Terrestrial Biodiversity Assessment

prepared in accordance with the
"Protocol for the Specialist Assessment and minimum report content requirements for environmental impacts on Terrestrial Biodiversity"

A part of Portion 31 of the Farm Buffelsfontein 250 near Boggomsbaai in the Western Cape Province

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Terrestrial Biodiversity Assessment Report for a part of Portion 31 of the Farm Buffelsfontein 250, Boggomsbaai near Mossel Bay in the Western Cape Province

2 May 2023

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SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows –

Table 1: Details of Specialist

Specialist	Qualification and accreditation
Dr David Hoare (Pr.Sci.Nat.)	• PhD Botany • SACNASP Reg. no. 400221/05 (Ecology, Botany)

Declaration of independence:

David Hoare Consulting (Pty) Ltd in an independent consultant and hereby declare that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by David Hoare Consulting (Pty) Ltd is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

Disclosure:

David Hoare Consulting (Pty) Ltd undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to David Hoare Consulting (Pty) Ltd by the client and in addition to information obtained during the course of this study, David Hoare Consulting (Pty) Ltd present the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practise.

_____ 2 May 2023

Dr David Hoare Date

TERMS OF REFERENCE

PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL BIODIVERSITY

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Biodiversity, on Animal Species, and on Plant Species. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

Protocol For The Specialist Assessment And Minimum Report Content Requirements For Environmental Impacts On Terrestrial Biodiversity

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

General information

1.1. An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of "**very high sensitivity**" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.

1.2. An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being "**low sensitivity**" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Compliance Statement.

1.3. However, where the information gathered from the site sensitivity verification differs from the designation of "very high" terrestrial biodiversity sensitivity on the screening tool and it is found to be of a "low" sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.

1.4. Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a "low" terrestrial biodiversity sensitivity on the screening tool, a Terrestrial Biodiversity Specialist Assessment must be conducted.

1.5. If any part of the proposed development footprint falls within an area of "very high" sensitivity, the assessment and reporting requirements prescribed for the "very high" sensitivity apply to the entire footprint, ***excluding linear activities*** *for which impacts on terrestrial biodiversity are temporary and the land in the opinion of the terrestrial biodiversity specialist, based on the mitigation and remedial measures, can be returned to the current state within two years of the completion of the construction phase*, in which case a compliance statement applies. Development footprint in the context of this protocol means the area on which the proposed development will take place and includes any area that will be disturbed.

Terrestrial Biodiversity Specialist Assessment

2.1. The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.

2.2. The assessment must be undertaken on the preferred site and within the proposed development footprint.

2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:

2.3.1. a description of the ecological drivers or processes of the system and how the proposed development will impact these;

2.3.2. ecological functioning and ecological processes (e.g. fire, migration, pollination, etc.) that operate within the preferred site;

2.3.3. the ecological corridors that the proposed development would impede including migration and movement of flora and fauna;

2.3.4. the description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments;

2.3.5. a description of terrestrial biodiversity and ecosystems on the preferred site, including:
(a) main vegetation types;
(b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified;
(c) ecologicalconnectivity,habitatfragmentation,ecologicalprocesses and fine-scale habitats; and
(d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified;

2.3.6. the assessment must identify any alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification; and

2.3.7. the assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:

2.3.7.1. terrestrial critical biodiversity areas (CBAs), including:
(a) the reasons why an area has been identified as a CBA;
(b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;
(c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);
(d) the impact on ecosystem threat status;
(e) the impact on explicit subtypes in the vegetation;
(f) the impact on overall species and ecosystem diversity of the site; and
(g) the impact on any changes to threat status of populations of species of conservation concern in the CBA;

2.3.7.2. terrestrial ecological support areas (ESAs), including:
(a) the impact on the ecological processes that operate within or across the site;
(b) the extent the proposed development will impact on the functionality of the ESA; and
(c) loss of ecological connectivity (on site, and in relation to the

broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;

2.3.7.3. protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including-

(a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;

2.3.7.4. priority areas for protected area expansion, including-

(a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;

2.3.7.5. SWSAsincluding:

(a) the impact(s) on the terrestrial habitat of a SWSA; and

(b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses);

2.3.7.6. FEPAsubcatchments,including-

(a) theimpactsoftheproposeddevelopmentonhabitatconditionand species in the FEPA sub catchment;

2.3.7.7 indigenous forests, including:

(a) impact on the ecological integrity of the forest; and

(b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.

2.4. The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.

Terrestrial Biodiversity Specialist Assessment Report

3.1. The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:

3.1.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;

3.1.2. a signed statement of independence by the specialist;

3.1.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

3.1.4. a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;

3.1.5. a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;

3.1.6. a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);

3.1.7. additional environmental impacts expected from the proposed development;

3.1.8. any direct, indirect and cumulative impacts of the proposed development;

3.1.9. the degree to which impacts and risks can be mitigated;

3.1.10. the degree to which the impacts and risks can be reversed;

3.1.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;

3.1.12. proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);

3.1.13. a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;

3.1.14. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and

3.1.15. any conditions to which this statement is subjected.

3.2.The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.

3.3. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

INTRODUCTION

Site location

The site, which is a part of Portion 31 of the Farm Buffelsfontein 250, is adjacent to Boggomsbaai near Mossel Bay to the south of the N2 national road near to Vleesbaai. Refer to Figure 1 below for the general location.

The property is on the northern edge of Boggomsbaai (Figure 2). The golf course is the north-western boundary of the property and cadastral boundaries the remaining property boundaries (Figure 2). The property is largely vacant land, but contains a reservoir on the highest point, buildings on the south-eastern corner, and a narrow gravel road to the reservoir and through the property. The proposed development site is to the south-east of the reservoir (Figure 2).

The scope of this report is the part of the property that is proposed for development. The majority of the property is planned to be omitted from the development. The entire site is 23.77 ha of which only 3.45 ha is proposed for development (Figure 2).

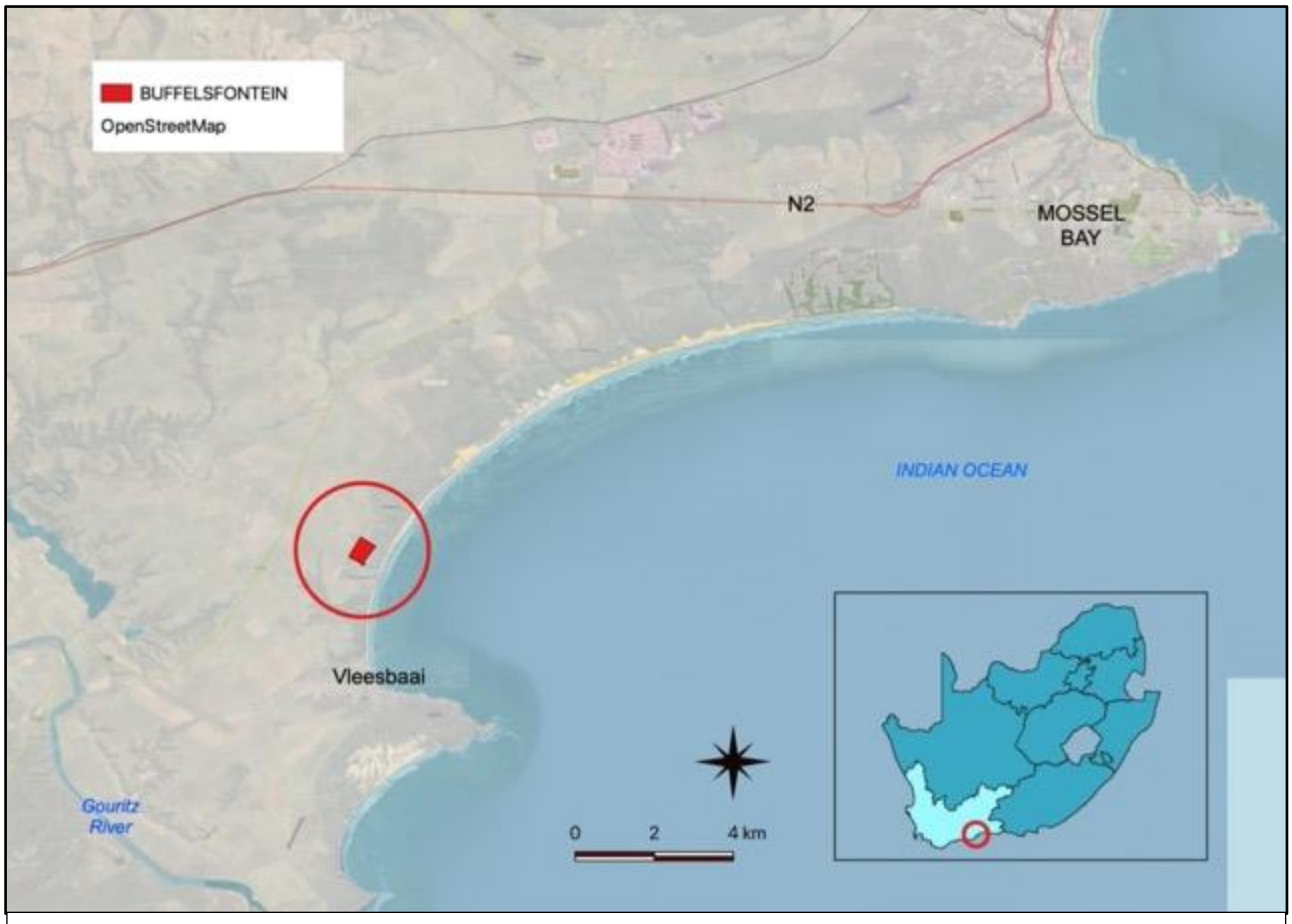

Figure 1: Location of the site.

Figure 2: Aerial image of Portion 31 of the Farm Buffelsfontein 250 and surrounding areas (schematic layout).

Identified Theme Sensitivities

A sensitivity screening report from the DEA Online Screening Tool was requested in the application category: Transformation of land | Indigenous vegetation. The DEA Screening Tool report for the area, dated 19/10/2022, indicates the following sensitivities (see Figure 3):

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Terrestrial Biodiversity Theme	X			

Terrestrial Biodiversity theme

Sensitivity features are indicates as follows:

Sensitivity	Feature(s)
Very High	Ecological support area 1
Very High	FEPA Subcatchments

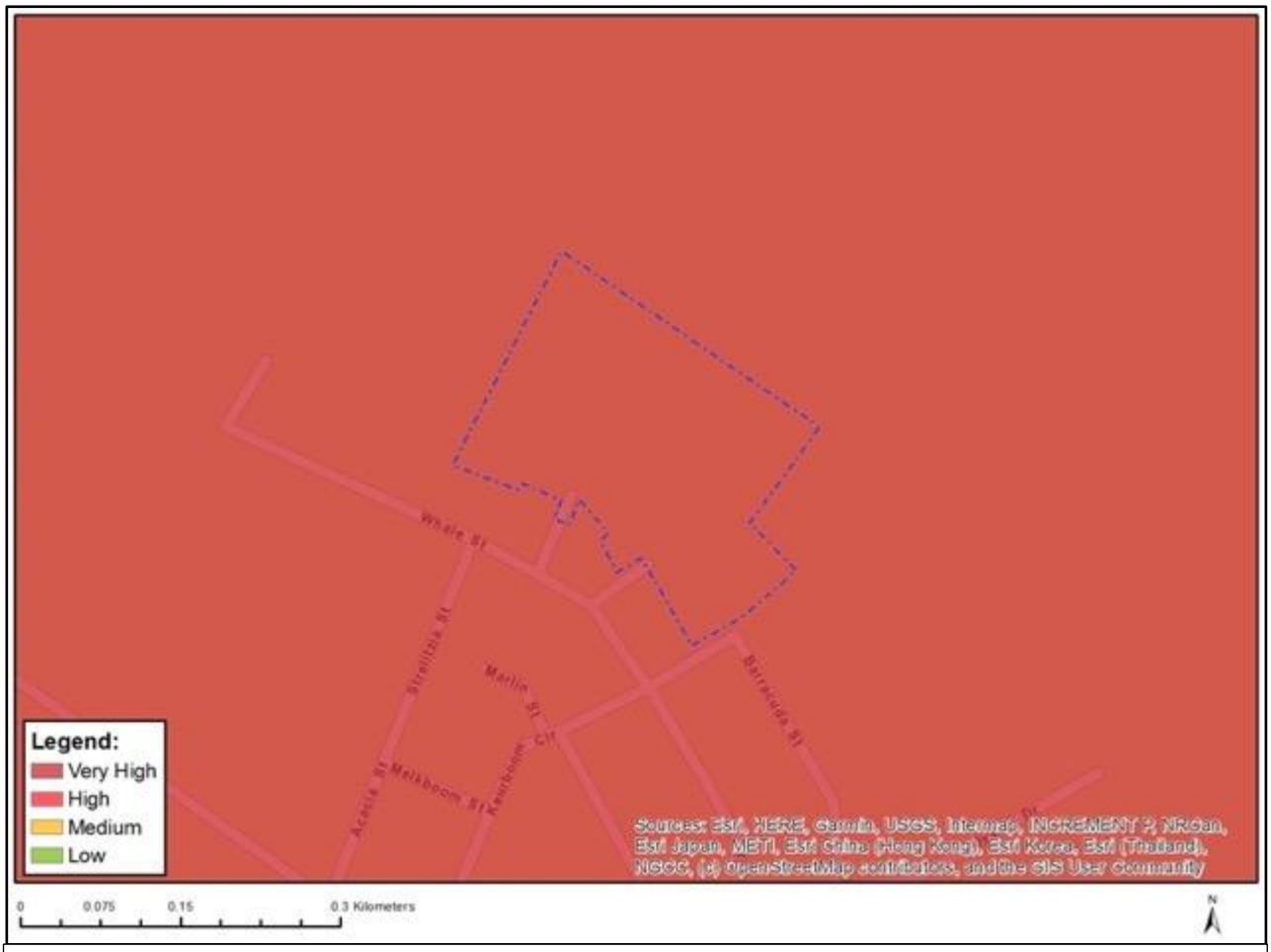

Figure 3: Map of relative terrestrial biodiversity theme sensitivity for the site.

ASSESSMENT METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Project Area of Influence (PAOI)

The proposal is to develop the site for residential purposes. This will include stands for free-standing houses (Figure 4 and Figure 5). Anticipated impacts will mostly occur during the construction phase. These impacts are not expected to extend significantly beyond the boundaries of the study area, except for possible edge effects. The PAOI is therefore treated here as the development footprint within which direct impacts will occur (Figure 4 and Figure 5).

Preferred Alternative

The preferred alternative consists of 13 units scattered over the development area (Figure 4).

Figure 4: Proposed development within part of Portion 31 of the Farm Buffelsfontein 250 (Preferred Alternative – Version 1).

Following public participation this preferred alternative was further mitigated (Version 2):

- 13 units reduced to 12.
- Scattered units clustered into two nodes.
- The position of the access road to the water reservoir has been slightly changed.

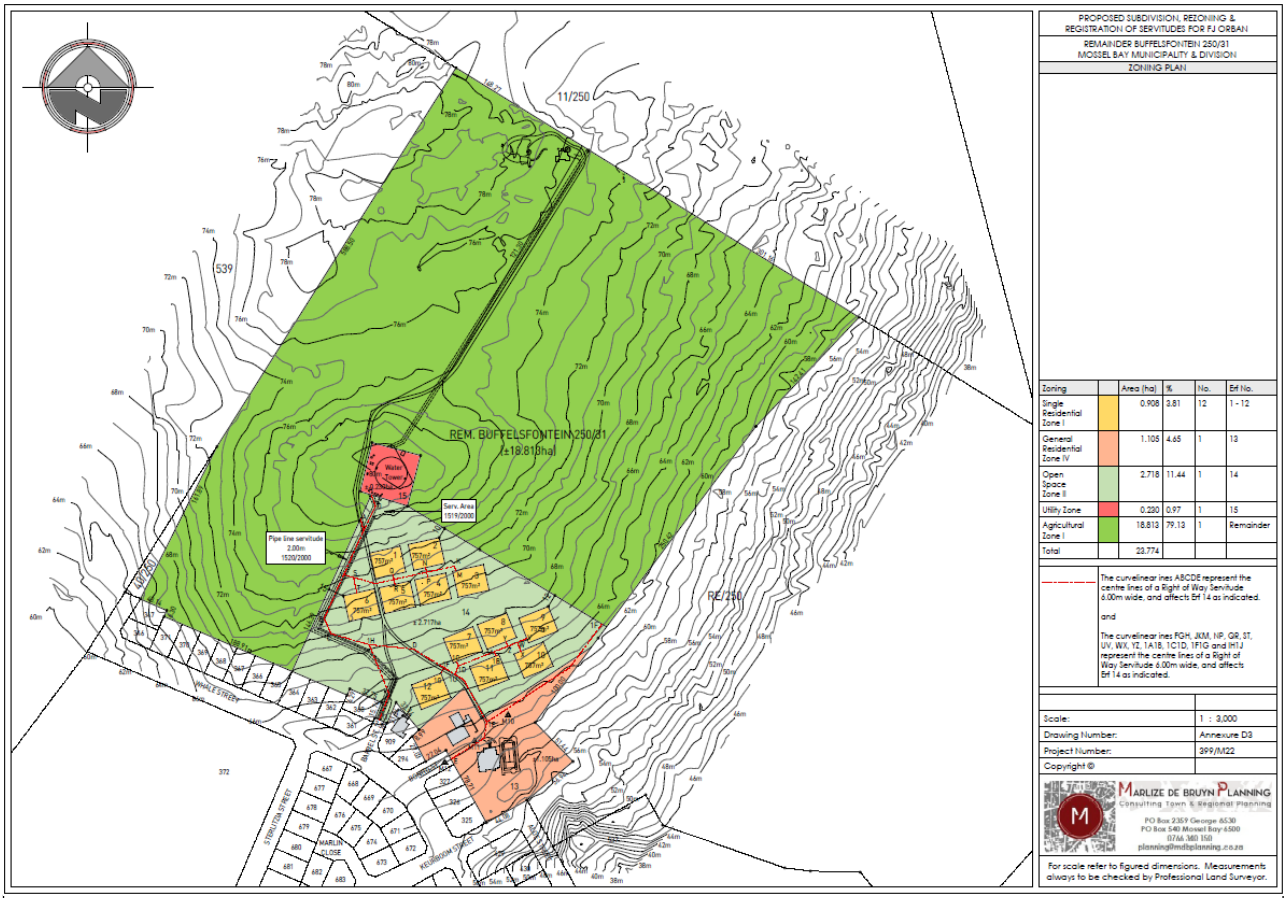

Figure 5: Proposed development within part of Portion 31 of the Farm Buffelsfontein 250 (Preferred Alternative – Version 2).

Since the initial layout of this preferred alternative (Figure 4) was deemed acceptable from a terrestrial biodiversity perspective, this mitigated preferred alternative (Figure 5) is also considered acceptable with the same impact assessment outcomes.

Survey timing

The study commenced as a desktop-study followed by site-specific field study on 28 February 2022. The site is within the Fynbos Biome with an all-year rainfall season with a slight dip in early winter (Figure 6). A more accurate indication of rainfall seasonality, which drives most ecological processes, is shown in Figure 7, which shows that Mossel Bay has peak rainfall from August to November, with another smaller peak in March to April. The timing of the survey in February is therefore suitable in terms of assessing the flora and vegetation of the site. The overall condition of the vegetation was possible to be determined with a high degree of confidence.

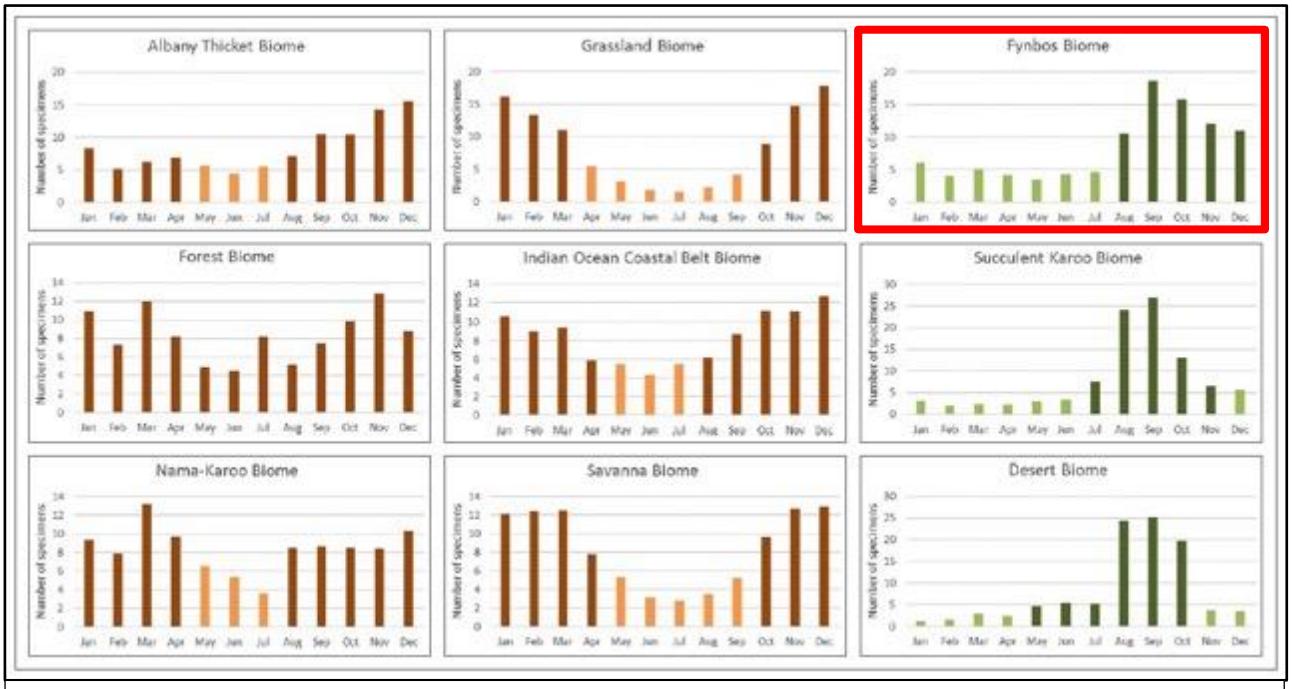

Figure 7: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines). The site is within the Fynbos Biome.

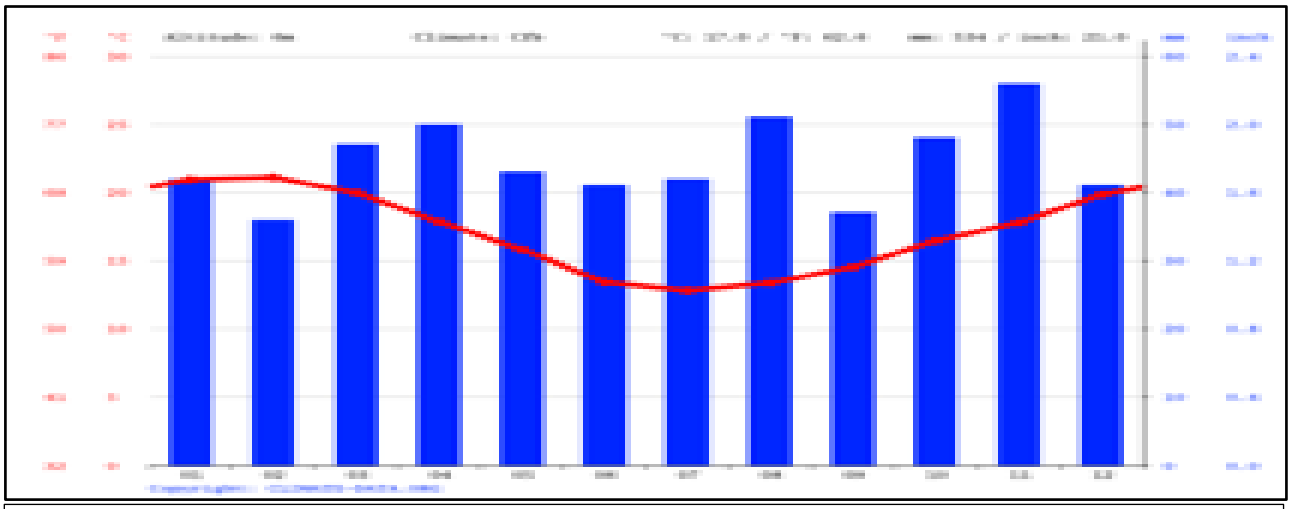

Figure 6: Climate diagram showing average monthly rainfall and temperature for Mossel Bay.

Field survey approach

The study commenced as a desktop-study followed by a site-specific field study. During the field survey of habitats on site, the entire property was assessed on foot. Field surveys included both meander searches of general areas, and active searching in habitats that were considered to be suitable for specific groups or species. Meander surveys were undertaken with no time restrictions - the objective was to comprehensively examine all natural areas. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made (Figure 8). Digital photographs were taken of features and habitats on site, as well as of all plant species that were seen. All plant and animal species recorded were uploaded to the iNaturalist website (https://www.inaturalist.org) and are accessible by viewing the observations for the site (use the Explore menu, zoom and pan

until the desired study area is within the browser window, click the button "Redo search in map", and all observations for that area will be shown and listed).

Aerial imagery from Google Earth was used to identify and assess habitats on site. This included historical imagery that may show information not visible in any single dated image. Patterns identified from satellite imagery were verified on the ground. Digital photographs were taken at locations where features of interest were observed. During the field survey, particular attention was paid to ensuring that all habitat variability was covered physically on the ground.

Figure 8: GPS track log of areas walked in the course of undertaking this assessment.

Sources of information

Regional Vegetation

- Broad vegetation types occurring on site were obtained from Mucina and Rutherford (2006), with updates according to the SANBI BGIS website (http://bgis.sanbi.org), as follows:
    - Mucina, L. and Rutherford, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. Strelitzia 19, South African National Biodiversity Institute, Pretoria.
    - South African National Biodiversity Institute 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland [Vector] 2018. Available from the Biodiversity GIS website, downloaded on 23 September 2021.

Threatened Ecosystems

- The conservation status of the vegetation types were obtained from Mucina and Rutherford (2006) and the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004).
- The plant species checklist of species that could potentially occur on site was compiled from a plant species checklist extracted from the NewPosa database of the South African National biodiversity Institute (SANBI) for the quarter degree grids 3422AA.
- The IUCN Red List Category for plant species, as well as supplementary information on habitats and distribution, was obtained from the SANBI Threatened Species Programme (Red List of South African Plants, http://redlist.sanbi.org).

Regional plans

- Information from the National Protected Areas Expansion Strategy (NPAES) was consulted for possible inclusion of the site into a protected area in future (available on http://bgis.sanbi.org).).
- The 2017 Western Cape Biodiversity Spatial Plan (WCBSP) Maps were consulted for inclusion of any parts of the site into any Critical Biodiversity Areas or Ecological Support Areas (CapeNature. 2017 WCBSP Mossel Bay [Vector] 2017. Available from the Biodiversity GIS website (biodiversityadvisor.sanbi.org)).

Limitations

The following assumptions, limitations, uncertainties are listed regarding the assessment of the site:

- The assessment is based on a single site visit. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general patterns across affected areas.

Impact assessment methodology

The Impact Assessment Methodology assists in evaluating the overall effect of a proposed activity on the environment. Impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). The rating system is applied to the potential impact on the receptor. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 2: Rating of impact assessment criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).

2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.

43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

OUTCOME OF THE ASSESSMENT

Regional vegetation patterns

There are two regional vegetation types mapped for the property within which the development is located (Portion 31 of the Farm Buffelsfontein 250), namely Canca Limestone Fynbos and Albertinia Sand Fynbos. Only Canca Limestone Fynbos is affected by the proposed development (Figure 9 and Figure 10). The national vegetation map is not mapped at a fine scale and the on-site patterns do not entirely match this description. The local topography includes river valleys that contain thicket vegetation. The larger valley systems in this area are mapped as having Hartenbos Dune Thicket. Smaller valley systems should also have been mapped within this vegetation unit, or at least as a mosaic. The original natural vegetation on the property (Portion 31 of the Farm Buffelsfontein 250) is therefore assumed to be some mosaic of these three vegetation types, although most of it has been lost to historical disturbances.

Figure 9: Regional vegetation types of the site and surrounding areas (Preferred Alternative – Version 1).

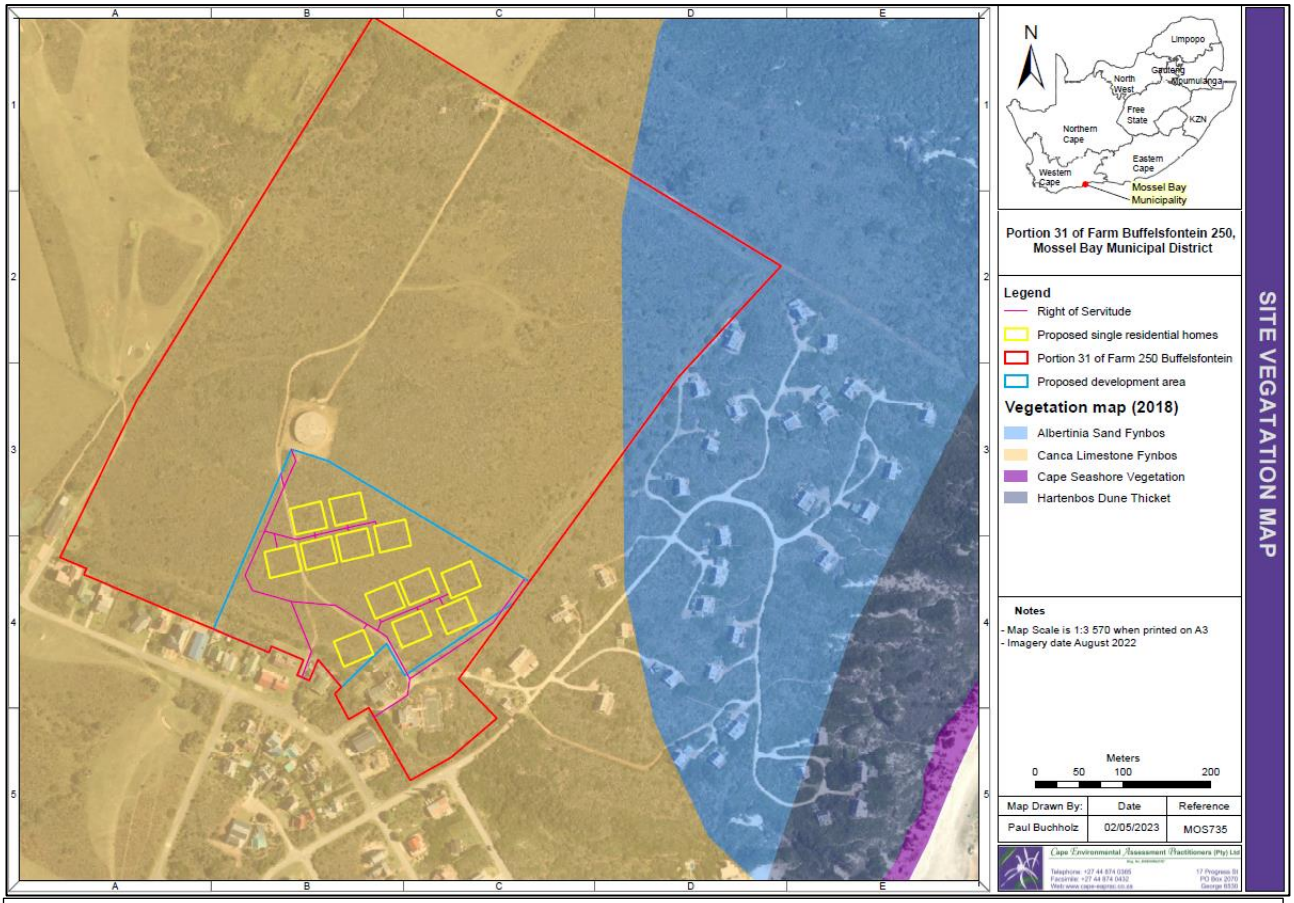

Figure 10: Regional vegetation types of the site and surrounding areas (Preferred Alternative – Version 2).

Canca Limestone Fynbos

Distribution

This vegetation type occurs in the Western Cape Province on coastal forelands from Witsand at the mouth of the Breede River to Mossel Bay, with narrow outliers close to the coast between Hartenbos and Groot Brak River. Furthest occurrence inland is at about 10 km south of Riversdale or roughly 25 km from the coast. Altitude 20–300 m.

Vegetation & Landscape Features

It occurs as a series of hills with parallel crests, sand-filled plains and undulating hills. Neutral and acid sands support FFd 9 Albertinia Sand Fynbos, which dominates the valleys and is far more extensive than in the other limestone fynbos units. This landscape is dominated by the Canca se Leegte and Wankoe depressions, with most of the limestone fynbos on the hill tops and ridges. This vegetation has tall, emergent proteoids in a medium dense low shrubland—mainly asteraceous and proteoid fynbos, with restioid fynbos on skeletal soils. Communities east of the Gouritz River lack the proteoid overstorey and are poorer in species, with *Erica* particularly rare. Rutaceae are dominant and succulents and geophytes are more abundant, grading into succulent thicket on the coast. Local diversity east of the Gouritz River depends on the extent of limestone patches, with smaller outcrops lacking characteristic species.

Geology & Soils

Shallow alkaline to neutral grey regic sands and Glenrosa and Mispah forms on limestone of the Bredasdorp Formation. Land types mainly Fc and Hb.

Climate
MAP 310–630 mm (mean: 485 mm), relatively constant throughout the year, but with a low from December to February. Mean daily maximum and minimum temperatures 25.5°C and 6.3°C for February and July, respectively. A mild temperature regime, with frost incidence only about 3 days per year. This is a marginally warmer unit than the other two limestone fynbos units.

Important Taxa

Growth form	Species
Tall shrub	*Protea obtusifolia (d), Chrysanthemoides monilifera, Erica prolata, Protea lanceolata.*
	Low Shrubs: Erica spectabilis (d), Leucadendron meridianum (d), L. muirii (d), Acmadenia densifolia, A. obtusata, Agathosma muirii, Aspalathus alopecurus, A. calcarea, A. incurvifolia, A. sanguinea subsp. sanguinea, Chascanum cernuum, Diospyros dichrophyllaT, Erica regia subsp. mariae, E. vestita, Euryops ericoides, Indigofera zeyheri, Metalasia calcicola, Phylica pubescens var. orientalis
Herb	*Osteospermum scariosum*
Geophytic herb	*Freesia leichtlinii*
Graminoid	*Ischyrolepis leptoclados (d), Ceratocaryum argenteum, Elegia microcarpa, Ficinia truncata, Pentaschistis calcicola, Thamnochortus erectus, T. lucens, T. pluristachyus*
Endemic taxa	
Low shrub	*Aspalathus candidula, Athanasia cochlearifolia, Erica baueri subsp. gouriquae, E. platycalyx, Euryops muirii, Hermannia muirii, Lobostemon belliformis, Metalasia luteola, Muraltia barkerae, M. depressa, Oedera steyniae*
Succulent shrub	*Delosperma virens, Ruschia leptocalyx*
Herb	*Sutera placida*
Geophytic herb	*Tritonia squalida*
Succulent herb	*Haorthia mirabilis* var. *paradoxa*

Remarks
Fire-safe habitats such as depressions and limestone ridges support Cape Milkwood Forests (see Von Maltitz et al. 2003), often with notably darker soils and extending well into the sandy soils. *Protea lanceolata* is a marked dominant in wetter areas and in ecotones, with dune thicket patches away from the coast. West of Blombos a small transitional form between *Leucospermum praecox* and *L. truncatum* is as much at home in the limestone as in the sand fynbos. There are still remnants of the shallow calcretes over shale north of the limestone deposits (not mapped). These do bear limestone fynbos, but more often have thicket communities, but this may be due to conversion of the veld into pasture and wheatlands, with only thicker calcretes remaining and protected from fire.

Albertinia Sand Fynbos

Distribution
This vegetation type occurs in the Western Cape Province: Generally longitudinally east-west-trending patches on the coastal plain from Potberg in the west to the Gouritz River in the east. Also found from Kleinberg to west of Mossel Bay, with isolated unmapped outliers near Groot Brak River and between Potberg and De Hoop Vlei. The patches of this vegetation unit almost always border a limestone fynbos type. When enclosed by limestone, it is often found in depressions which can be extensive, for example the Wankoe south of Riversdale and Canca se Leegte south of Albertinia. Altitude 20–260 m.

Vegetation & Landscape Features
It is found on plains and undulating hills with numerous dune slacks—forming the most extensive area of sand fynbos within the limestone fynbos area and occupying most of the depressions, valleys and lower slopes. Vegetation is characterised by medium tall (1.5–2 m tall) open shrub layer, together with a dense stratum of 1–1.2 m tall shrubs and hemicryptophytes. It is structurally predominantly proteoid fynbos, but with extensive restioid fynbos in the watercourses and coastal edges.

Geology & Soils
Deep neutral to acid, usually red, Tertiary sands associated with limestone of Bredasdorp Formation, but also acid sands derived from alluvial deposits from the Gouritz River. Acid Tertiary sands, usually grey, from Potberg and Aasvogelberg are locally prominent. Land types mainly Fc, Hb and Db.

Climate
MAP 230–620 mm (mean: 430 mm), with no clear peak and a slight low in December–January. Mean daily maximum and minimum temperatures 25.5°C and 6.4°C for January–February and July, respectively. Frost incidence about 3 days per year.

Important Taxa

Growth form	Species
Tall shrub	*Cassine peragua subsp. peragua (d), Leucadendron eucalyptifolium (d), Metalasia densa (d), Protea repens (d), P. susannae (d), Nylandtia spinosa, Passerina corymbosa, Psoralea pinnata.*
Low shrub	*Chironia baccifera (d), Cliffortia ilicifolia (d), C. stricta (d), Erica imbricata (d), Lachnaea axillaris (d), Agathosma bifida, A. scaberula, Amphithalea tomentosa, Anthospermum prostratum, Aulax umbellata, Carpacoce vaginellata, Chrysocoma ciliata, Cliffortia drepanoides, Diospyros dichrophyllaT, Erica discolor, E. pulchella, E. sessiliflora, E. versicolor, Euryops ericoides, Leucadendron meridianum, L. salignum, Muraltia ciliaris, Passerina galpinii, P. rigida, Phylica parviflora, Psoralea laxa, Senecio ilicifolius, Staavia radiata, Struthiola ciliata subsp. incana, Syncarpha paniculata, Trichocephalus stipularis, Trichogyne repens.*
Herbs	*Edmondia sesamoides, Senecio laevigatus*
Geophytic herb	*Pteridium aquilinum (d), Bobartia robusta, Bulbine frutescens, Romulea dichotoma, R. gigantea*
Graminoid	*Calopsis adpressa (d), Elegia stipularis (d), Ischyrolepis leptoclados (d), Mastersiella purpurea (d), Thamnochortus insignis (d), Cynodon dactylon, Elegia muirii, E. tectorum, Mastersiella spathulata, Staberoha distachyos, Thamnochortus erectus, T. fruticosus, Willdenowia teres*
Endemic taxa	
Tall shrubs	*Leucospermum praecox (d), Leucadendron galpinii (d), Leucospermum fulgens.*
Low shrubs	*Euchaetis albertiniana (d), Agathosma pallens, Aspalathus acutiflora, A. dasyantha, A. odontoloba, A. quadrata, A. sanguinea subsp. foliosa, Diosma sabulosa, Erica baueri subsp. baueri, E. dispar, E. viscosissima, Lebeckia fasciculata, Leucospermum muirii, Lobelia valida.*
Succulent shrubs	*Lampranthus antemeridianus, L. creber, L. diutinus, L. fergusoniae, L. multiseriatus.*
Herb	*Zaluzianskya muirii*
Graminoid	*Thamnochortus muirii*

Remarks
The boundary between the limestone and sand fynbos is often one of soil depth, with limestone fynbos being largely confined to skeletal soils. In permanently wet areas and fire-safe habitats, thicket may occur, often in association with *Protea lanceolata, Elegia microcarpa* and *Thamnochortus erectus*—these are usually at the interface between sand and limestone fynbos. *Leucospermum muirii* is an endemic to the grey, sandstone-derived soils—it is not known whether other endemics to this soil type occur or whether this deserves special recognition.

This unit is still not accurately mapped and is more extensive than shown. Pockets occur in valleys and depressions within limestone fynbos as far west as De Hoop Vlei and as far east as the Groot Brak River. Disturbed areas on the coastal fringe sometimes converted to *Cynodon* grazing, with extensive mole rat (*Bathyergus suillus*) activity.

The tall tussock restios typical of this sand fynbos are an important source for the thatching industry.

Hartenbos Dune Thicket

Distribution

This vegetation type occurs in the Western Cape Province. In coastal stretches from the Duiwenhoks River Mouth eastward to Glentana near the Great Brak River.

Vegetation & Landscape Features

On flat to moderately undulating coastal dunes. A mosaic of low (1 - 3 m) thicket, occurring in small bush clumps dominated by small trees and woody shrubs, in a mosaic of low (1 - 2 m) asteraceous fynbos. Thicket clumps are best developed in fire-protected dune slacks, and the fynbos shrubland occurs on upper dune slopes and crests. Succulent karroid elements (*Aloe ferox*, *A. arborescens*, *Eriocephalus africanus*) occur along bands of mudstone and shale.

Geology & Soils

Predominantly occurs in Wankoe and Strandveld Formations. The most important land types are Fc, Hb, Ha.

Climate

Non-seasonal rainfall dominates the region, with MAP between 261 mm and 666 mm. Frost is present for approximately 3 days per year. The mean monthly maximum is 25.19 °C in February and the mean monthly minimum is 6.47 °C in July. Altitude ranges from 0 - 273 masl.

Important Taxa

Growth form	Species
Small tree	*Pterocelastrus tricuspidatus* (d), *Sideroxylon inerme* (d)
Succulent tree	*Aloe ferox*
Succulent shrub	*Aloe arborescens, Carpobrotus acinaciformis* (d), *Carpobrotus edulis, Conicosia pugioniformis, Cotyledon orbiculata, Crassula nudicaulis, Cleretum bellidiforme,, Euphorbia burmannii, Euphorbia caput-medusae, Jordaaniella dubia, Roepera morgsana* (d)
Succulent herb	*Carpobrotus muirii, Haworthia mirabilis var. paradoxa, Euphorbia bayeri*
Geophytic herb	*Brunsvigia orientalis, Chasmanthe aethiopica, Freesia leichtlinii, Haemanthus coccineus, Ixia orientalis*
Low shrub	*Eriocephalus africanus, Eriocephalus africanus* var. *paniculatus, Felicia echinata, Helichrysum patulum, Muraltia spinosa, Salvia africana-lutea* (d), *Agathosma apiculata* (d), *Agathosma muirii, Athanasia cochlearifolia, Athanasia quinquedentata subsp. rigens, Diosma aristata, Euchaetis albertiniana, Hermannia muirii, Muraltia barkerae, Muraltia depressa*
Graminoid	*Restio eleocharis* (d), *Sporobolus fimbriatus, Stenotaphrum secundatum* (d), *Thamnochortus insignis* (d), *Themeda triandra* (d)
Tall shrub	*Azima tetracantha, Carissa bispinosa, Cassine peragua, Cussonia thyrsiflora, Euclea racemosa* (d), *Grewia occidentalis, Lauridia tetragona, Maytenus procumbens* (d), *Metalasia muricata* (d), *Morella cordifolia, Mystroxylon aethiopicum, Olea exasperata* (d), *Osteospermum moniliferum* (d), *Passerina rigida* (d), *Putterlickia pyracantha, Robsonodendron maritimum, Scutia myrtina, Searsia crenata* (d), *Searsia glauca, Searsia lucida, Searsia pterota, Leucospermum praecox*
Herbaceous climber	*Cynanchum ellipticum, Rhoicissus digitata, Solanum africanum*

Listed threatened ecosystems

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists ecosystems, which are often national vegetation types, that are afforded protection on the basis of rates of transformation. The entire property (Portion 31 of the Farm Buffelsfontein 250) is partly within

a listed ecosystem, namely Albertinia Sand Fynbos (see Figure 8). However, only Canca Limestone Fynbos is affected by the proposed development footprint, therefore no listed ecosystem is affected.

Conservation status of broad vegetation types

The development footprint falls entirely within Canca Limestone Fynbos, which is listed as Least Concern in the National Ecosystem List and in the more recent 2018 National Biodiversity Assessment (Skowno et al. 2019).

The two nearby vegetation types are Albertinia Sand Fynbos and Hartenbos Dune Thicket, neither of which is directly affected by the proposed project. Hartenbos Dune Thicket is a newly described vegetation type (Grobler et al. 2018) resulting from ongoing review of the National Vegetation Map. This newly described vegetation type has been assessed as being Least Concern (Table 2).

Table 3: Conservation status of different vegetation types occurring in the study area.

Vegetation Type	**Conservation status**		
	Driver *et al*. 2005 ; Mucina *et al*., 2006	**2018 NBA (Skowno et al. 2019)**	**National Ecosystem List (NEM:BA) (2011)**
Canca Limestone Fynbos	None	Least Concern	Least Concern
Albertinia Sand Fynbos	Vulnerable	Least Concern	Vulnerable
Hartenbos Dune Thicket	None	Least Concern	None

Note that this is a desktop description of what could possibly occur on site, based on mapped ecosystems. The on-site habitat assessment, described in a section below, determines whether any such vegetation occurs on site or not.

It is therefore <u>verified</u> that the development footprint does not fall within any mapped Listed Ecosystem, as listed in The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). The site sensitivity is therefore <u>LOW</u> with respect to this attribute.

Biodiversity Conservation Plans

The Western Cape Biodiversity Spatial Plan (WCBSP) classifies the habitats of the province according to conservation value in decreasing value, as follows:

1. Protected Areas (PA);
2. Critical Biodiversity Areas 1 (CBA1);
3. Critical Biodiversity Areas 2 (CBA2);
4. Ecological Support Area 1 (ESA1);
5. Ecological Support Area 2 (ESA2);

The WCBSP map for Mossel Bay shows that large parts of the entire property within which the development is located (Portion 31 of the Farm Buffelsfontein 250) within a CBA1 a ESA1 area (Figure 11 & Figure 12). Only Ecological Support Areas are affected by the proposed development (see Figure 11 & Figure 12).

Figure 11: Western Cape Biodiversity Spatial Plan of the site and surrounding areas (Preferred Alternative – Version 1).

Note that the purpose of the specialist study, as undertaken here, is to verify whether the vegetation on site meets the standards for inclusion in a conservation zone or not. Provincial-level conservation assessments make use of remote methods for mapping and do not ground-truth all locations. It is

necessary to verify on the ground whether natural habitat occurs on site or not in order to determine whether the inclusion in a conservation zone is justified.

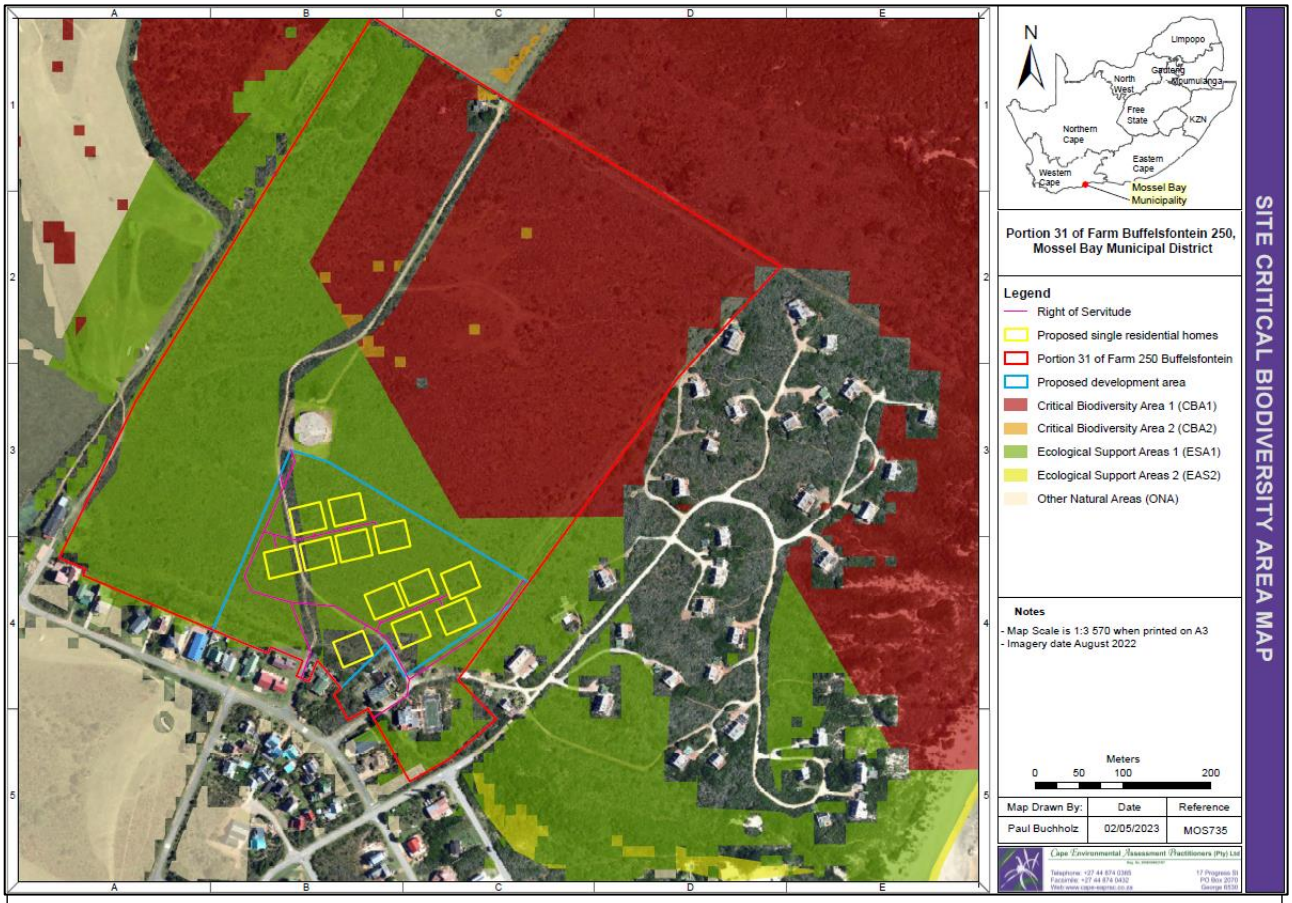

Figure 12: Western Cape Biodiversity Spatial Plan of the site and surrounding areas (Preferred Alternative – Version 2).

This desktop description verifies that the site is included in conservation zones (Ecological Support Area 1) and that an on-site assessment is required to verify the sensitivity of the site with respect to this attribute.

Historical disturbance on site

A 1964 aerial photograph shows that most of the property (Portion 31 of the Farm Buffelsfontein 250) had been ploughed by that date (1964), with the exception of the north-western corner, as well as the highest point in the centre of the property (outlined in red in Figure 10). By 1974 the roads for the new township of Boggomsbaai had been laid out, and by 1999, most of the houses in Boggomsbaai were already built, as well as the water reservoir on the property, leaving the pattern that is currently in place for the area. The ploughed areas in 1964 therefore represent areas that currently contain secondary vegetation within previously ploughed areas (almost 60 years since ploughing), and the two unploughed areas were in a natural state, which persists to date. These patterns are consistent with the vegetation patterns found on site, as determined from the site visit. The proposed development footprint in the south-eastern corner is entirely within areas that were previously disturbed.

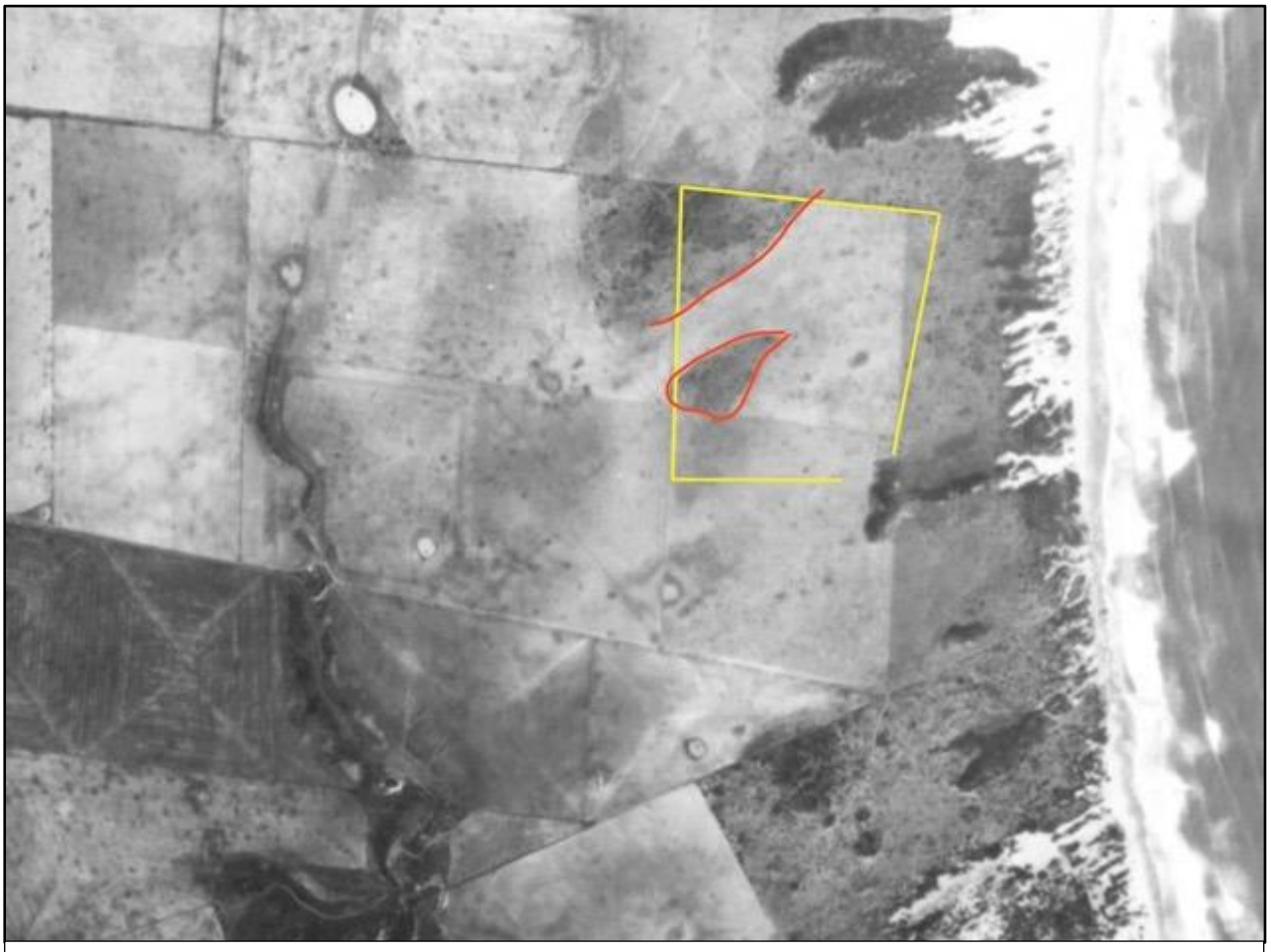

Figure 13: Historical aerial photo of the property, dated 6 June 1989.

Natural habitats on site

Based on a detailed field survey to verify conditions on site, it was determined that, with the exception of the two areas of natural thicket, only secondary habitat remains on the property (shown for the entire property in Figure 14 & Figure 15). An aerial view of the site is shown in Figure 16 and a series of photographs are provided below that give various views of the vegetation on site (Figures 16 - 19). The habitat assessment is important for understanding the natural status of the vegetation on site (whether in a natural state or secondary, and whether degraded, disturbed or in good condition), which affects the sensitivity.

Thicket mosaic

There are two patches of thicket on the property, one of which is marginally within the defined development area. Historical aerial photographs indicate that these are areas of original natural vegetation. It has a relatively short stature, usually around one-and-a-half metres tall, and is impenetrably dense. This is typical of thicket. The species composition includes a diversity of woody species, including *Pterocelastrus tricuspidatus, Schotia afra, Grewia occidentalis, Sideroxylon inerme, Osteospermum moniliferum, Searsia glauca, Searsia pterota, Searsia lucida, Diospyros dichrophylla, Gymnosporia buxifolia, Olea europaea ssp. cuspidata, Azima tetracantha, Lycium ferocissimum, Salvia aurea, Putterlickia pyracantha, Maytenus procumbens, Euclea undulata, Rhoicissus digitata, Aloe arborescens, Aloe ferox*, and *Tarchonanthus littoralis*. This species composition is typical of coastal thicket in the Garden Route area.

Figure 14: Map of habitats on site (Preferred Alternative – Version 1).

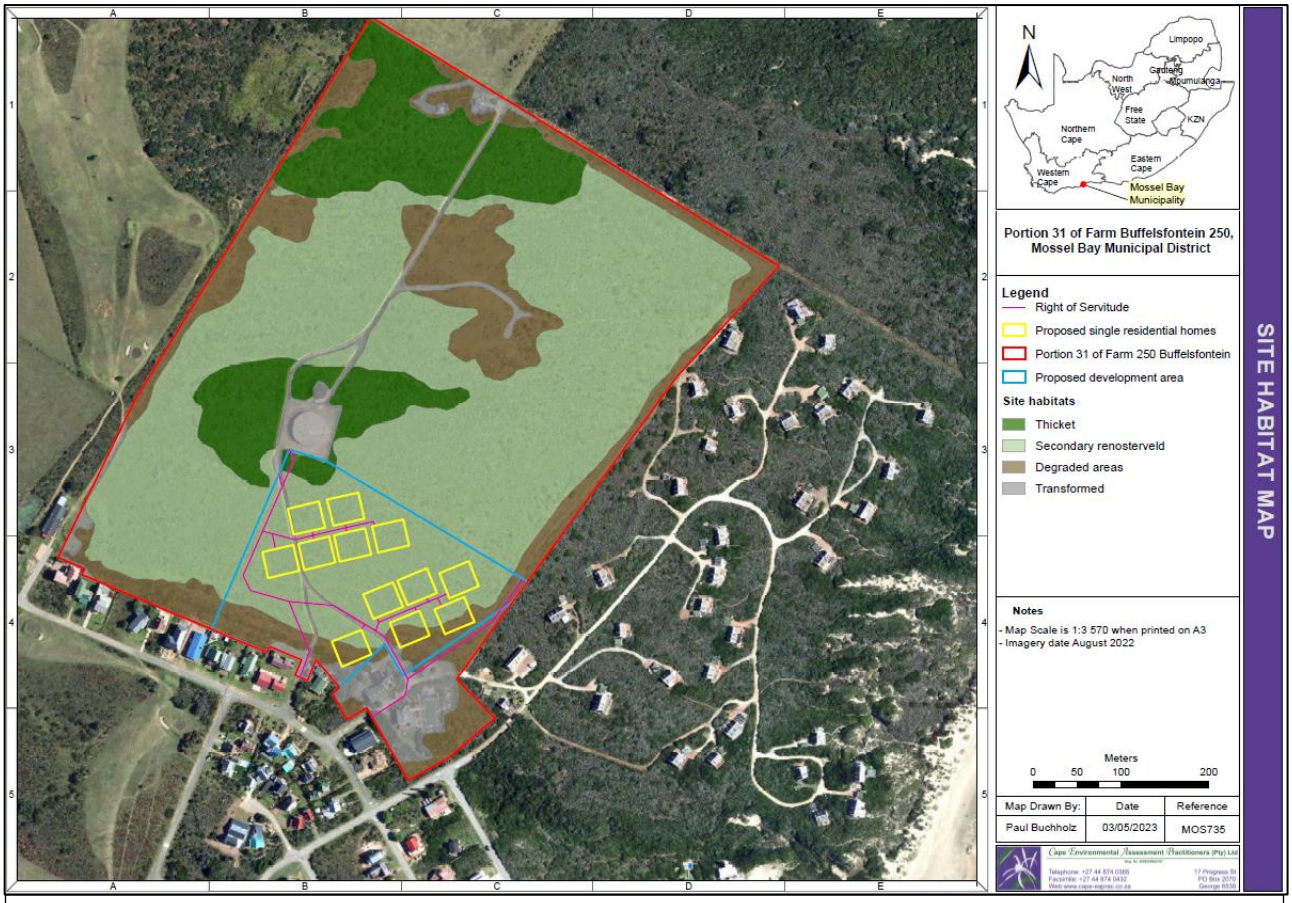

Figure 15: Map of habitats on site (Preferred Alternative – Version 2).

Secondary vegetation

Most of the vegetation on site is in previously disturbed areas, where there has also been localised disturbance in places. The vegetation is almost entirely dominated by *Eriocephalus africanus*, giving the vegetation a uniform grey appearance (see Figure 13). Other plant species occurring in these areas include *Dicerothamnus rhinocerotis*, *Nidorella ivifolia*, *Carpobrotus acinaciformis, Cynodon dactylon, Cynanchum viminale, Mesembryanthemum nodiflorum, Eragrostis curvula, Pelargonium peltatum,* and *Helichrysum teretifolium*, as well as the exotic species, *Acacia cyclops** (NEMBA Category 1b), *Myoporum insulare** (NEMBA Category 3) and *Solanum linnaeanum**.

This is a transformed habitat type and no plant species of concern were found here or are likely to occur here.

Figure 16: View from west to east over the site.

Figure 17: Typical thicket on site.

Figure 18: Vegetation within proposed development footprint area.

Figure 20: Secondary vegetation on site in previously disturbed areas.

Figure 19: Reservoir in centre of property.

SITE ECOLOGICAL IMPORTANCE

The Species Environmental Assessment Guidelines require that a Site Ecological Importance (SEI) is calculated for each habitat on site, and provides methodology for making this calculation. The SEI is assessed separately for each biodiversity theme and is assessed below specifically for the Terrestrial Biodiversity theme.

As per the Species Environmental Assessment Guidelines, Site Ecological Importance (SEI) is calculated as a function of the Biodiversity Importance (BI) of the receptor and its resilience to impacts (SEI = BI + RR). The Biodiversity Importance (BI) in turn is a function of Conservation Importance (CI) and Functional Integrity (FI), i.e. BI = CI + FI.

An assessment of habitats on site is provided below (Table 3) specifically for the Plant Species Theme.

Table 4: Site ecological importance for habitats found on site

Habitat	Conservation importance	Functional integrity	Receptor resilience	Site Ecological Importance (BI)
Thicket mosaic	Medium > 50% of receptor contains natural habitat with potential to support SCC.	Medium Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types.	Low Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.	High (BI = Medium)
Secondary vegetation	Low < 50% of receptor contains natural habitat with limited potential to support SCC.	Medium Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora)	Medium Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor	Low (BI = Low)

		and a few signs of minor past disturbance. Moderate rehabilitation potential..	functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.	
Degraded & transformed	Very low No natural habitat remaining.	Very low Several major current negative ecological impacts.	Very high Habitat that can recover rapidly	Very low (BI = Very low)

Guidelines for development activities within different importance levels are given in the Table below (Table 8).

Table 5: Guidelines for interpreting SEI in the context of the proposed development activities

Site ecological importance	**Interpretation in relation to proposed development activities**
Very high	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/ not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities
Very low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

Summary of site sensitivity

The remaining natural habitat on site is the patches of thicket in the northern and central parts of the site. All other vegetation on site is secondary or disturbed and does not qualify as original natural vegetation. Based on the "Site Ecological Importance" assessment, the Thicket is mapped as having HIGH sensitivity, and other parts of the site as having LOW or VERY LOW sensitivity (Figure 21 and Figure 22) for the Terrestrial Biodiversity Theme.

Figure 21: Terrestrial Biodiversity species theme sensitivity for the site (Preferred Alternative – Version 1).

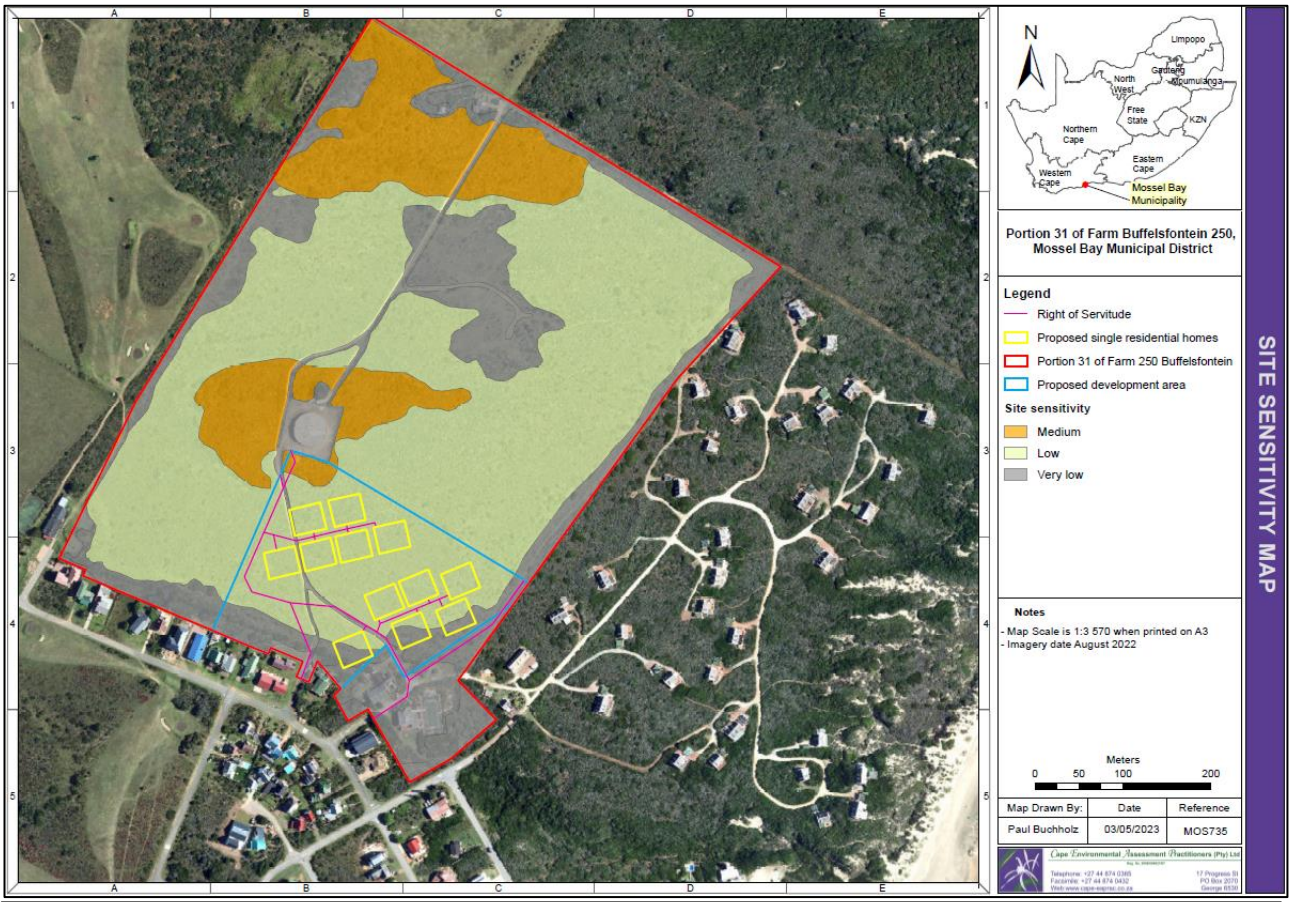

Figure 22: Terrestrial Biodiversity species theme sensitivity for the site (Preferred Alternative – Version 2).

IMPACT ASSESSMENT

Proposed development

The proposal is to develop residential areas on site. The proposed development layout is shown in Figure 5. The development layout relative to sensitivities on site is shown in Figure 22. This shows that the proposed development will be located within habitats in the VERY LOW and LOW sensitivity classes.

For the assessment undertaken here, two alternatives are being considered:

1. Alternative 1: No-Go Alternative: continued land use zoned for Agricultural
2. Alternative 2: Preferred Alternative: proposed development

Any comparisons below between the development proposal and the "No-go" alternative are for the same area (proposed development area).

Alternative 1

This is the "No-go" alternative. The property will remain vacant and under current management. Current burning regimes and alien invasive levels are likely to remain relatively static. There is currently no ecological burning regime for the site. The impact of this is uncertain since most of the area being considered is secondary vegetation. Thicket in adjacent areas would be negatively affected by regular burning and could potentially be lost, therefore the current burning regime potentially protects remaining patches of thicket in adjacent areas. Fynbos becomes moribund in the absence of fire, therefore any fynbos species would require some fire management. There is, however, no fynbos on site, only secondary vegetation. Alien invasive plants are under control, which is likely to continue under the present ownership, but could change under new ownership.

Alternative 2

This is the limited development option. Under this option there is likely to be an incentive to enhance natural habitat health, especially if it is prescribed as part of the management plan for the project. For example, it has been recommended that gardens are planted with species indigenous to the area and that open spaces are rehabilitated to encourage establishment of indigenous species. In a best-case scenario, it would be possible to fence sensitive areas, manage fire regimes and alien plants, and re-establish fynbos within open spaces. A possible outcome would be similar to the existing development on the coastal side of the current site. At the worst, this alternative would result in the loss of a small area of secondary vegetation and no change to the status of remaining areas.

Affected sensitivities

All remaining natural vegetation within the proposed development footprint is within mapped ESAs (Ecological Support Areas).

The impacts assessed here are therefore as follows:

1. DIRECT LOSS OF SECONDARY HABITAT WITHIN ESA.
2. INVASION BY ALIEN INVASIVE PLANT SPECIES.

Assessment of impacts

Degradation of habitat within ESA: Alternative 1 (No-go)

Extent of impact
The impact will occur at the local scale but (theoretically) potentially affects the entire provincial conservation plan. ESA areas are supportive in terms of maintaining ecosystem processes. The development site assessed here for the "No-go" option is almost 3.5 hectares in size, which is relatively insignificant at a provincial level. This area is also secondary vegetation and therefore does not contain the original vegetation that would have occurred at this locality. If the biodiversity objective is maintaining ecosystem processes or patterns, then this locality is not irreplaceable. Depending on local circumstances, there is therefore the opportunity to replace lost support roles at alternative locations, or through some other intervention. The impact is therefore scored as SITE.

Duration of impact
Management of natural vegetation is a LONG-TERM issue.

Probability of occurrence
Based on the current status and the known location of natural habitats found on site, the impact will be POSSIBLE and mostly due to **indirect** impacts.

Reversibility of impact
Impacts due to inappropriate fire regimes and invasion by alien plants is partly reversible.

Degree to which resources will be irreplaceably lost
Due to being small and already secondary, marginal loss of resources will take place.

Intensity or magnitude of impact
Relative to the current status, possible impacts may affect the quality, use and integrity of the system/component in a way that is barely perceptible, therefore impacts will be of LOW magnitude.

Significance of impact
The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

On this basis, the impact is calculated as [(Extent = 1) + (Probability = 2) + (Reversibility = 2) + (Irreplaceability = 2) + (Duration = 3)] x (Intensity = 1)

Score = 10 = LOW negative significance

Possible mitigation measures:
No mitigation is envisaged therefore the "post-mitigation" score is identical.

Issue	Degradation of natural habitat within ESA	
Description of Impact		
Poor management of habitat may result in long-term degradation of secondary vegetation on site		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Operation	
Criteria	**Without Mitigation**	**With Mitigation**

Extent	Site	Site
Duration	Long-term	Long-term
Probability	Possible	Possible
Degree to which impact may cause irreplaceable loss of resources	Marginal loss of resources	Marginal
Degree to which impact can be reversed	Partly reversible	Partly reversible
Intensity	Low	Low
Significance	Low -	Low -

Direct loss of habitat within ESA: Alternative 2 (limited development)

Extent of impact
The impact will occur at the local scale but (theoretically) potentially affects the entire provincial conservation plan. ESA areas are supportive in terms of maintaining ecosystem processes. The affected area of ESA1 is almost 3.5 hectares, which is relatively insignificant at a provincial level. This area is also secondary vegetation and therefore does not contain the original vegetation that would have occurred at this locality. If the biodiversity objective is maintaining ecosystem processes or patterns, then this locality is not irreplaceable. Depending on local circumstances, there is therefore the opportunity to replace lost support roles at alternative locations, or through some other intervention. The impact is therefore scored as SITE.

Duration of impact
Clearing of natural vegetation will result in a PERMANENT impact (cannot be reversed).

Probability of occurrence
Based on the proposed development plan and the known location of habitats found on site, the impact will be DEFINITE and mostly due to direct impacts.

Reversibility of impact
Loss of original habitat is irreversible, but the affected area is secondary vegetation that can be restored within a few years to a few decades. It is therefore partly reversible.

Degree to which resources will be irreplaceably lost
Due to being small and already secondary, marginal loss of resources will take place.

Intensity or magnitude of impact
At a site scale, possible impacts may result in system components continuing to function in a moderately modified way, therefore impacts will be of MEDIUM magnitude.

Significance of impact
The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

On this basis, the impact is calculated as [(Extent = 1) + (Probability = 3) + (Reversibility = 2) + (Irreplaceability = 2) + (Duration = 4)] x (Intensity = 2)

Score = 24 = MEDIUM negative significance

Possible mitigation measures:

According to the guidelines for interpreting Site Ecological Importance in the context of proposed development activities, minimisation and restoration mitigation is required in habitats with Low sensitivity. The following mitigation measures are therefore proposed:

1. Fence the development site prior to construction and prohibit access or activities to areas outside of development footprint.
2. Protect neighbouring areas of thicket and, through ecological management, attempt to enhance the condition of thicket on site.
3. Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.
4. Use indigenous and site-appropriate plant species in any rehabilitation and landscaping.
5. No additional clearing of vegetation should take place without a proper assessment of the environmental impacts, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
6. Limit access to thicket to appropriate low-impact activities, for example, walking trails.
7. Obtain permits for any protected trees that may need to be pruned or removed.

Post-mitigation impact is calculated as [(Extent = 1) + (Probability = 2) + (Reversibility = 2) + (Irreplaceability = 2) + (Duration = 4)] x (Intensity = 1)

Score = 11 = LOW negative significance

Issue	Loss of natural habitat within ESA	
Description of Impact		
Construction activities may result in some clearing of natural habitat, to be replaced by the infrastructure. This will result in permanent local loss of secondary vegetation		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction, Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	Site	Site
Duration	Permanent	Permanent
Probability	Probable	Possible
Degree to which impact may cause irreplaceable loss of resources	Marginal loss of resources	Marginal
Degree to which impact can be reversed	Partly reversible	Partly reversible
Intensity	Medium	Low
Significance	Medium -	Low -

Invasion by alien invasive plant species: Alternative 1 (No-go)

Extent of impact
The impact will occur at the site scale. The impact is therefore scored as SITE.

Duration of impact
Severe invasion (worst-case scenario) can cause irreversible ecosystem changes that will result in a PERMANENT impact (cannot be reversed). However, under current legislation, alien control is required by law, therefore effects are more likely to be LONG-TERM.

Probability of occurrence

Based on the presence of several potentially destructive alien invasive species in the region and nearby, it is likely that continuous invasion will occur, therefore the impact will be PROBABLE.

Reversibility of impact
Loss of secondary habitat is partly reversible.

Degree to which resources will be irreplaceably lost
Marginal loss of resources will take place (secondary vegetation).

Intensity or magnitude of impact
In terms of the effect of alien invasive species on secondary vegetation, severe invasion is potentially an impact that affects the continued viability of the natural ecosystems on site, therefore impacts will be of HIGH magnitude/intensity.

Significance of impact
The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

On this basis, the impact is calculated as [(Extent = 1) + (Probability = 2) + (Reversibility = 3) + (Irreplaceability = 2) + (Duration = 3)] x (Intensity = 3)

Score = 33 = MEDIUM negative significance

Possible mitigation measures:
Under the "No-go" option, it is assumed that no specific mitigation will be applied. The "post mitigation" score is therefore identical.

Issue	Invasion by alien invasive plant species, leading to degradation of indigenous habitat	
Description of Impact		
Disturbance and clearing of natural habitat leads to conditions that are ideal for alien invasive species to colonise. Once present, they modify the environment in ways that limit recovery of indigenous habitat..		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction, Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	Site	Site
Duration	Long-term	Long-term
Probability	Probable	Probable
Degree to which impact may cause irreplaceable loss of resources	Marginal	Marginal
Degree to which impact can be reversed	Partly reversible	Partly reversible
Intensity	High	High
Significance	Medium -	Medium -

Invasion by alien invasive plant species: Alternative 2 (limited development)

Extent of impact
The impact will occur at the site scale and is therefore scored as SITE.

Duration of impact
Severe invasion (worst-case scenario) can cause irreversible ecosystem changes that will result in a PERMANENT impact (cannot be reversed). However, under current legislation, alien control is required by law, therefore effects are more likely to be LONG-TERM.

Probability of occurrence
Based on the presence of several potentially destructive alien invasive species in the region and nearby, it is almost certain that disturbance will lead to invasion, therefore the impact will be PROBABLE.

Reversibility of impact
Loss of secondary habitat is partly reversible.

Degree to which resources will be irreplaceably lost
Marginal loss of resources will take place (secondary vegetation).

Intensity or magnitude of impact
In terms of the effect of alien invasive species on secondary vegetation, severe invasion is potentially an impact that affects the continued viability of the natural ecosystems on site, therefore impacts will be of HIGH magnitude/intensity.

Significance of impact
The calculation of the significance of an impact uses the following formula:

Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.

On this basis, the impact is calculated as [(Extent = 1) + (Probability = 3) + (Reversibility = 3) + (Irreplaceability = 2) + (Duration = 3)] x (Intensity = 3)

Score = 36 = MEDIUM negative significance

Possible mitigation measures:
Early detection and effective management, as well as limiting disturbance to vegetation, are all measures that can effectively prevent and control alien invasions. The following mitigation measures are therefore proposed:

1. Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.
2. Use indigenous and site-appropriate plant species in any rehabilitation and landscaping.
3. Protect natural areas outside of the development footprint from disturbance.
4. Maintain neighbouring thicket vegetation canopy structure.
5. Minimise vegetation fragmentation due to any factor, for example, pathways, fire-breaks, and other opening of vegetation provides suitable invasion pathways and disturbance regimes that favour invasive species colonisation.

Post-mitigation impact is calculated as [(Extent = 1) + (Probability = 2) + (Reversibility = 2) + (Irreplaceability = 1) + (Duration = 2)] x (Intensity = 1)

Score = 8 = LOW negative significance

Issue	Invasion by alien invasive plant species, leading to degradation of indigenous habitat
Description of Impact	
Disturbance and clearing of natural habitat leads to conditions that are ideal for alien invasive species to colonise. Once present, they modify the environment in ways that limit recovery of indigenous habitat..	

Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction, Operation	
Criteria	**Without Mitigation**	**With Mitigation**
Extent	Site	Site
Duration	Long-term	Medium-term
Probability	Probable	Possible
Degree to which impact may cause irreplaceable loss of resources	Marginal	None
Degree to which impact can be reversed	Partly reversible	Partly reversible
Intensity	High	Low
Significance	Medium -	Low -

SUMMARY & CONCLUSIONS

Desktop information, field data collection and mapping from aerial imagery provides the following verifications of patterns for the terrestrial biodiversity theme:

1. Most of the development footprint is within an Ecological Support Area. Any habitat therefore has ecological value in terms of supporting ecosystem function in the area. However, the habitat on site was found to be secondary. These natural parts of the site have Low sensitivity in terms of the Terrestrial Biodiversity Theme, as calculated using Site Ecological Importance.

2. Most of the development site consists of secondary and/ or degraded areas, including areas invaded by alien invasive shrubs. There is a patch of dune thicket adjacent to the development site, dominated by milkwood trees, but this falls outside the proposed development footprint. These thicket areas have been designated as having HIGH sensitivity. Secondary vegetation directly affected by the proposed development has LOW sensitivity. The remaining degraded areas are designated as having VERY LOW sensitivity.

3. The proposed development is entirely within areas mapped as degraded / secondary that have low biodiversity value and sensitivity. The development is therefore supported, on condition areas of high sensitivity in adjacent areas are protected (both Version 1 & 2 of the preferred alternative).

RECOMMENDATIONS

- Thicket in the areas adjacent to the development footprint should be treated as sensitive. This vegetation should be protected, especially during construction. Boundary areas should also be protected to maintain understorey microhabitats.

- Firebreaks can be placed around the development but should not intersect thicket patches, rather go around them. Firebreaks can also be consolidated, according to relevant legislation.

- An ongoing alien invasive management programme should take place on site. This will protect neighbouring sensitive habitats from degradation and could potentially be the biggest contribution to maintaining and protecting biodiversity on site and in surrounding areas.

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