaptation to the previously proposed layout design for: The proposed establishment of an 'Eco-Residential' development adjacent to the coast and including pristine sand dunes at Aston Bay, Portion 2, Eastern Cape. Prepared for Glenny Buchner Trust (Private Developer) (2004 – 2005)
 - The proposed establishment of an 'Eco-Residential' Development at Aston Bay on Farm Swanlake in the Eastern Cape Environmental Scoping Report. Prepared for Glenny Buchner Trust - Private Developer (2004 – 2005).
 - Letaba Water Quality Reserve: Specialist Trainee – Water Quality Assessment of the Letaba River Catchment - Water quality sampling, statistics and report writing (Dr Scherman & Ms Vromans). Preparing for Department of Water Affairs and Forestry (2003 – 2005).
 - Luanda Dredging Pre-feasibility Study: Assistance in writing part of the dredging report for this study. Prepared for PRDW, Cape Town (2003).
 - Construction of a 66kv Power Line Linking Fort Beaufort and Adelaide, Eastern Cape: Scoping Report. Prepared for Eskom, Southern Region, East London (2003).
 - Corridor Sands Chongoene Export Facility EIA, Volume 2: Specialist Reports: Vegetation & Floristics. Assisted in writing and compiling this specialist report. Prepared for 'Corridor Sands Limitada'. (Prof Lubke & Vromans) (2003).
 - N2 Toll Road Bridges EMP: Vegetation & Sensitivity Analysis. Assisted in writing and compiling the specialist report. (Prof Lubke and Vromans) (2003).
- * Note that all scoping studies include a vegetation assessment and project management.**

Environmental Scientist: Projects Assistant at Enviro-fish Africa PTY (LTD) (Jan – April 2003)

- Duties – Preparation of Tender Proposals, Information Sourcing and Gathering, Data Capture (Excel); Report Writing: Assisted with the compilation of the 'Nelson Mandela Municipal
- Metro: Coastal Management Plan'. General Administration and Co-ordination (New Company established).

Environmental Scientist: Projects Management and Assistant at 'Anchor Environmental' PTY (LTD) (2000-2002)

- Duties – Preparation of Tender Proposals, Project Management of Tuna Longline, Hake Longline and West Coast Rock Lobster Observer Programmes, Information Sourcing and Presentation (Powerpoint), Data Capture (Excel & Access); Report Writing (MSWord); Financial Administration (Pastel 5.2), General Administration, Project Co-ordination & Logistics, Scientific Sampling (SASS), Estuarine Sampling (Vertebrate & Invertebrate), Coastal Zone (Off-Shore & On-Shore) Sampling (Vertebrate & Invertebrate), Class 4 Scientific Diver.

REFERENCES

1. Dr Philip Desmet. Ecosol GIS. Conservation Planner. Cell: 082 850 8751. Email: drphil@ecosolgis.com
2. South African National Parks, Park Planning and Implementation: Conservation Services, Port Elizabeth - Dr Mike Knight (Tel: 041 508 5411; Email: M.Knight@nmmu.ac.za).
3. EOH - Coastal and Environmental Services, Grahamstown and East London (Dr Alan Carter, Prof Roy Lubke) www.cesnet.co.za – Dr Alan Carter (Tel: 043 742 3302; Email: a.carter@cesnet.co.za).